Lampiran Peer Review Korespondensi Proses Submit Publikasi Jurnal

Nama Jurnal	: Jurnal Ners
Volume	: 16, No. 2, Oktober 2022
ISSN	: p-ISSN: 1858-3598, e-ISSN: 2502-5791
DOI	: <u>http://dx.doi.org/10.20473/jn.v16i2.29952</u>
Reputasi	: SINTA-2

Judul Artikel	: Effects of Aerobic Exercise on Depression and CD4 Counts in People
Living with HIV	

Item	Tanggal
Submission	14 September 2021
Comment review from reviewer	6 Oktober 2021
Re-Submitted from author (first	16 November 2021
revision)	
Paper published	17 November 2021

Submission

Authors	Untung Sujianto, Madya Sulisno, Richal Grace Zefanya Uly
Title	Effects of Aerobic Exercise on Depression and CD4 Counts in People Living with HIV
Original file	29952-117794-1-SM.PDF 2021-09-14
Supp. files	None
Submitter	Untung Sujianto 🖾
Date submitted	September 14, 2021 - 07:16 PM
Section	Original Article
Editor	Retnayu Pradanie, S.Kep., Ns., M.Kep. 🖾
Abstract Views	256

EFFECT OF AEROBIC EXERCISE ON DEPRESSION AND CD4 COUNT IN PEOPLE LIVING WITH HIV

1

Abstract

Introduction: HIV patients often experience psychological and physical disorders which greatly affect the adherence of PLWHA. This study aimed to assess the effect of aerobic exercise on levels of depression and CD4 cell count of HIV patients. **Method:** The research design was a quasi experiment pre-post test with control group. The sampling technique was consecutive sampling, with a total sample of 52 HIV respondents. Data analysis used paired samples test and Independent samples test. Depression level was measured by Beck Depression Inventory (BDI) questionnaire, CD4 count using Pyma Analyzer. Exercise is done 3 times a week with 20-30 minutes of exercise for 4 weeks. **Results:** The results showed a significant difference between the average value of depression level before 25.15 and after 22.46 intervention of aerobic exercise with a value of p = 0.001, with a p value = 0.001 and a significant difference in CD4 count between the control group 303.38 and the intervention group 305.38 doing aerobic exercise with a value = 0.031. **Discussion:** Aerobic exercise is effective in reducing depression levels and CD4 counts in HIV patients. Immune system cells circulate more rapidly and there is a boost in the production of macrophages, cells that can attack bacteria.

Keyword: Aerobic exercise, depression, CD4 count, HIV

Introduction

Human Immunodefiency Virus (HIV) is a virus that attacks the immune system that can be contagious and deadly. HIV can occur due to several risk factors including alternating drug injection equipment (drugs, alcohol, psychotropic substances and additives), free sex (heterosexual, homosexual) without a condom, from infected mothers to children, perinatals and through transfusions (Kemenkes, 2017).

Various impacts that can arise on HIV sufferers such as physical, social, emotional and spiritual problems. Most PLWHA experience changes in emotional status, one of which is depression. Demirel said HIV/ AIDS sufferers in Turky experienced depression 31% and up to 19% mental disorders. The prevalence of depression in Indonesia is quite high, around 17-27%. About 5-10% of the general population are depressed. The causes of depression in PLHWA patients are low CD4 count, adherence to ART, lack of physical activity and community stigma (Demirel, 2018)

HIV directly destroys CD4 T cells (Cluster of Differentiation 4) which functions as body immunity and causes primary infection which further accelerates the decrease in the number of CD4 lymphocytes in the blood. If you attack CD4 T cells until their number drops below 200 per microliter, the body's immunity will be lost and become AIDS. Dianatisanab said a CD4 cell count <500 cells / ml or <200 cells / ml in PLWHA will cause severe depression. Factors that influence CD4 counts in PLWHA are baseline CD4 count, medication adherence level, depression, tuberculosis infection. (Dianatinasab, 2018).

The number of people infected with HIV in 2012 was 35.3 million people and increased in 2018 as many as 37.9 million people worldwide, the most at the age of 15-49 years (UNAIDS, 2019). In Indonesia, in 2018 there were 640,443 people with HIV/ AIDS (PLWHA). The Indonesian Ministry of Health stated that the number of HIV/ AIDS cases had reached 18,442 cases in 33 provinces with 3,708 deaths. (Kemenkes, 2017).

Aerobic exercise is a physical activity that uses leg and arm muscle movements which are known to have many benefits. Regular movement can increase the release of neurotransmitters that is mediated by activation of Brain-derived Neurotrophic Factor (BDNF). Increased BDNF, VEGF, and IGF-1 as neurotrophic factors in the hippocampus are useful for nerve cell growth, increase regulation of stress hormones, namely cortisol on the hypothalamic-pituitary-adrenal (HPA) axis and decrease the release of pro-inflammatory cytokines so that depressive symptoms can be reduced and cells the immune

system will circulate more quickly in the body, and there may also be a boost in the production of macrophages, which are cells that attack bacteria, which can increase CD4 counts in PLWHA (Nosrat, 2017).

A study by Heissel found that to assess aerobic exercise activity for depression and CD4 cell count, the evaluation could be done at week four. Statistical test in the control group (SMD= -0.84, 95% CI = -1.57, -0.11, p = 0.02). The test results in the intervention group (SMD = 0.90, 95% CI= -1.63, -0.30, p= 0.004, p<0.001). Exercise can reduce symptoms of depression and anxiety in PLWHA. This therapy can also affect the CD4 count of HIV patients (Heissel, 2019).

The results of a study conducted by Nosrat were found to be significant differences in depression levels in both groups (F=2.63, p=0.05) and (F=7.40, p<0.001), with greater increases in resistance training compared to controls. Meanwhile, Dianatisanab study found that after the aerobic exercise intervention program, a significant difference in CD4 cell count was found between the two groups (P=0.01). This means that aerobic exercise is effective in reducing levels of depression and increasing the CD4 count of HIV patients (Nosrat, 2017)

The difference in this study lies in the type and design of the study, population, number of samples, place of study, and the variables measured. The researcher uses a quasi-experimental research type with a pre-post test design with a control group. The population used is male and female. The number of samples taken was also different, namely 52 patients diagnosed with HIV stage 1 and 2 who had their CD4 count checked first and checked for depression levels with an assessment of BDI (Beck Depression Inventory) before being given aerobic exercise. Research variables have never been carried out in a study that combines the two variables, namely depression and CD4 cell count.

The advantages of giving aerobic exercise interventions in increasing circulation in HIV patients are that it is easy, effective and economical for all patients to do and has no side effects. Based on these descriptions, the researchers were interested in conducting a study to see the effect of aerobic exercise on depression levels and CD4 cell counts in HIV patients.

Matherial and Method

This study used a quantitative method with a pre-post test design with a control group. The sample size used a sample size formula to test the hypothesis for a mean of two populations (Notoatmodjo, 2005). Each respondent needed for the intervention group 26 respondents and the control group 26 respondents, a total of 52 respondents. The sample in this study was 52 HIV patients undergoing outpatient treatment at the VCT clinic. The sampling technique was consecutive sampling. Consecutive sampling is a sampling technique by selecting all individuals encountered and meeting the criteria until the desired sample size is met (Jannaim & Asrizal, 2018).

The inclusion criteria of this study were: 1) HIV patients stage 1 and II; 2) age> 18 years; 3) able to communicate well; 4) at least those who have been adhering to taking ARV drugs> 6 months; 5) patients with a CD4 count> 200 / ml; 6) patients who come with a companion who lives in the same house; 7) patients who are depressed (moderate, severe).

Before conducting the research, the researcher first made a research permit and research ethics approval letter from the Health Research Ethics Commission of the Faculty of Nursing, Diponegoro University which was addressed to the VCT Clinic Sobat Kupang. Health Research Ethics Committee Health Polytechnic Ministry of Health Kupang Ethichal Approval No: LB.02.03/1/0062/2020. After obtaining the research permit, the researcher conducted research.

The researcher gave the Beck Depression Inventory questionnaire and filled it out to measure the level of depression. The instrument uses Indonesian which has been tested for validity and measuring the reliability of BDI with Cronbach's alpha result is 0.923, which means that the measuring instrument is very reliable, so the questionnaire is declared reliable. To check the CD4 count using PIMA Analyzer in HIV patients before and after the intervention in both groups. Researchers identify respondents based on criteria that have been made previously. Then the researcher explained the procedure for the research process, namely the first meeting of all samples was carried out by filling out a questionnaire on the demographic data of the respondents, assessing the level of depression, checking CD4 counts and teaching aerobic exercise techniques for 20-30 minutes.

This intervention was given once at the beginning of the meeting, after which the researcher gave the SOP and video of aerobic exercise to be done at home and monitored by a companion who lived in the same house and then filled out the check list sheet that would be given by the researcher after the initial intervention. The exercise is carried out three times a week for four weeks, while the aerobic exercise stages consist of 3 movement sessions, namely: 1) Warm-up; Slowly approaching the extent of joint movement, then hold for 8 counts in 10 seconds and finally relax, until you feel a sufficient stretch without pain, for 5-10 minutes involving the joints and muscles of the upper, lower body as well as the left and right sides of the body, without bouncing and breathing regularly; 2) core movements; raising hands forward, upward, sideways, backward, hand movements opening and crossing, pushing and pumping forward, upward and sideways, punching hand movements, forward, sideways, upward, downwards and crosses, one-handed or two-handed swinging motion, clapping, among others, the hands clap, hands pat the thighs and shoulders. Walk in place, take a step or two, jump a foot or two to the side, forward and back, raise the knee, kick, back, forward, and sideways; 3) Cooling (Grace, 2015)

Data processing is processed using the help of a computer program system. The results were analyzed using univariate and bivariate analysis. Univariate analysis was carried out on respondent characteristics data (gender, age, education, marital status, number of OIs, type of ARV, risk factors, initial CD4 count), while bivariate analysis was performed on the measurement results of the Beck Depression Inventory value and CD4 count in the control group and the intervention group used the dependent samples test and Independent samples test.

Result

Respondent characteristics. The results showed that the age of respondents mostly occurred in the vulnerable ages 26-46 years with 43 people (165.4%), then 9 people at 18-25 years old (36.4%), male gender 27 25 people (96.1%) and women (61.9%), 23 people (88.4%) graduated from high school, 22 people (84.7%) graduated from elementary school (15.4%) and graduated from junior high school (3 people) (11.5%), 31 people (119.3%) unmarried status, 12 married (46.2%), 6 divorced people (23.1%) and there were 3 people who were divorced (11.5%), 29 people had the type of ARV drug with the EFV based type (111.5%) and 23 people had the type of NVP based medicine (88.5%), More opportunistic infections did not experience opportunistic infections or opportunistic infections <2, namely 51 people (98.1%) and the remaining 1 person (1.9%) who had opportunistic infections as much as 2 or> 2 types of infections.

The difference in the level of depression. Based on table 1, it can be seen that there is a difference in the level of depression in the control group and the intervention group on the average, indicating that the depression level of HIV patients who received aerobic exercise intervention decreased significantly by -2.69 with p value <0.05. Meanwhile, in the control group who did not get the aerobic exercise intervention there was no significant change. The changes that occurred were 0.88 with p value > 0.05.

Based on the data above, it can be concluded that there was a significant change in the level of depression before and after giving aerobic exercise to the intervention group.

CD4 count difference. Based on the table, 2 It can be seen that there is a difference in the CD4 count of the control group and the intervention group on the average, indicating that the CD4 cell count of HIV patients who received aerobic exercise intervention increased significantly by 5.00 with p value <0.05. Meanwhile, in the control group who did not get the aerobic exercise intervention there was no significant change. The changes that occur are 0.57 with p value>0.05. Based on the data above, it can be concluded that there was a significant change in CD4 count before and after giving aerobic exercise to the intervention group.

Variable	Type of group	Depressi on category	Frequ	quency Mean			Mean differe nce	Differen ce SD	P value
			Before	After	Before	After			
Depression	Intervention	Light	6	11	25.15	22.46	-2.69	-1.002	0.001
		Moderate	16	10					
		Severe	6	5	_				
	Control	Light	5	6	24.12	25.00	0.88	-0.141	0.179
		Moderate	16	13	_				
		Severe	5	7	_				

Table 2. Differences in changes in CD4 count of the control group and the aerobic exercise intervention

Variable	Type of group	Category	Freq	%	Mean		Mean differen	Differe nce SD	P value
							ce		
					Before	After			
CD4	Intervention	Increase	19	73.1	300.46	305.4	5.00	2.655	0.031
count		Standing	4	15.4		6			
		Decrease	3	11.5					
	Control	Increase	12	34.6	302.81	303.3	0.57	-1.576	0.523
		Standing	5	19.2		8			
		Decrease	9	46.2					

Discussion

The effect of aerobic exercise on the level of depression in the control group and intervention group. After the aerobic exercise intervention was carried out in the intervention group, the results of the different tests in the table above show that after the intervention, the depression level of HIV patients was significantly different. So it could be concluded that aerobic exercise intervention was proven to be able to reduce depression levels in HIV patients. The results of this study are in line with the research conducted by Heissel which showed that there were significant differences in the level of depression before and after the intervention with a value of p = 0.00.

Andreany said that there was an effect of aerobic exercise on the level of depression with a value of p=0.0002, which means it was significant for the level of depression. Physical exercise that is done can increase endorphin activity. Increasing endorphins will strengthen the body's natural immunity and improve mood and encourage body activity. Psychologically, the ability to show movement during exercise will increase self-confidence and self-esteem which affects mood. Regular physical exercise

can help with faster recovery from stressors, thereby improving depression symptoms (Al-Qahtani, 2018).

Conceptually, a stressful situation in an individual will stimulate the hypothalamus to release neuropeptides that will activate the ANS (Autonomic Nerve System) and the pituitary to secrete corticosteroids and ketokelamine which are hormones that react to stressful conditions. Increased levels of glucocorticoids will interfere with the immune system which causes the CD4 to decrease and make you more susceptible to infections and health conditions.

Increased levels of glucocorticoids will interfere with the immune system which causes the patient's CD4 to decrease and the patient is more susceptible to infection and worsening health conditions (Benton & Karnik, 2019). Lubis stated that there are several ways to handle depression patients, one of which is to provide training in the form of therapy, one of which is by exercising and developing constructive coping to prevent depression in HIV patients. (Safira & Lubis, 2014).

The effect of aerobic exercise on the CD4 count of the control group and intervention group. After the aerobic exercise intervention was carried out in the intervention group, the results of the different tests in the table above show that after the intervention, the CD4 count of HIV patients was significantly different. The results of this study are in line with research conducted by Dianatinasab where there was an effect of aerobic exercise on increasing CD4 cell count (p < 0.001).

Yasirin also said in the results of his research that there was an effect of aerobic exercise in the intervention group with a CD4 count of 1.7 cells / mm3. In the Journal of the American Medical Association says there is no drug now or in the future that will be used that promises to definitely provide and maintain health better than a habit of living constantly exercise. (Yasirin, 2014).

Metabolism is also related to endurance, substances that function to maintain the stability of the body's immunity also come from the metabolic process. The results of protein metabolism function to maintain endurance. Protein substances that come from foods that are eaten. The increase in CD4 which is part of the immune system, including the impact of protein metabolism.

Aerobic exercise can increase metabolism in the body, including protein metabolism. So that it has an impact on the quality of the immune system. Immune system cells circulate rapidly in the body and there may also be a temporary boost in the production of macrophages, cells that attack bacteria. A decrease in CD4 cells from HIV sufferers who are not normal must be balanced with treatment in the form of drugs as well as exercise to increase metabolism in the body (Naoroibam, 2016). The results of this study prove the research hypothesis which states that giving aerobic exercise interventions can reduce depression levels and increase CD4 counts in HIV patients.

Conclusion

Based on this study, it can be concluded that there is a significant change in the level of depression after being given aerobic exercise between the control group and the intervention group with the results of statistical tests showing a p value <0.05, there is a significant change between the control group and the intervention group and there is a significant change in CD4 cell count after being given aerobics. exercise between the control group and the intervention group with differences respectively 5.00 and 0.57. The difference in the mean level of depression and CD4 counts of the control group and the intervention group before and after the intervention showed a significant difference and the difference

in the mean level of depression and CD4 cell count between the control group and the intervention group after aerobic exercise showed a significant difference as well.

Suggestions

For the nursing profession It is recommended for nurses to be able to provide one alternative action, namely aerobic exercise in reducing depression levels and increasing CD4 cell counts. Can develop themselves by studying various non-pharmacological therapies as independent actions of nurses. Families can be involved in the exercise so that they can assist the patient in doing aerobic exercise.

For further researchers The results of this study can be used as a basis for further researchers in order to control confounding variables and add a larger sample with a research period that can be further investigated in a longer period of time than this study.

Reference

- Al-Qahtani, A. M., Shaikh, M. A. K., & Shaikh, I. A. (2018). Exercise as a treatment modality for depression: A narrative review. *Alexandria Journal of Medicine*, 54(4), 429–435.
- Benton, T. D., Kee Ng, W. Y., Leung, D., Canetti, A., & Karnik, N. (2019). Depression among Youth Living with HIV/AIDS. Child and Adolescent Psychiatric Clinics of North America, 28(3), 447– 459.
- Demirel, O. F., Mayda, P. Y., Yıldız, N., Sağlam, H., Koçak, B. T., Habip, Z. Kocazeybek, B. (2018). Self-stigma, depression, and anxiety levels of people living with HIV in Turkey. *European Journal* of Psychiatry, 32(4), 182–186.
- Dianatinasab, M., Fararouei, M., Padehban, V., Dianatinasab, A., Alimohamadi, Y., Beheshti, S., ... AminiLari, M. (2018). The effect of a 12-week combinational exercise program on CD4 count and mental health among HIV infected women: A randomized control trial. *Journal of Exercise Science* and Fitness, 16(1), 21–25.
- Grace, J. M., Semple, S. J., & Combrink, S. (2015). Exercise therapy for human immunodeficiency virus/AIDS patients: Guidelines for clinical exercise therapists. *Journal of Exercise Science and Fitness*, 13(1), 49–56.
- Heissel, A., Zech, P., Rapp, M. A., Schuch, F. B., Lawrence, J. B., Kangas, M., & Heinzel, S. (2019). Effects of exercise on depression and anxiety in persons living with HIV: A meta-analysis. *Journal* of Psychosomatic Research, 126(August), 109823.
- Jannaim, J., Dharmajaya, R., & Asrizal, A. (2018). Pengaruh Buerger Allen Exercise Terhadap Sirkulasi Ektremitas Bawah Pada Pasien Luka Kaki Diabetik. Jurnal Keperawatan Indonesia, 21(2), 101– 108.
- Kemenkes. (2017). Laporan Perkembangan HIV-AIDS. 1-565.
- Kusuma, H. (2011). Hubungan Antara Depresi dan Dukungan Keluarga Dengan Kualitas Hidup Pasien HIV/AIDS yang Menjalani Perawatan di RSUP Cipto Mangunkusumo Jakarta. Universitas Indonesia, 20,21,76-79,111-114,135-139.
- Naoroibam, R., Metri, K., Bhargav, H., Nagaratna, R., & Nagendra, H. (2016). Effect of Integrated Yoga (IY) on psychological states and CD4 counts of HIV-1 infected Patients: A Randomized controlled pilot study. *International Journal of Yoga*, 9(1), 57. https://doi.org/10.4103/0973-6131.171723
- Nosrat, S., Whitworth, J. W., Dunsiger, S. I., SantaBarbara, N. J., & Ciccolo, J. T. (2017). Acute effects of resistance exercise in a depressed HIV sample: The exercise for people who are immunocompromised (EPIC) study. *Mental Health and Physical Activity*, *12*, 2–9.
- Notoatmodjo, S. (2005). Metodologi penelitian kesehatan (Vol. 205).

Safira, N., Lubis, R., & Rasmaliah, R. (2014). Faktor-faktor yang berhubungan dengan kepatuhan penderita HIV/AIDS mengonsumsi obat antiretroviral (ARV) di klinik voluntary counseling and testing (VCT) RSUP H. Adam Malik Medan tahun 2014. *Portal Garuda*, 1–10. Retrieved from http://www.portalgaruda.org

UNAIDS. (2019). 2018 GLOBAL HIV STATISTICS. 2(1), 1-6.

- Yasirin, A., Rahayu, S., Junaidi, S., & Artikel, I. (2014). Latihan Senam Aerobik dan Peningkatan Limfosit CD4 pada Penderita HIV. 3(3), 1–6.
- Yogani, I., Karyadi, T. H., Uyainah, A., & Koesnoe, S. (2017). Faktor-faktor yang Berhubungan dengan Kenaikan CD4 pada Pasien HIV yang Mendapat Highly Active Antiretroviral Therapy dalam 6 bulan Pertama. Jurnal Penyakit Dalam Indonesia, 2(4), 217.

[JN] Editor Decision4

untung71/Email Masuk

Retnayu Pradanie, S.Kep., Ns., M.Kep. <rena.unair@gmail.com>

Kepada:Untung Sujianto

Sel, 9 Nov 2021 jam 11.06

Dear Untung Sujianto:

We have reached a decision regarding your submission to Jurnal Ners, "EFFECT

OF AEROBIC EXERCISE ON DEPRESSION AND CD4 COUNT IN PEOPLE LIVING WITH HIV".

Based on the referees' comments, we will be pleased to publish your article

conditional on the following revision as we have sent to you by OJS system.

To avoid delay in the publication of your paper, we would greatly appreciate

your uploading your revised manuscript as soon as possible. Please let me

know urgently if you will not be able to submit your revision within 5 days.

When submitting your revised manuscript, you should also respond to the

comments made by the reviewer(s). Please add:

1. a point-by-point reply to the reviewers' comments

2. and/or a rebuttal against each point that is being raised

Please use this file to respond to the reviewer(s) comments and upload it

along with your revised manuscript:

https://drive.google.com/file/d/19ScnUunKnadIJvY1kNQ64eez5VTMzf7a/view?usp=sharing

Once again, thank you for submitting your manuscript to Jurnal Ners and I

look forward to receiving your revision.

Sincerely,

Editor in Chief, Jurnal Ners

ners@journal.unair.ac.id

EFFECT OF AEROBIC EXERCISE ON DEPRESSION AND CD4 COUNT IN PEOPLE LIVING WITH HIV

Abstrak

Pasien HIV sering mengalami gangguan psikologi dan fisik yang sangat berpengaruh terhadap kepatuhan ODHA. Penelitian ini bertujuan untuk mengetahui pengaruh *aerobic exercise* terhadap tingkat depresi dan jumlah CD4 pasien HIV. Desain penelitian adalah quasi *experiment pre-post test with control group*. Teknik pengambilan sampel adalah consecutive sampling, sebanyak sampel 52 responden HIV. Analisis data menggunakan uji paired samples test dan Independent samples test. Tingkat depresi diukur dengan kuisioner *Beck Depression Inventory* (BDI), jumlah CD4 dengan Pyma Analyser. Latihan dilakukan sebanyak 3 kali seminggu dengan waktu latihan 20-30 menit selama 4 minggu. Hasil penelitian menunjukkan ada perbedaan signifikan setelah melakukan aerobic exercise terhadap tingkat depresi antara kelompok kontrol 25.00 dan kelompok intervensi 22.46, dengan nilai p= 0,001 dan perbedaan signifikan pada jumlah CD4 antara kelompok kontrol 303.38 dan kelompok intervensi 305.38 melakukan aerobic exercise dengan nilai p= 0,031. Aerobic exercise efektif untuk menurunkan tingkat depresi dan jumlah CD4 pasien HIV. Sel-sel sistem kekebalan tubuh bersirkulasi dengan lebih cepat dan ada dorongan di dalam produksi makrofag yaitu sel-sel yang dapat menyerang bakteri.

Kata Kunci: Aerobic exercise, Depresi, Jumlah CD4, HIV

Abstract

Effect of Aerobic Exercise on Depression and CD4 Count in People Living with HIV. HIV patients often experience psychological and physical disorders which greatly affect the adherence of PLWHA. This study aimed to assess the effect of aerobic exercise on levels of depression and CD4 cell count of HIV patients. The research design was a quasi experiment pre-post test with control group. The sampling technique was consecutive sampling, with a total sample of 52 HIV respondents. Data analysis used paired samples test and Independent samples test. Depression level was measured by Beck Depression Inventory (BDI) questionnaire, CD4 count using Pyma Analyzer. Exercise is done 3 times a week with 20-30 minutes of exercise for 4 weeks. The results showed that there was a significant difference after doing aerobic exercise on the depression level between the control group 25.00 and the intervention group 22.46, with a p value = 0.001 and a significant difference in CD4 count between the control group 303.38 and the intervention group 305.38 doing aerobic exercise with a p value = 0.031. Aerobic exercise is effective in reducing depression levels and CD4 counts in HIV patients. Immune system cells circulate more rapidly and there is a boost in the production of macrophages, cells that can attack bacteria.

Keyword: Aerobic exercise, depression, CD4 count, HIV

Introduction

Human Immunodefiency Virus (HIV) is a virus that attacks the immune system that can be contagious and deadly. HIV can occur due to several risk factors including alternating drug injection equipment (drugs, alcohol, psychotropic substances and additives), free sex (heterosexual, homosexual) without a condom, from infected mothers to children, perinatals and through transfusions (Kemenkes, 2017).

Commented [BP1]: What did the scores mean?

Various impacts that can arise on HIV sufferers such as physical, social, emotional and spiritual problems. Most PLWHA experience changes in emotional status, one of which is depression. Demirel said HIV/ AIDS sufferers in Turky experienced depression 31% and up to 19% mental disorders. The prevalence of depression in Indonesia is quite high, around 17-27%. About 5-10% of the general population are depressed. The causes of depression in PLHWA patients are low CD4 count, adherence to ART, lack of physical activity and community stigma (Demirel, 2018)

HIV directly destroys CD4 T cells (Cluster of Differentiation 4) which functions as body immunity and causes primary infection which further accelerates the decrease in the number of CD4 lymphocytes in the blood. If you attack CD4 T cells until their number drops below 200 per microliter, the body's immunity will be lost and become AIDS. Dianatisanab said a CD4 cell count

<500 cells / ml or <200 cells / ml in PLWHA will cause severe depression. Factors that influence CD4 counts in PLWHA are baseline CD4 count, medication adherence level, depression, tuberculosis infection. (Dianatinasab, 2018).

The number of people infected with HIV in 2012 was 35.3 million people and increased in 2018 as many as 37.9 million people worldwide, the most at the age of 15-49 years (UNAIDS, 2019). In Indonesia, in 2018 there were 640,443 people with HIV/ AIDS (PLWHA). The Indonesian Ministry of Health stated that the number of HIV/ AIDS cases had reached 18,442 cases in 33 provinces with 3,708 deaths. (Kemenkes, 2017).

Aerobic exercise is a physical activity that uses leg and arm muscle movements which are known to have many benefits. Regular movement can increase the release of neurotransmitters that is mediated by activation of Brain-derived Neurotrophic Factor (BDNF). Increased BDNF, VEGF, and IGF-1 as neurotrophic factors in the hippocampus are useful for nerve cell growth, increase regulation of stress hormones, namely cortisol on the hypothalamic-pituitary-adrenal (HPA) axis and decrease the release of pro-inflammatory cytokines so that depressive symptoms can be reduced and cells the immune system will circulate more quickly in the body, and there may also be a boost in the production of macrophages, which are cells that attack bacteria, which can increase CD4 counts in PLWHA (Nosrat, 2017).

A study by Heissel found that to assess aerobic exercise activity for depression and CD4 cell count, the evaluation could be done at week four. Statistical test in the control group (SMD= -0.84, 95% CI = -1.57, -0.11, p = 0.02). The test results in the intervention group (SMD = 0.90, 95% CI= -1.63, -0.30, p=0.004, p<0.001). Exercise can reduce symptoms of depression and anxiety in PLWHA. This therapy can also affect the CD4 count of HIV patients (Heissel, 2019).

The results of a study conducted by Nosrat were found to be significant differences in depression levels in both groups (F= 2.63, p= 0.05) and (F= 7.40, p<0.001), with greater increases in resistance training compared to controls. Meanwhile, Dianatisanab study found that after the aerobic exercise intervention program, a significant difference in CD4 cell count was found between the two groups (P= 0.01). This means that aerobic exercise is effective in reducing levels of depression and increasing the CD4 count of HIV patients (Nosrat, 2017)

The advantages of giving aerobic exercise interventions in increasing circulation in HIV patients are that it is easy, effective and economical for all patients to do and has no side effects. Based on these descriptions, the researchers were interested in conducting a study to see the effect of aerobic exercise on depression levels and CD4 cell counts in HIV patients.

Commented [BP2]: What kind of aerobic exercise? Was it different from the previous studies above?

Commented [BP3]: Previous studies you described above has proved it. why did you need to do the same?

Method

This study used a quantitative method with a pre-post test design with a control group. The sample size used a sample size formula to test the hypothesis for a mean of two populations (Notoatmodjo, 2005). Each respondent needed for the intervention group 26 respondents and the control group 26 respondents, a total of 52 respondents. The sample in this study was 52 HIV patients undergoing outpatient treatment at the VCT clinic. The sampling technique was consecutive sampling. Consecutive sampling is a sample size is met (Jannaim & Asrizal, 2018).

The inclusion criteria of this study were: 1) HIV patients stage 1 and II; 2) age> 18 years; 3) able to communicate well; 4) at least those who have been adhering to taking ARV drugs> 6 months; 5) patients with a CD4 count> 200 / ml; 6) patients who come with a companion who lives in the same house; 7) patients who are depressed (moderate, severe).

Before conducting the research, the researcher first made a research permit and research ethics approval letter from the Health Research Ethics Commission of the Faculty of Nursing, Diponegoro University which was addressed to the VCT Clinic Sobat Kupang. After obtaining the research permit, the researcher conducted research.

The researcher gave the Beck Depression Inventory questionnaire and filled it out to measure the level of depression. To check the CD4 count using PIMA Analyzer in HIV patients before and after the intervention in both groups. Researchers identify respondents based on criteria that have been made previously. Then the researcher explained the procedure for the research process, namely the first meeting of all samples was carried out by filling out a questionnaire on the demographic data of the respondents, assessing the level of depression, checking CD4 counts and teaching aerobic exercise techniques for 20-30 minutes. The exercise is carried out three times a week for four weeks, while the aerobic exercise stages consist of 3 movement sessions, namely: 1) Warm-up; Slowly approaching the extent of joint movement, then hold for 8 counts in 10 seconds and finally relax, until you feel a sufficient stretch without pain, for 5-10 minutes involving the joints and muscles of the upper, lower body as well as the left and right sides of the body, without bouncing and breathing regularly; 2) core movements; raising hands forward, upward, sideways, backward, hand movements opening and crossing, pushing and pumping forward, upward and sideways, punching hand movements, forward, sideways, upward, downwards and crosses, one-handed or two-handed swinging motion, clapping, among others, the hands clap, hands pat the thighs and shoulders. Walk in place, take a step or two, jump a foot or two to the side, forward and back, raise the knee, kick, back, forward, and sideways; 3) Cooling (Grace, 2015)

Data processing is processed using the help of a computer program system. The results were analyzed using univariate and bivariate analysis. Univariate analysis was carried out on respondent characteristics data (gender, age, education, marital status, number of OIs, type of ARV, risk factors, initial CD4 count), while bivariate analysis was performed on the measurement results of the Beck Depression Inventory value and CD4 count in the control group and the intervention group used the dependent samples test and Independent samples test.

Result

Respondent characteristics. The results showed that the age of respondents mostly occurred in the vulnerable ages 26-46 years with 43 people (165.4%), then 9 people at 18-25 years old (36.4%), 12

Commented [BP4]: Could they follow your treatment in the study? it is hard to believe

Commented [BP5]: Did you obtain the ethical clearance? If yes, let readers know it details.

Commented [BP6]: Was it in English or Indonesian? If you used in Indonesian, it was valid and reliable?

Commented [BP7]: How did you make sure that they do it correctly?

male gender 27 25 people (96.1%) and women (61.9%), 23 people (88.4%) graduated from high school, 22 people (84.7%) graduated from elementary school (15.4%) and graduated from junior high school (3 people) (11.5%), 31 people (119.3%) unmarried status, 12 married (46.2%), 6 divorced people (23.1%) and there were 3 people who were divorced (11.5%), 29 people had the type of ARV drug with the EFV based type (111.5%) and 23 people had the type of NVP based medicine (88.5%), More opportunistic infections did not experience opportunistic infections or opportunistic infections <2, namely 51 people (98.1%) and the remaining 1 person (1.9%) who had opportunistic infections as much as 2 or> 2 types of infections.

The difference in the level of depression. Based on table 1, it can be seen that there is a difference in the level of depression in the control group and the intervention group on the average, indicating that the depression level of HIV patients who received aerobic exercise intervention decreased significantly by -2.69 with p value <0.05. Meanwhile, in the control group who did not get the aerobic exercise intervention there was no significant change. The changes that occurred were 0.88 with p value> 0.05. Based on the data above, it can be concluded that there was a significant changein the level of depression before and after giving aerobic exercise to the intervention group.

CD4 count difference. Based on the table, 2 It can be seen that there is a difference in the CD4 count of the control group and the intervention group on the average, indicating that the CD4 cell count of HIV patients who received aerobic exercise intervention increased significantly by 5.00 with p value <0.05. Meanwhile, in the control group who did not get the aerobic exercise intervention there was no significant change. The changes that occur are 0.57 with p value> 0.05. Based on the data above, it can be concluded that there was a significant change in CD4 count before and after giving aerobic exercise to the intervention group.

Variable	Type of	Depressi on	Frequ	iency	Me	an	Mean	Differen	P
	group	category					uniere	te sp	vaiue
							nce		
			Before	After	Before	After			

Table 1. Differences in the level of depression in the control group and the aerobic exercise

							nce			
			Before	After	Before	After				
Depression	Intervention	Light	6	11	25.15	22.46	-2.69	-1.002	0.001	
	-	Moderate	16	10	-					
	-	Weigh	6	5	_					Commented [BP8]: Do you mean severe
	Control	Light	5	6	24.12	25.00	0.88	-0.141	0.179	
		Moderate	16	13	_					
	-	Weigh	5	7	_					Commented [BP9]: Do you mean severe

Table 2. Differences in changes in CD4 count of the control group and the aerobic exercise intervention

Variable	Type of	Category	Freq	%	Mean	Mean	Differe	Р
	group					differen	nce SD	value
						ce		

					Before	After				
CD4	Intervention	Ride	19	73.1	300.46	305.4	5.00	2.655	0.031	Commented (BP10)
count		Permanent	4	15.4		6				commenteu [bi to]:
		Down	3	11.5						Commented [BP11]:
	Control	Ride	12	34.6	302.81	303.3	0.57	-1.576	0.523	Commented [BP12]: What is it?

Permanent	5	19.2	8	
Down	9	46.2		

Discussion

Based on the age of the respondents, most of them were at the vulnerable ages of 26-46 years with 43 people (165.4%). Kusuma found that the average age of HIV sufferers in his study was 35.4 years. The younger age of the patient may be due to the different modes of transmission (Kusuma, 2011). According to the researchers, if a person is diagnosed with HIV in old age, the chances of developing opportunistic infections are greater and adherence to taking medication also decreases.

Based on the sex of the respondents, most of the sexes of HIV patients were mostly male, amounting to 27 people (51.9%), while 48.1% women. Nojomi in his research 88.5% were male. From the mode of transmission, men were more exposed to HIV incidence, namely through IDU, homosexual and heterosexual. Whereas women are more often exposed only from heterosexual modes of transmission (free sex or contracted from a partner) (Kusuma, 2011).

Based on the education level of respondents, it shows that most of the respondents have high school education, namely 23 people (44.2%) and 22 people from higher education (42.3%), while those with low education level are 3 people (5.8%) and elementary school education, namely 4 people (7.7%). Kusuma, who got the most respondents in his research, had a high level of education (high school and college), namely 93.5%. High educational status has 20 times the proportion of ARV adherence compared to low educational status (Kusuma, 2011).

Based on the marital status, there were more than 31 people (59.6%), while 12 people were unmarried (23.1%). The results of this study are in accordance with the results of Nojomi research, the number of which is more unmarried (62.7%), as well as the results of Greeff research on 1.457 HIV sufferers found that 72% of respondents were unmarried. HIV patients with married status willhave a strong source of coping from their partners so they can develop adaptive coping to stressors. (Kusuma, 2011)

Based on the types of ARV drugs in this study, of the 52 respondents, the most respondents who consumed the Efavirenz (EFV based) type were 29 people (55.8%), while the respondents who consumed Nevirapine (NVP based) were 23 people (44.2%). Yogani's research results show that many respondents consume EFV. 60.8% of the rest consume NVP. The type of ARV given was not associated with an increase in CD4 cells (p= 0.819) (Yogani, 2017).

Based on opportunistic infections in this study, 51 people (98.1%) did not experience opportunistic infections or opportunistic infections, and the remaining 1 person (1.9%) had 2 or> 2 types of infections. According to Yogani, the number of opportunistic infections also had no relationship with the increase in CD4 cells (p=0.480) (Yogani, 2017).

The effect of aerobic exercise on the level of depression in the control group and intervention group. The difference in the level of depression in the control group and the intervention group on average showed that the depression level of HIV patients who received aerobic exercise intervention decreased significantly by -2.69 with a p value <0.05. Meanwhile, in the control group who did not get the aerobic exercise intervention there was no significant change. The changes that occurred were 0.88 with a p value> 0.05, so it could be concluded that aerobic exercise intervention was proven to be able to reduce depression levels in HIV patients. The results of this study are in line with the research conducted by Heissel which showed that there were significant differences in the level of depression before and after the intervention with a value of p = 0.00.

Commented [BP13]: Do not repeat your results. Just discuss it.

Commented [BP14]: Do not repeat the results. Just discuss it.

Andreany said that there was an effect of aerobic exercise on the level of depression with a value of p=0.0002, which means it was significant for the level of depression. Physical exercise that is done can increase endorphin activity. Increasing endorphins will strengthen the body's natural immunity and improve mood and encourage body activity. Psychologically, the ability to show movement during exercise will increase self-confidence and self-esteem which affects mood. Regular physical exercise can help with faster recovery from stressors, thereby improving depression symptoms (Al-Qahtani, 2018).

The stressful state in depressed individuals will stimulate the hypothalamus to release neuropeptides which will activate the ANS (Autonomic Nerve System) and hypofise to release corticosteroids and ketocelamines which are hormones that react to stressful conditions. Increased levels of glucocorticoids will interfere with the immune system which causes the patient's CD4 to decrease and the patient is more susceptible to infection and worsening health conditions (Benton & Karnik, 2019). Lubis stated that there are several ways to handle depression patients, one of which is to provide training in the form of therapy, one of which is by exercising and developing constructive coping to prevent depression in HIV patients. (Safira & Lubis, 2014).

The effect of aerobic exercise on the CD4 count of the control group and intervention group. The difference in the CD4 count of the control group and the intervention group on the average showed that the CD4 cell count of HIV patients who received aerobic exercise intervention increased significantly by 5.00 with p value <0.05. Meanwhile, in the control group who did not getthe aerobic exercise intervention there was no significant change. The changes that occur are 0.57 with p value> 0.05. Furthermore, after the intervention in the intervention group it can be seen that there is an increase in CD4 cell counts. Based on the results of this analysis, it can be concluded that the aerobic exercise intervention was proven to be able to increase the CD4 count of HIV patients.

The results of this study are in line with research conducted by Dianatinasab where there was an effect of aerobic exercise on increasing CD4 cell count (p < 0.001). Yasirin also said in the results of his research that there was an effect of aerobic exercise in the intervention group with a CD4 count of 1.7 cells / mm3. In the Journal of the American Medical Association says there is no drug now orin the future that will be used that promises to definitely provide and maintain health better than a habit of living constantly exercise. (Yasirin, 2014).

Metabolism is also related to endurance, substances that function to maintain the stability of the body's immunity also come from the metabolic process. The results of protein metabolism function to maintain endurance. Protein substances that come from foods that are eaten. The increase in CD4 which is part of the immune system, including the impact of protein metabolism. Aerobic exercise can increase metabolism in the body, including protein metabolism. So that it has an impact on the quality of the immune system. Immune system cells circulate rapidly in the body and there may also be a temporary boost in the production of macrophages, cells that attack bacteria. A decrease in CD4 cells from HIV sufferers who are not normal must be balanced with treatment in the form of drugs as well as exercise to increase metabolism in the body (Naoroibam, 2016).

The results of this study prove the research hypothesis which states that giving aerobic exercise interventions can reduce depression levels and increase CD4 counts in HIV patients.

Commented [BP15]: Do not repeat the results. Discuss it.

Conclusion

Based on this study, it can be concluded that there is a significant change in the level of depression after being given aerobic exercise between the control group and the intervention group with the results of statistical tests showing a p value <0.05, there is a significant change between the control group and the intervention group and there is a significant change in CD4 cell count after being given aerobics. exercise between the control group and the intervention group with differences respectively 5.00 and 0.57. The difference in the mean level of depression and CD4 counts of the control group and the intervention group before and after the intervention showed a significant difference and the difference in the mean level of depression and CD4 cell count between the control group and the intervention group after aerobic exercise showed a significant difference as well. What is suggestion from the study?

Reference

- Al-Qahtani, A. M., Shaikh, M. A. K., & Shaikh, I. A. (2018). Exercise as a treatment modality for depression: A narrative review. *Alexandria Journal of Medicine*, 54(4), 429–435.
- Benton, T. D., Kee Ng, W. Y., Leung, D., Canetti, A., & Karnik, N. (2019). Depression among Youth Living with HIV/AIDS. *Child and Adolescent Psychiatric Clinics of North America*, *28*(3), 447–459.
- Demirel, O. F., Mayda, P. Y., Yıldız, N., Sağlam, H., Koçak, B. T., Habip, Z. Kocazeybek, B. (2018). Self-stigma, depression, and anxiety levels of people living with HIV in Turkey. *European Journal of Psychiatry*, 32(4), 182–186.
- Dianatinasab, M., Fararouei, M., Padehban, V., Dianatinasab, A., Alimohamadi, Y., Beheshti, S., ... AminiLari, M. (2018). The effect of a 12-week combinational exercise program on CD4 count and mental health among HIV infected women: A randomized control trial. *Journal of Exercise Science and Fitness*, 16(1), 21–25.
- Grace, J. M., Semple, S. J., & Combrink, S. (2015). Exercise therapy for human immunodeficiency virus/AIDS patients: Guidelines for clinical exercise therapists. *Journal of Exercise Science and Fitness*, 13(1), 49–56.
- Heissel, A., Zech, P., Rapp, M. A., Schuch, F. B., Lawrence, J. B., Kangas, M., & Heinzel, S. (2019). Effects of exercise on depression and anxiety in persons living with HIV: A meta- analysis. *Journal of Psychosomatic Research*, 126(August), 109823.
- Jannaim, J., Dharmajaya, R., & Asrizal, A. (2018). Pengaruh Buerger Allen Exercise Terhadap Sirkulasi Ektremitas Bawah Pada Pasien Luka Kaki Diabetik. Jurnal Keperawatan Indonesia, 21(2), 101–108.
- Kemenkes. (2017). Laporan Perkembangan HIV-AIDS. 1-565.
- Kusuma, H. (2011). Hubungan Antara Depresi dan Dukungan Keluarga Dengan Kualitas Hidup Pasien HIV/AIDS yang Menjalani Perawatan di RSUP Cipto Mangunkusumo Jakarta. *Universitas Indonesia*, 20,21,76-79,111-114,135-139.
- Naoroibam, R., Metri, K., Bhargav, H., Nagaratna, R., & Nagendra, H. (2016). Effect of Integrated Yoga (IY) on psychological states and CD4 counts of HIV-1 infected Patients: A Randomized controlled pilot study. *International Journal of Yoga*, 9(1), 57. https://doi.org/10.4103/0973-6131.171723
- Nosrat, S., Whitworth, J. W., Dunsiger, S. I., SantaBarbara, N. J., & Ciccolo, J. T. (2017). Acute effects of resistance exercise in a depressed HIV sample: The exercise for people who are immunocompromised (EPIC) study. *Mental Health and Physical Activity*, 12, 2–9.

Notoatmodjo, S. (2005). Metodologi penelitian kesehatan (Vol. 205).

Safira, N., Lubis, R., & Rasmaliah, R. (2014). Faktor-faktor yang berhubungan dengan kepatuhan penderita HIV/AIDS mengonsumsi obat antiretroviral (ARV) di klinik voluntary counseling and testing (VCT) RSUP H. Adam Malik Medan tahun 2014. Portal Garuda, 1-10. Retrieved from http://www.portalgaruda.org

UNAIDS. (2019). 2018 GLOBAL HIV STATISTICS. 2(1), 1-6.

- Yasirin, A., Rahayu, S., Junaidi, S., & Artikel, I. (2014). Latihan Senam Aerobik dan Peningkatan Limfosit CD4 pada Penderita HIV. 3(3), 1–6.
- Yogani, I., Karyadi, T. H., Uyainah, A., & Koesnoe, S. (2017). Faktor-faktor yang Berhubungan dengan Kenaikan CD4 pada Pasien HIV yang Mendapat Highly Active Antiretroviral Therapy dalam 6 bulan Pertama. Jurnal Penyakit Dalam Indonesia, 2(4), 217.

untung71@fk.undip.ac.id <untung71@fk.undip.ac.id>

Kepada:Retnayu Pradanie, S.Kep., Ns., M.Kep.

Kam, 18 Nov 2021 jam 11.08

Dear Retnayu Pradanie

Thank you for the feedback article that I have sent. I will improve the article according to the input.

Sincerely

TEMPLATE OF JURNAL NERS

Updated: March 5, 2020



AUTHORS' RESPONSES TO REVIEWERS & REVISED MAIN TEXT

Title: Effects of Aerobic Exercises on Depression and CD4 Count in People Living with HIV

Dear Editors and Reviewers,

Thank you very much for the valuable comments and inputs to improve our manuscript. We have provided our responses to the reviewers as outlined below.

The other details can be seen in the responses below, and all changes in the manuscript are highlighted in red color. Please let us know if revisions are still needed. Thank you.

Sincerely,

Authors

Comments	Location	Authors' Responses
#Reviewer 1	Location	Autors Responses
What did the scores mean?	Abstract	The results showed a significant difference between the average value of depression level before 25.15 and after 22.46 intervention of aerobic exercise with a value of $p = 0.001$, with a p value = 0.001 and a significant difference in CD4 count between the control group 303.38 and the intervention group 305.38 doing aerobic exercise with a p value = 0.031
Based on these descriptions, the researchers were interested in conducting a study to see the effect of aerobic exercise on depression levels and CD4 cell counts in HIV patients. Previous studies you described above has proved it. why did you need to do the same? What kind of aerobic exercise? Was it different from the previous studies above?	Introduction	The difference in this study lies in the type and design of the study, population, number of samples, place of study, and the variables measured. The researcher uses a quasi-experimental research type with a pre-post test design with a control group. The population used is male and female. The number of samples taken was also different, namely 52 patients diagnosed with HIV stage 1 and 2 who had their CD4 count checked first and checked for depression levels with an assessment of BDI (Beck Depression Inventory) before being given aerobic exercise. Research variables have never been carried out in a study that combines the two variables, namely depression and CD4 cell count.
 7) patients who are depressed (moderate, severe). Could they follow your treatment in the study? it is hard to believe research ethics approval letter from the Health Research Ethics Commission of the Faculty of Nursing, DiponegoroUniversity Did you obtain the ethical clearance? If yes, let readers know it details. 	Methods	Before conducting the research, the researcher first made a research permit and research ethics approval letter from the Health Research Ethics Commission of the Faculty of Nursing, Diponegoro University which was addressed to the VCT Clinic Sobat Kupang. Health Research Ethics Committee Health Polytechnic Ministry of Health Kupang Ethichal Approval No: LB.02.03/1/0062/2020. After obtaining the research permit, the researcher conducted research.
the Beck Depression Inventory questionnaire	Methods	The researcher gave the Beck Depression Inventory questionnaire

Comments	Location	Authors' Responses
#Reviewer 1	Location	Autors Responses
Was it in English or Indonesian? If you used in Indonesian, it was valid and reliable?		and filled it out to measure the level of depression. The instrument uses Indonesian which has been tested for validity and measuring the reliability of BDI with Cronbach's alpha result is 0.923, which means that the measuring instrument is very reliable, so the questionnaire is declared reliable. To check the CD4 count using PIMA Analyzer in HIV patients before and after the intervention in both groups.
The exercise is carried out three times a week for four weeks, while the aerobic exercise stages consist of 3 movement sessions. <u>How did you make sure that they do it</u> <u>correctly?</u>	Methods	The researcher gave the Beck Depression Inventory questionnaire and filled it out to measure the level of depression. The instrument uses Indonesian which has been tested for validity and measuring the reliability of BDI with Cronbach's alpha result is 0.923, which means that the measuring instrument is very reliable, so the questionnaire is declared reliable. To check the CD4 count using PIMA Analyzer in HIV patients before and after the intervention in both groups.
Weigh Do you mean severe?	Results	Severe
Ride Permanent Down What is it?	Results	Increase Standing Decrease
Do not repeat your results. Just discuss it.	Discussion	After the aerobic exercise intervention was carried out in the intervention group, the results of the different tests in the table above show that after the intervention, the depression level of HIV patients was significantly different. So it could be concluded that aerobic exercise intervention was proven to be able to reduce depression levels in HIV patients. The results of this study are in line with the research conducted by Heissel which showed that there were significant differences in the level of depression before and after the intervention with a value of $p = 0.00$.

Comments	Location	Authors' Responses
#Reviewer 1		
		Andreany said that there was an effect of aerobic exercise on the level of depression with a value of p= 0.0002, which means it was significant for the level of depression. Physical exercise that is done can increase endorphin activity. Increasing endorphins will strengthen the body's natural immunity and improve mood and encourage body activity. Psychologically, the ability to show movement during exercise will increase self-confidence and self-esteem which affects mood. Regular physical exercise can help with faster recovery from stressors, thereby improving depression symptoms (Al-Qahtani, 2018). Conceptually, a stressful situation in an individual will stimulate the hypothalamus to release neuropeptides that will activate the ANS (Autonomic Nerve System) and the pituitary to secrete corticosteroids and ketokelamine which are hormones that react to stressful conditions. Increased levels of glucocorticoids will interfere with the immune system which causes the CD4 to decrease and make you more susceptible to infections and health conditions. Increased levels of glucocorticoids will interfere with the immune system which causes the patient's CD4 to decrease and the patient is more susceptible to infection and worsening health conditions (Benton & Karnik, 2019). Lubis stated that there are several ways to handle depression patients, one of which is to provide training in the form of therapy, one of which is by exercising and developing constructive coping to
Do not repeat the results. Just discuss it.	Discussion	(Safira & Lubis, 2014). The effect of aerobic exercise on the
		CD4 count of the control group and intervention group. After the aerobic exercise intervention was carried out in the intervention group, the results of the different tests in the table above show that after the intervention, the CD4 count of HIV patients was significantly different. The results of this study are in line with research conducted by Dianatinasab where there was an effect of aerobic exercise on increasing CD4 cell

Comments	Location	Authors' Responses
#Reviewer 1		
		Yasirin also said in the results of his research that there was an effect of aerobic exercise in the intervention group with a CD4 count of 1.7 cells / mm3. In the Journal of the American Medical Association says there is no drug now or in the future that will be used that promises to definitely provide and maintain health better than a habit of living constantly exercise. (Yasirin,
Do not repeat the results. Just discuss it.	Discussion	2014). Metabolism is also related to endurance, substances that function to maintain the stability of the body's immunity also come from the metabolism function to maintain endurance. Protein substances that come from foods that are eaten. The increase in CD4 which is part of the immune system, including the impact of protein metabolism. Aerobic exercise can increase metabolism in the body, including protein metabolism. So that it has an impact on the quality of the immune system. Immune system cells circulate rapidly in the body and there may also be a temporary boost in the production of macrophages, cells that attack bacteria. A decrease in CD4 cells from HIV sufferers who are not normal must be balanced with treatment in the form of drugs as well as exercise to increase metabolism in the body (Naoroibam, 2016). The results of this study prove the research hypothesis which states that giving aerobic exercise interventions can reduce depression levels and increase
What is suggestion from the study?	Conclusion	For the nursing profession It is recommended for nurses to be able to provide one alternative action, namely aerobic exercise in reducing depression levels and increasing CD4 cell counts. Can develop themselves by studying various non-pharmacological therapies as independent actions of nurses. Families can be involved in the exercise so that they can assist the patient in doing aerobic exercise. For further researchers The results of this study can be used as a basis for

Comments	Location	Authors' Responses
#Reviewer 1		
		further researchers in order to control confounding variables and add a larger sample with a research period that can be further investigated in a longer period of time than this study.

EFFECT OF AEROBIC EXERCISE ON DEPRESSION AND CD4 COUNT IN PEOPLE LIVING WITH HIV

Abstrak

Pasien HIV sering mengalami gangguan psikologi dan fisik yang sangat berpengaruh terhadap kepatuhan ODHA. Penelitian ini bertujuan untuk mengetahui pengaruh *aerobic exercise* terhadap tingkat depresi dan jumlah CD4 pasien HIV. Desain penelitian adalah quasi *experiment pre-post test with control group*. Teknik pengambilan sampel adalah consecutive sampling, sebanyak sampel 52 responden HIV. Analisis data menggunakan uji paired samples test dan Independent samples test. Tingkat depresi diukur dengan kuisioner *Beck Depression Inventory* (BDI), jumlah CD4 dengan Pyma Analyser. Latihan dilakukan sebanyak 3 kali seminggu dengan waktu latihan 20-30 menit selama 4 minggu. Hasil penelitian menunjukkan ada rata-rata perbedaan signifikan tingkat depresi sebelum melakukan aerobic exercise 25.15 dan sesudah 22.46, dengan nilai p= 0,001 dan perbedaan signifikan pada jumlah CD4 antara kelompok kontrol 303.38 dan kelompok intervensi 305.38 melakukan aerobic exercise dengan nilai p= 0,031. Aerobic exercise efektif untuk menurunkan tingkat depresi dan jumlah CD4 pasien HIV. Sel-sel sistem kekebalan tubuh bersirkulasi dengan lebih cepat dan ada dorongan di dalam produksi makrofag yaitu sel-sel yang dapat menyerang bakteri.

Kata Kunci: Aerobic exercise, Depresi, Jumlah CD4, HIV

Abstract

Effect of Aerobic Exercise on Depression and CD4 Count in People Living with HIV. HIV patients often experience psychological and physical disorders which greatly affect the adherence of PLWHA. This study aimed to assess the effect of aerobic exercise on levels of depression and CD4 cell count of HIV patients. The research design was a quasi experiment pre-post test with control group. The sampling technique was consecutive sampling, with a total sample of 52 HIV respondents. Data analysis used paired samples test and Independent samples test. Depression level was measured by Beck Depression Inventory (BDI) questionnaire, CD4 count using Pyma Analyzer. Exercise is done 3 times a week with 20-30 minutes of exercise for 4 weeks. The results showed a significant difference between the average value of depression level before 25.15 and after 22.46 intervention of aerobic exercise with a value of p = 0.001, with a p value = 0.001 and a significant difference in CD4 count between the control group 303.38 and the intervention group 305.38 doing aerobic exercise with a p value = 0.031. Aerobic exercise is effective in reducing depression levels and CD4 counts in HIV patients. Immune system cells circulate more rapidly and there is a boost in the production of macrophages, cells that can attack bacteria.

Keyword: Aerobic exercise, depression, CD4 count, HIV

Introduction

Human Immunodefiency Virus (HIV) is a virus that attacks the immune system that can be contagious and deadly. HIV can occur due to several risk factors including alternating drug injection equipment (drugs, alcohol, psychotropic substances and additives), free sex (heterosexual, homosexual) without a condom, from infected mothers to children, perinatals and through transfusions (Kemenkes, 2017).

Various impacts that can arise on HIV sufferers such as physical, social, emotional and spiritual problems. Most PLWHA experience changes in emotional status, one of which is depression. Demirel said HIV/ AIDS sufferers in Turky experienced depression 31% and up to 19% mental disorders. The prevalence of depression in Indonesia is quite high, around 17-27%. About 5-10% of the general

population are depressed. The causes of depression in PLHWA patients are low CD4 count, adherence to ART, lack of physical activity and community stigma (Demirel, 2018)

HIV directly destroys CD4 T cells (Cluster of Differentiation 4) which functions as body immunity and causes primary infection which further accelerates the decrease in the number of CD4 lymphocytes in the blood. If you attack CD4 T cells until their number drops below 200 per microliter, the body's immunity will be lost and become AIDS. Dianatisanab said a CD4 cell count <500 cells / ml or <200 cells / ml in PLWHA will cause severe depression. Factors that influence CD4 counts in PLWHA are baseline CD4 count, medication adherence level, depression, tuberculosis infection. (Dianatinasab, 2018).

The number of people infected with HIV in 2012 was 35.3 million people and increased in 2018 as many as 37.9 million people worldwide, the most at the age of 15-49 years (UNAIDS, 2019). In Indonesia, in 2018 there were 640,443 people with HIV/ AIDS (PLWHA). The Indonesian Ministry of Health stated that the number of HIV/ AIDS cases had reached 18,442 cases in 33 provinces with 3,708 deaths. (Kemenkes, 2017).

Aerobic exercise is a physical activity that uses leg and arm muscle movements which are known to have many benefits. Regular movement can increase the release of neurotransmitters that is mediated by activation of Brain-derived Neurotrophic Factor (BDNF). Increased BDNF, VEGF, and IGF-1 as neurotrophic factors in the hippocampus are useful for nerve cell growth, increase regulation of stress hormones, namely cortisol on the hypothalamic-pituitary-adrenal (HPA) axis and decrease the release of pro-inflammatory cytokines so that depressive symptoms can be reduced and cells the immune system will circulate more quickly in the body, and there may also be a boost in the production of macrophages, which are cells that attack bacteria, which can increase CD4 counts in PLWHA (Nosrat, 2017).

A study by Heissel found that to assess aerobic exercise activity for depression and CD4 cell count, the evaluation could be done at week four. Statistical test in the control group (SMD= -0.84, 95% CI = -1.57, -0.11, p = 0.02). The test results in the intervention group (SMD = 0.90, 95% CI= -1.63, -0.30, p= 0.004, p<0.001). Exercise can reduce symptoms of depression and anxiety in PLWHA. This therapy can also affect the CD4 count of HIV patients (Heissel, 2019).

The results of a study conducted by Nosrat were found to be significant differences in depression levels in both groups (F= 2.63, p= 0.05) and (F= 7.40, p<0.001), with greater increases in resistance training compared to controls. Meanwhile, Dianatisanab study found that after the aerobic exercise intervention program, a significant difference in CD4 cell count was found between the two groups (P= 0.01). This means that aerobic exercise is effective in reducing levels of depression and increasing the CD4 count of HIV patients (Nosrat, 2017)

The difference in this study lies in the type and design of the study, population, number of samples, place of study, and the variables measured. The researcher uses a quasi-experimental research type with a pre-post test design with a control group. The population used is male and female. The number of samples taken was also different, namely 52 patients diagnosed with HIV stage 1 and 2 who had their CD4 count checked first and checked for depression levels with an assessment of BDI (Beck Depression Inventory) before being given aerobic exercise. Research variables have never been carried out in a study that combines the two variables, namely depression and CD4 cell count.

The advantages of giving aerobic exercise interventions in increasing circulation in HIV patients are that it is easy, effective and economical for all patients to do and has no side effects. Based on these descriptions, the researchers were interested in conducting a study to see the effect of aerobic exercise on depression levels and CD4 cell counts in HIV patients.

Matherial and Method

This study used a quantitative method with a pre-post test design with a control group. The sample size used a sample size formula to test the hypothesis for a mean of two populations (Notoatmodjo, 2005). Each respondent needed for the intervention group 26 respondents and the control group 26 respondents, a total of 52 respondents. The sample in this study was 52 HIV patients undergoing outpatient treatment at the VCT clinic. The sampling technique was consecutive sampling. Consecutive sampling is a sampling technique by selecting all individuals encountered and meeting the criteria until the desired sample size is met (Jannaim & Asrizal, 2018).

The inclusion criteria of this study were: 1) HIV patients stage 1 and II; 2) age> 18 years; 3) able to communicate well; 4) at least those who have been adhering to taking ARV drugs> 6 months; 5) patients with a CD4 count> 200 / ml; 6) patients who come with a companion who lives in the same house; 7) patients who are depressed (moderate, severe).

Before conducting the research, the researcher first made a research permit and research ethics approval letter from the Health Research Ethics Commission of the Faculty of Nursing, Diponegoro University which was addressed to the VCT Clinic Sobat Kupang. Health Research Ethics Committee Health Polytechnic Ministry of Health Kupang Ethichal Approval No: LB.02.03/1/0062/2020. After obtaining the research permit, the researcher conducted research.

The researcher gave the Beck Depression Inventory questionnaire and filled it out to measure the level of depression. The instrument uses Indonesian which has been tested for validity and measuring the reliability of BDI with Cronbach's alpha result is 0.923, which means that the measuring instrument is very reliable, so the questionnaire is declared reliable. To check the CD4 count using PIMA Analyzer in HIV patients before and after the intervention in both groups. Researchers identify respondents based on criteria that have been made previously. Then the researcher explained the procedure for the research process, namely the first meeting of all samples was carried out by filling out a questionnaire on the demographic data of the respondents, assessing the level of depression, checking CD4 counts and teaching aerobic exercise techniques for 20-30 minutes.

This intervention was given once at the beginning of the meeting, after which the researcher gave the SOP and video of aerobic exercise to be done at home and monitored by a companion who lived in the same house and then filled out the check list sheet that would be given by the researcher after the initial intervention. The exercise is carried out three times a week for four weeks, while the aerobic exercise stages consist of 3 movement sessions, namely: 1) Warm-up; Slowly approaching the extent of joint movement, then hold for 8 counts in 10 seconds and finally relax, until you feel a sufficient stretch without pain, for 5-10 minutes involving the joints and muscles of the upper, lower body as well as the left and right sides of the body, without bouncing and breathing regularly; 2) core movements; raising hands forward, upward, sideways, backward, hand movements opening and crossing, pushing and pumping forward, upward and sideways, punching hand movements, forward, sideways, upward, downwards and crosses, one-handed or two-handed swinging motion, clapping, among others, the hands clap, hands pat the thighs and shoulders. Walk in place, take a step or two, jump a foot or two to the side, forward and back, raise the knee, kick, back, forward, and sideways; 3) Cooling (Grace, 2015)

Data processing is processed using the help of a computer program system. The results were analyzed using univariate and bivariate analysis. Univariate analysis was carried out on respondent characteristics data (gender, age, education, marital status, number of OIs, type of ARV, risk factors, initial CD4 count), while bivariate analysis was performed on the measurement results of the Beck Depression Inventory value and CD4 count in the control group and the intervention group used the dependent samples test and Independent samples test.

Result

Respondent characteristics. The results showed that the age of respondents mostly occurred in the vulnerable ages 26-46 years with 43 people (165.4%), then 9 people at 18-25 years old (36.4%), male gender 27 25 people (96.1%) and women (61.9%), 23 people (88.4%) graduated from high school, 22 people (84.7%) graduated from elementary school (15.4%) and graduated from junior high school (3 people) (11.5%), 31 people (119.3%) unmarried status, 12 married (46.2%), 6 divorced people (23.1%) and there were 3 people who were divorced (11.5%), 29 people had the type of ARV drug with the EFV based type (111.5%) and 23 people had the type of NVP based medicine (88.5%), More opportunistic infections did not experience opportunistic infections or opportunistic infections <2, namely 51 people (98.1%) and the remaining 1 person (1.9%) who had opportunistic infections as much as 2 or> 2 types of infections.

The difference in the level of depression. Based on table 1, it can be seen that there is a difference in the level of depression in the control group and the intervention group on the average, indicating that the depression level of HIV patients who received aerobic exercise intervention decreased significantly by -2.69 with p value <0.05. Meanwhile, in the control group who did not get the aerobic exercise intervention there was no significant change. The changes that occurred were 0.88 with p value> 0.05. Based on the data above, it can be concluded that there was a significant change in the level of depression before and after giving aerobic exercise to the intervention group.

CD4 count difference. Based on the table, 2 It can be seen that there is a difference in the CD4 count of the control group and the intervention group on the average, indicating that the CD4 cell count of HIV patients who received aerobic exercise intervention increased significantly by 5.00 with p value <0.05. Meanwhile, in the control group who did not get the aerobic exercise intervention there was no significant change. The changes that occur are 0.57 with p value> 0.05. Based on the data above, it can be concluded that there was a significant change in CD4 count before and after giving aerobic exercise to the intervention group.

Variable	Type of group	Depressi on category	Frequency		Me	an	Mean differe nce	Differen ce SD	P value
			Before	After	Before	After			
Depression	Intervention	Light	6	11	25.15	22.46	-2.69	-1.002	0.001
		Moderate	16	10	_				
		Severe	6	5	_				
	Control	Light	5	6	24.12	25.00	0.88	-0.141	0.179
		Moderate	16	13	_				
		Severe	5	7					

Table 1. Differences in the level of depression in the control group and the aerobic exercise intervention

Table 2. Differences in changes in CD4 count of the control group and the aerobic exercise intervention

Variable	Type of group	Category	Freq	%	Me	Mean		Mean		Mean		Differe nce SD	P value
							ce						
					Before	After							
CD4	Intervention	Increase	19	73.1	300.46	305.4	5.00	2.655	0.031				
count		Standing	4	15.4		6							
		Decrease	3	11.5									
	Control	Increase	12	34.6	302.81	303.3	0.57	-1.576	0.523				
		Standing	5	19.2		8							
		Decrease	9	46.2									

Discussion

The effect of aerobic exercise on the level of depression in the control group and intervention group. After the aerobic exercise intervention was carried out in the intervention group, the results of the different tests in the table above show that after the intervention, the depression level of HIV patients was significantly different. So it could be concluded that aerobic exercise intervention was proven to be able to reduce depression levels in HIV patients. The results of this study are in line with the research conducted by Heissel which showed that there were significant differences in the level of depression before and after the intervention with a value of p = 0.00.

Andreany said that there was an effect of aerobic exercise on the level of depression with a value of p=0.0002, which means it was significant for the level of depression. Physical exercise that is done can increase endorphin activity. Increasing endorphins will strengthen the body's natural immunity and improve mood and encourage body activity. Psychologically, the ability to show movement during exercise will increase self-confidence and self-esteem which affects mood. Regular physical exercise can help with faster recovery from stressors, thereby improving depression symptoms (Al-Qahtani, 2018).

Conceptually, a stressful situation in an individual will stimulate the hypothalamus to release neuropeptides that will activate the ANS (Autonomic Nerve System) and the pituitary to secrete corticosteroids and ketokelamine which are hormones that react to stressful conditions. Increased levels of glucocorticoids will interfere with the immune system which causes the CD4 to decrease and make you more susceptible to infections and health conditions.

Increased levels of glucocorticoids will interfere with the immune system which causes the patient's CD4 to decrease and the patient is more susceptible to infection and worsening health conditions (Benton & Karnik, 2019). Lubis stated that there are several ways to handle depression patients, one of which is to provide training in the form of therapy, one of which is by exercising and developing constructive coping to prevent depression in HIV patients. (Safira & Lubis, 2014).

The effect of aerobic exercise on the CD4 count of the control group and intervention group. After the aerobic exercise intervention was carried out in the intervention group, the results of the different tests in the table above show that after the intervention, the CD4 count of HIV patients was significantly different. The results of this study are in line with research conducted by Dianatinasab where there was an effect of aerobic exercise on increasing CD4 cell count (p < 0.001).

Yasirin also said in the results of his research that there was an effect of aerobic exercise in the intervention group with a CD4 count of 1.7 cells / mm3. In the Journal of the American Medical Association says there is no drug now or in the future that will be used that promises to definitely provide and maintain health better than a habit of living constantly exercise. (Yasirin, 2014).

Metabolism is also related to endurance, substances that function to maintain the stability of the body's immunity also come from the metabolic process. The results of protein metabolism function to maintain endurance. Protein substances that come from foods that are eaten. The increase in CD4 which is part of the immune system, including the impact of protein metabolism.

Aerobic exercise can increase metabolism in the body, including protein metabolism. So that it has an impact on the quality of the immune system. Immune system cells circulate rapidly in the body and there may also be a temporary boost in the production of macrophages, cells that attack bacteria. A decrease in CD4 cells from HIV sufferers who are not normal must be balanced with treatment in the form of drugs as well as exercise to increase metabolism in the body (Naoroibam, 2016). The

results of this study prove the research hypothesis which states that giving aerobic exercise interventions can reduce depression levels and increase CD4 counts in HIV patients.

Conclusion

Based on this study, it can be concluded that there is a significant change in the level of depression after being given aerobic exercise between the control group and the intervention group with the results of statistical tests showing a p value <0.05, there is a significant change between the control group and the intervention group and there is a significant change in CD4 cell count after being given aerobics. exercise between the control group and the intervention group with differences respectively 5.00 and 0.57. The difference in the mean level of depression and CD4 counts of the control group and the intervention group before and after the intervention showed a significant difference and the difference in the mean level of depression and CD4 cell count between the control group and the intervention group after aerobic exercise showed a significant difference as well.

Suggestions

For the nursing profession It is recommended for nurses to be able to provide one alternative action, namely aerobic exercise in reducing depression levels and increasing CD4 cell counts. Can develop themselves by studying various non-pharmacological therapies as independent actions of nurses. Families can be involved in the exercise so that they can assist the patient in doing aerobic exercise.

For further researchers The results of this study can be used as a basis for further researchers in order to control confounding variables and add a larger sample with a research period that can be further investigated in a longer period of time than this study.

Reference

- Al-Qahtani, A. M., Shaikh, M. A. K., & Shaikh, I. A. (2018). Exercise as a treatment modality for depression: A narrative review. *Alexandria Journal of Medicine*, 54(4), 429–435.
- Benton, T. D., Kee Ng, W. Y., Leung, D., Canetti, A., & Karnik, N. (2019). Depression among Youth Living with HIV/AIDS. *Child and Adolescent Psychiatric Clinics of North America*, 28(3), 447– 459.
- Demirel, O. F., Mayda, P. Y., Yıldız, N., Sağlam, H., Koçak, B. T., Habip, Z. Kocazeybek, B. (2018). Self-stigma, depression, and anxiety levels of people living with HIV in Turkey. *European Journal of Psychiatry*, 32(4), 182–186.
- Dianatinasab, M., Fararouei, M., Padehban, V., Dianatinasab, A., Alimohamadi, Y., Beheshti, S., ... AminiLari, M. (2018). The effect of a 12-week combinational exercise program on CD4 count and mental health among HIV infected women: A randomized control trial. *Journal of Exercise Science and Fitness*, 16(1), 21–25.
- Grace, J. M., Semple, S. J., & Combrink, S. (2015). Exercise therapy for human immunodeficiency virus/AIDS patients: Guidelines for clinical exercise therapists. *Journal of Exercise Science and Fitness*, 13(1), 49–56.
- Heissel, A., Zech, P., Rapp, M. A., Schuch, F. B., Lawrence, J. B., Kangas, M., & Heinzel, S. (2019). Effects of exercise on depression and anxiety in persons living with HIV: A meta-analysis. *Journal of Psychosomatic Research*, 126(August), 109823.
- Jannaim, J., Dharmajaya, R., & Asrizal, A. (2018). Pengaruh Buerger Allen Exercise Terhadap Sirkulasi Ektremitas Bawah Pada Pasien Luka Kaki Diabetik. Jurnal Keperawatan Indonesia, 21(2), 101–108.

Kemenkes. (2017). Laporan Perkembangan HIV-AIDS. 1-565.

- Kusuma, H. (2011). Hubungan Antara Depresi dan Dukungan Keluarga Dengan Kualitas Hidup Pasien HIV/AIDS yang Menjalani Perawatan di RSUP Cipto Mangunkusumo Jakarta. Universitas Indonesia, 20,21,76-79,111-114,135-139.
- Naoroibam, R., Metri, K., Bhargav, H., Nagaratna, R., & Nagendra, H. (2016). Effect of Integrated Yoga (IY) on psychological states and CD4 counts of HIV-1 infected Patients: A Randomized controlled pilot study. *International Journal of Yoga*, 9(1), 57. https://doi.org/10.4103/0973-6131.171723
- Nosrat, S., Whitworth, J. W., Dunsiger, S. I., SantaBarbara, N. J., & Ciccolo, J. T. (2017). Acute effects of resistance exercise in a depressed HIV sample: The exercise for people who are immunocompromised (EPIC) study. *Mental Health and Physical Activity*, *12*, 2–9.

Notoatmodjo, S. (2005). Metodologi penelitian kesehatan (Vol. 205).

Safira, N., Lubis, R., & Rasmaliah, R. (2014). Faktor-faktor yang berhubungan dengan kepatuhan penderita HIV/AIDS mengonsumsi obat antiretroviral (ARV) di klinik voluntary counseling and testing (VCT) RSUP H. Adam Malik Medan tahun 2014. *Portal Garuda*, 1–10. Retrieved from http://www.portalgaruda.org

UNAIDS. (2019). 2018 GLOBAL HIV STATISTICS. 2(1), 1-6.

- Yasirin, A., Rahayu, S., Junaidi, S., & Artikel, I. (2014). Latihan Senam Aerobik dan Peningkatan Limfosit CD4 pada Penderita HIV. 3(3), 1–6.
- Yogani, I., Karyadi, T. H., Uyainah, A., & Koesnoe, S. (2017). Faktor-faktor yang Berhubungan dengan Kenaikan CD4 pada Pasien HIV yang Mendapat Highly Active Antiretroviral Therapy dalam 6 bulan Pertama. Jurnal Penyakit Dalam Indonesia, 2(4), 217.

[JN] Editor Decision3

untung71/Email Masuk

Retnayu Pradanie, S.Kep., Ns., M.Kep. <rena.unair@gmail.com>

Kepada:Untung Sujianto

Sel, 9 Nov 2021 jam 11.12

Dear Untung Sujianto:

Besides the comments from the reviewer, please also make this following

changes to your manuscript:

1. please use Mendeley reference manager to manage the reference and

citation in the article.

2. please explain about the ethical clearance for this research

3. please refer to the style/template/guideline of Jurnal Ners

4. Please submit your revision no longer than 13 November 2021

Best regards

Editor Jurnal Ners

JURNAL NERS

http://e-journal.unair.ac.id/JNERS

Kam, 11 Nov 2021 jam 12.29

untung71@fk.undip.ac.id <untung71@fk.undip.ac.id>

Kepada:Retnayu Pradanie, S.Kep., Ns., M.Kep.

Kam, 18 Nov 2021 jam 11.13

Dear Retnayu Pradanie

I have corrected the article based on the feedback, and I have submitted it

Sicerely

Untung Sujianto

EFFECT OF AEROBIC EXERCISE ON DEPRESSION AND CD4 COUNT IN PEOPLE LIVING WITH HIV

Abstrak

Pasien HIV sering mengalami gangguan psikologi dan fisik yang sangat berpengaruh terhadap kepatuhan ODHA. Penelitian ini bertujuan untuk mengetahui pengaruh *aerobic exercise* terhadap tingkat depresi dan jumlah CD4 pasien HIV. Desain penelitian adalah quasi *experiment pre-post test with control group*. Teknik pengambilan sampel adalah consecutive sampling, sebanyak sampel 52 responden HIV. Analisis data menggunakan uji paired samples test dan Independent samples test. Tingkat depresi diukur dengan kuisioner *Beck Depression Inventory* (BDI), jumlah CD4 dengan Pyma Analyser. Latihan dilakukan sebanyak 3 kali seminggu dengan waktu latihan 20-30 menit selama 4 minggu. Hasil penelitian menunjukkan ada rata-rata perbedaan signifikan tingkat depresi sebelum melakukan aerobic exercise 25.15 dan sesudah 22.46, dengan nilai p= 0,001 dan perbedaan signifikan pada jumlah CD4 antara kelompok kontrol 305.38 melakukan aerobic exercise dengan nilai p= 0,031. Aerobic exercise efektif untuk menurunkan tingkat depresi dan jumlah CD4 pasien HIV. Sel-sel sistem kekebalan tubuh bersirkulasi dengan lebih cepat dan ada dorongan di dalam produksi makrofag yaitu sel-sel yang dapat menyerang bakteri.

Kata Kunci: Aerobic exercise, Depresi, Jumlah CD4, HIV

Abstract

Effect of Aerobic Exercise on Depression and CD4 Count in People Living with HIV. HIV patients often experience psychological and physical disorders which greatly affect the adherence of PLWHA. This study aimed to assess the effect of aerobic exercise on levels of depression and CD4 cell count of HIV patients. The research design was a quasi experiment pre-post test with control group. The sampling technique was consecutive sampling, with a total sample of 52 HIV respondents. Data analysis used paired samples test and Independent samples test. Depression level was measured by Beck Depression Inventory (BDI) questionnaire, CD4 count using Pyma Analyzer. Exercise is done 3 times a week with 20-30 minutes of exercise for 4 weeks. The results showed a significant difference between the average value of depression level before 25.15 and after 22.46 intervention of aerobic exercise with a value of p = 0.001, with a p value = 0.001 and a significant difference in CD4 count between the control group 303.38 and the intervention group 305.38 doing aerobic exercise with a p value = 0.031. Aerobic exercise is effective in reducing depression levels and CD4 counts in HIV patients. Immune system cells circulate more rapidly and there is a boost in the production of macrophages, cells that can attack bacteria.

Keyword: Aerobic exercise, depression, CD4 count, HIV

Introduction

Human Immunodefiency Virus (HIV) is a virus that attacks the immune system that can be contagious and deadly. HIV can occur due to several risk factors including alternating drug injection equipment (drugs, alcohol, psychotropic substances and additives), free sex (heterosexual, homosexual) without a condom, from infected mothers to children, perinatals and through transfusions (Kemenkes, 2017).

Various impacts that can arise on HIV sufferers such as physical, social, emotional and spiritual problems. Most PLWHA experience changes in emotional status, one of which is depression. Demirel said HIV/ AIDS sufferers in Turky experienced depression 31% and up to 19% mental disorders. The prevalence of depression in Indonesia is quite high, around 17-27%. About 5-10% of the general population are depressed. The causes of depression in PLHWA patients are low CD4 count, adherence to ART, lack of physical activity and community stigma (Demirel, 2018)

HIV directly destroys CD4 T cells (Cluster of Differentiation 4) which functions as body immunity and causes primary infection which further accelerates the decrease in the number of CD4 lymphocytes in the blood. If you attack CD4 T cells until their number drops below 200 per microliter, the body's immunity will be lost and become AIDS. Dianatisanab said a CD4 cell count <500 cells / ml or <200 cells / ml in PLWHA will cause severe depression. Factors that influence CD4 counts in PLWHA are baseline CD4 count, medication adherence level, depression, tuberculosis infection. (Dianatinasab, 2018).

The number of people infected with HIV in 2012 was 35.3 million people and increased in 2018 as many as 37.9 million people worldwide, the most at the age of 15-49 years (UNAIDS, 2019). In Indonesia, in 2018 there were 640,443 people with HIV/ AIDS (PLWHA). The Indonesian Ministry of Health stated that the number of HIV/ AIDS cases had reached 18,442 cases in 33 provinces with 3,708 deaths. (Kemenkes, 2017).

Aerobic exercise is a physical activity that uses leg and arm muscle movements which are known to have many benefits. Regular movement can increase the release of neurotransmitters that is mediated by activation of Brain-derived Neurotrophic Factor (BDNF). Increased BDNF, VEGF, and IGF-1 as neurotrophic factors in the hippocampus are useful for nerve cell growth, increase regulation of stress hormones, namely cortisol on the hypothalamic-pituitary-adrenal (HPA) axis and decrease the release of pro-inflammatory cytokines so that depressive symptoms can be reduced and cells the immune system will circulate more quickly in the body, and there may also be a boost in the production of macrophages, which are cells that attack bacteria, which can increase CD4 counts in PLWHA (Nosrat, 2017).

A study by Heissel found that to assess aerobic exercise activity for depression and CD4 cell count, the evaluation could be done at week four. Statistical test in the control group (SMD= -0.84, 95% CI = -1.57, -0.11, p = 0.02). The test results in the intervention group (SMD = 0.90, 95% CI= -1.63, -0.30, p= 0.004, p<0.001). Exercise can reduce symptoms of depression and anxiety in PLWHA. This therapy can also affect the CD4 count of HIV patients (Heissel, 2019).

The results of a study conducted by Nosrat were found to be significant differences in depression levels in both groups (F= 2.63, p= 0.05) and (F= 7.40, p<0.001), with greater increases in resistance training compared to controls. Meanwhile, Dianatisanab study found that after the aerobic exercise intervention program, a significant difference in CD4 cell count was found between the two groups (P= 0.01). This means that aerobic exercise is effective in reducing levels of depression and increasing the CD4 count of HIV patients (Nosrat, 2017)

The difference in this study lies in the type and design of the study, population, number of samples, place of study, and the variables measured. The researcher uses a quasi-experimental research type with a pre-post test design with a control group. The population used is male and female. The number of samples taken was also different, namely 52 patients diagnosed with HIV stage 1 and 2 who had their CD4 count checked first and checked for depression levels with an assessment of BDI (Beck Depression Inventory) before being given aerobic exercise. Research variables have never been carried out in a study that combines the two variables, namely depression and CD4 cell count.

The advantages of giving aerobic exercise interventions in increasing circulation in HIV patients are that it is easy, effective and economical for all patients to do and has no side effects. Based on these descriptions, the researchers were interested in conducting a study to see the effect of aerobic exercise on depression levels and CD4 cell counts in HIV patients.

Matherial and Method

This study used a quantitative method with a pre-post test design with a control group. The sample size used a sample size formula to test the hypothesis for a mean of two populations (Notoatmodjo, 2005). Each respondent needed for the intervention group 26 respondents and the control group 26 respondents, a total of 52 respondents. The sample in this study was 52 HIV patients undergoing outpatient treatment at the VCT clinic. The sampling technique was consecutive sampling. Consecutive sampling is a sampling technique by selecting all individuals encountered and meeting the criteria until the desired sample size is met (Jannaim & Asrizal, 2018).

The inclusion criteria of this study were: 1) HIV patients stage 1 and II; 2) age> 18 years; 3) able to communicate well; 4) at least those who have been adhering to taking ARV drugs> 6 months; 5) patients with a CD4 count> 200 / ml; 6) patients who come with a companion who lives in the same house; 7) patients who are depressed (moderate, severe).

Before conducting the research, the researcher first made a research permit and research ethics approval letter from the Health Research Ethics Commission of the Faculty of Nursing, Diponegoro University which was addressed to the VCT Clinic Sobat Kupang. Health Research Ethics Committee Health Polytechnic Ministry of Health Kupang Ethichal Approval No: LB.02.03/1/0062/2020. After obtaining the research permit, the researcher conducted research.

The researcher gave the Beck Depression Inventory questionnaire and filled it out to measure the level of depression. The instrument uses Indonesian which has been tested for validity and measuring the reliability of BDI with Cronbach's alpha result is 0.923, which means that the measuring instrument is very reliable, so the questionnaire is declared reliable. To check the CD4 count using PIMA Analyzer in HIV patients before and after the intervention in both groups. Researchers identify respondents based on criteria that have been made previously. Then the researcher explained the procedure for the research process, namely the first meeting of all samples was carried out by filling

out a questionnaire on the demographic data of the respondents, assessing the level of depression, checking CD4 counts and teaching aerobic exercise techniques for 20-30 minutes.

This intervention was given once at the beginning of the meeting, after which the researcher gave the SOP and video of aerobic exercise to be done at home and monitored by a companion who lived in the same house and then filled out the check list sheet that would be given by the researcher after the initial intervention. The exercise is carried out three times a week for four weeks, while the aerobic exercise stages consist of 3 movement sessions, namely: 1) Warm-up; Slowly approaching the extent of joint movement, then hold for 8 counts in 10 seconds and finally relax, until you feel a sufficient stretch without pain, for 5-10 minutes involving the joints and muscles of the upper, lower body as well as the left and right sides of the body, without bouncing and breathing regularly; 2) core movements; raising hands forward, upward, sideways, backward, hand movements, forward, sideways, upward, downwards and crosses, one-handed or two-handed swinging motion, clapping, among others, the hands clap, hands pat the thighs and shoulders. Walk in place, take a step or two, jump a foot or two to the side, forward and back, raise the knee, kick, back, forward, and sideways; 3) Cooling (Grace, 2015)

Data processing is processed using the help of a computer program system. The results were analyzed using univariate and bivariate analysis. Univariate analysis was carried out on respondent characteristics data (gender, age, education, marital status, number of OIs, type of ARV, risk factors, initial CD4 count), while bivariate analysis was performed on the measurement results of the Beck Depression Inventory value and CD4 count in the control group and the intervention group used the dependent samples test and Independent samples test.

Result

Respondent characteristics. The results showed that the age of respondents mostly occurred in the vulnerable ages 26-46 years with 43 people (165.4%), then 9 people at 18-25 years old (36.4%), male gender 27 25 people (96.1%) and women (61.9%), 23 people (88.4%) graduated from high school, 22 people (84.7%) graduated from elementary school (15.4%) and graduated from junior high school (3 people) (11.5%), 31 people (119.3%) unmarried status, 12 married (46.2%), 6 divorced people (23.1%) and there were 3 people who were divorced (11.5%), 29 people had the type of ARV drug with the EFV based type (111.5%) and 23 people had the type of NVP based medicine (88.5%), More opportunistic infections did not experience opportunistic infections or opportunistic infections <2, namely 51 people (98.1%) and the remaining 1 person (1.9%) who had opportunistic infections as much as 2 or> 2 types of infections.

The difference in the level of depression. Based on table 1, it can be seen that there is a difference in the level of depression in the control group and the intervention group on the average, indicating that the depression level of HIV patients who received aerobic exercise intervention decreased significantly by -2.69 with p value <0.05. Meanwhile, in the control group who did not get the aerobic exercise intervention there was no significant change. The changes that occurred were 0.88 with p value> 0.05. Based on the data above, it can be concluded that there was a significant change in the level of depression before and after giving aerobic exercise to the intervention group.

CD4 count difference. Based on the table, 2 It can be seen that there is a difference in the CD4 count of the control group and the intervention group on the average, indicating that the CD4 cell count of HIV patients who received aerobic exercise intervention increased significantly by 5.00 with p value <0.05. Meanwhile, in the control group who did not get the aerobic exercise intervention there was no significant change. The changes that occur are 0.57 with p value > 0.05. Based on the data above,

it can be concluded that there was a significant change in CD4 count before and after giving aerobic exercise to the intervention group.

Table 1. Differences in the level of depression in the control group and the aerobic exercise intervention

Variable	Type of group	Depressi on category	Frequ	Frequency Mean		Mean differe nce	Differen ce SD	P value	
			Before	After	Before	After			
Depression	Intervention	Light	6	11	25.15	22.46	-2.69	-1.002	0.001
		Moderate	16	10	_				
		Severe	6	5	_				
	Control	Light	5	6	24.12	25.00	0.88	-0.141	0.179
		Moderate	16	13	_				
		Severe	5	7	_				

Table 2. Differences in changes in CD4 count of the control group and the aerobic exercise intervention

Variable	Type of group	Category	Freq	%	Mean		Mean Mean Di differen no		Differe nce SD	P value
							ce			
					Before	After				
CD4	Intervention	Increase	19	73.1	300.46	305.4	5.00	2.655	0.031	
count		Standing	4	15.4		6				
		Decrease	3	11.5						
	Control	Increase	12	34.6	302.81	303.3	0.57	-1.576	0.523	
		Standing	5	19.2		8				
		Decrease	9	46.2						

Discussion

The effect of aerobic exercise on the level of depression in the control group and intervention group. After the aerobic exercise intervention was carried out in the intervention group, the results of the different tests in the table above show that after the intervention, the depression level of HIV patients was significantly different. So it could be concluded that aerobic exercise intervention was proven to be able to reduce depression levels in HIV patients. The results of this study are in line with the research conducted by Heissel which showed that there were significant differences in the level of depression before and after the intervention with a value of p = 0.00.

Andreany said that there was an effect of aerobic exercise on the level of depression with a value of p=0.0002, which means it was significant for the level of depression. Physical exercise that is done can increase endorphin activity. Increasing endorphins will strengthen the body's natural immunity and improve mood and encourage body activity. Psychologically, the ability to show movement during exercise will increase self-confidence and self-esteem which affects mood. Regular physical exercise can help with faster recovery from stressors, thereby improving depression symptoms (Al-Qahtani, 2018).

Conceptually, a stressful situation in an individual will stimulate the hypothalamus to release neuropeptides that will activate the ANS (Autonomic Nerve System) and the pituitary to secrete corticosteroids and ketokelamine which are hormones that react to stressful conditions. Increased levels of glucocorticoids will interfere with the immune system which causes the CD4 to decrease and make you more susceptible to infections and health conditions.

Increased levels of glucocorticoids will interfere with the immune system which causes the patient's CD4 to decrease and the patient is more susceptible to infection and worsening health conditions (Benton & Karnik, 2019). Lubis stated that there are several ways to handle depression patients, one of which is to provide training in the form of therapy, one of which is by exercising and developing constructive coping to prevent depression in HIV patients. (Safira & Lubis, 2014).

The effect of aerobic exercise on the CD4 count of the control group and intervention group. After the aerobic exercise intervention was carried out in the intervention group, the results of the different tests in the table above show that after the intervention, the CD4 count of HIV patients was significantly different. The results of this study are in line with research conducted by Dianatinasab where there was an effect of aerobic exercise on increasing CD4 cell count (p < 0.001).

Yasirin also said in the results of his research that there was an effect of aerobic exercise in the intervention group with a CD4 count of 1.7 cells / mm3. In the Journal of the American Medical Association says there is no drug now or in the future that will be used that promises to definitely provide and maintain health better than a habit of living constantly exercise. (Yasirin, 2014).

Metabolism is also related to endurance, substances that function to maintain the stability of the body's immunity also come from the metabolic process. The results of protein metabolism function to maintain endurance. Protein substances that come from foods that are eaten. The increase in CD4 which is part of the immune system, including the impact of protein metabolism.

Aerobic exercise can increase metabolism in the body, including protein metabolism. So that it has an impact on the quality of the immune system. Immune system cells circulate rapidly in the body and there may also be a temporary boost in the production of macrophages, cells that attack bacteria. A decrease in CD4 cells from HIV sufferers who are not normal must be balanced with treatment in the form of drugs as well as exercise to increase metabolism in the body (Naoroibam, 2016). The results of this study prove the research hypothesis which states that giving aerobic exercise interventions can reduce depression levels and increase CD4 counts in HIV patients.

Conclusion

Based on this study, it can be concluded that there is a significant change in the level of depression after being given aerobic exercise between the control group and the intervention group with the results of statistical tests showing a p value <0.05, there is a significant change between the control group and the intervention group and there is a significant change in CD4 cell count after being given aerobics. exercise between the control group and the intervention group with differences respectively 5.00 and 0.57. The difference in the mean level of depression and CD4 counts of the control group and the intervention group before and after the intervention showed a significant difference and the difference in the mean level of depression and CD4 cell count between the control group and the intervention group after aerobic exercise showed a significant difference as well.

Suggestions

For the nursing profession It is recommended for nurses to be able to provide one alternative action, namely aerobic exercise in reducing depression levels and increasing CD4 cell counts. Can develop themselves by studying various non-pharmacological therapies as independent actions of nurses. Families can be involved in the exercise so that they can assist the patient in doing aerobic exercise.

For further researchers The results of this study can be used as a basis for further researchers in order to control confounding variables and add a larger sample with a research period that can be further investigated in a longer period of time than this study.

Reference

- Al-Qahtani, A. M., Shaikh, M. A. K., & Shaikh, I. A. (2018). Exercise as a treatment modality for depression: A narrative review. *Alexandria Journal of Medicine*, 54(4), 429–435.
- Benton, T. D., Kee Ng, W. Y., Leung, D., Canetti, A., & Karnik, N. (2019). Depression among Youth Living with HIV/AIDS. Child and Adolescent Psychiatric Clinics of North America, 28(3), 447– 459.
- Demirel, O. F., Mayda, P. Y., Yıldız, N., Sağlam, H., Koçak, B. T., Habip, Z. Kocazeybek, B. (2018). Self-stigma, depression, and anxiety levels of people living with HIV in Turkey. *European Journal of Psychiatry*, 32(4), 182–186.
- Dianatinasab, M., Fararouei, M., Padehban, V., Dianatinasab, A., Alimohamadi, Y., Beheshti, S., ... AminiLari, M. (2018). The effect of a 12-week combinational exercise program on CD4 count and mental health among HIV infected women: A randomized control trial. *Journal of Exercise Science and Fitness*, 16(1), 21–25.
- Grace, J. M., Semple, S. J., & Combrink, S. (2015). Exercise therapy for human immunodeficiency virus/AIDS patients: Guidelines for clinical exercise therapists. *Journal of Exercise Science and Fitness*, 13(1), 49–56.
- Heissel, A., Zech, P., Rapp, M. A., Schuch, F. B., Lawrence, J. B., Kangas, M., & Heinzel, S. (2019). Effects of exercise on depression and anxiety in persons living with HIV: A meta-analysis. *Journal of Psychosomatic Research*, 126(August), 109823.
- Jannaim, J., Dharmajaya, R., & Asrizal, A. (2018). Pengaruh Buerger Allen Exercise Terhadap Sirkulasi Ektremitas Bawah Pada Pasien Luka Kaki Diabetik. Jurnal Keperawatan Indonesia, 21(2), 101–108.
- Kemenkes. (2017). Laporan Perkembangan HIV-AIDS. 1-565.
- Kusuma, H. (2011). Hubungan Antara Depresi dan Dukungan Keluarga Dengan Kualitas Hidup Pasien HIV/AIDS yang Menjalani Perawatan di RSUP Cipto Mangunkusumo Jakarta. *Universitas Indonesia*, 20,21,76-79,111-114,135-139.
- Naoroibam, R., Metri, K., Bhargav, H., Nagaratna, R., & Nagendra, H. (2016). Effect of Integrated Yoga (IY) on psychological states and CD4 counts of HIV-1 infected Patients: A Randomized controlled pilot study. *International Journal of Yoga*, 9(1), 57. https://doi.org/10.4103/0973-6131.171723
- Nosrat, S., Whitworth, J. W., Dunsiger, S. I., SantaBarbara, N. J., & Ciccolo, J. T. (2017). Acute effects of resistance exercise in a depressed HIV sample: The exercise for people who are immunocompromised (EPIC) study. *Mental Health and Physical Activity*, *12*, 2–9.
- Notoatmodjo, S. (2005). Metodologi penelitian kesehatan (Vol. 205).
- Safira, N., Lubis, R., & Rasmaliah, R. (2014). Faktor-faktor yang berhubungan dengan kepatuhan penderita HIV/AIDS mengonsumsi obat antiretroviral (ARV) di klinik voluntary counseling and testing (VCT) RSUP H. Adam Malik Medan tahun 2014. *Portal Garuda*, 1–10. Retrieved from http://www.portalgaruda.org
- UNAIDS. (2019). 2018 GLOBAL HIV STATISTICS. 2(1), 1-6.
- Yasirin, A., Rahayu, S., Junaidi, S., & Artikel, I. (2014). Latihan Senam Aerobik dan Peningkatan Limfosit CD4 pada Penderita HIV. 3(3), 1–6.
- Yogani, I., Karyadi, T. H., Uyainah, A., & Koesnoe, S. (2017). Faktor-faktor yang Berhubungan dengan Kenaikan CD4 pada Pasien HIV yang Mendapat Highly Active Antiretroviral Therapy dalam 6 bulan Pertama. *Jurnal Penyakit Dalam Indonesia*, 2(4), 217.

[JN] Editor Decision2

untung71/Email Masuk

Retnayu Pradanie, S.Kep., Ns., M.Kep. <rena.unair@gmail.com>

Kepada:Untung Sujianto

Rab, 17 Nov 2021 jam 08.55

Dear Untung Sujianto,

We have reached a decision regarding your submission to Jurnal Ners, "EFFECT

OF AEROBIC EXERCISE ON DEPRESSION AND CD4 COUNT IN PEOPLE LIVING WITH HIV".

Our decision is to ACCEPT your submission.

In order to publish your article, Jurnal Ners requires that you complete an

author(s)' declaration and copyright transfer agreement attached below.

https://drive.google.com/file/d/0B5ormcRMCTnWNG1IZGdNRGNoSFU/view?usp=sharing

Thank you for your fine contribution. We look forward to your continued

contributions to the Journal.

Sincerely,

Editor in Chief, Jurnal Ners

secretariat_jurnalners@fkp.unair.ac.id

JURNAL NERS

http://e-journal.unair.ac.id/JNERS

untung71@fk.undip.ac.id <untung71@fk.undip.ac.id>

Kepada:Retnayu Pradanie, S.Kep., Ns., M.Kep.

Kam, 18 Nov 2021 jam 10.57

Dear Retnayu Pradanie

I have completed author's statement and copyright transfer agreement

Sincerely

Untung Sujianto

Tampilkan pesan asli

0

0 0

[JN] Copyediting Review Request2

untung71/Email Masuk

Retnayu Pradanie, S.Kep., Ns., M.Kep. <rena.unair@gmail.com>

Kepada:Untung Sujianto

Rab, 17 Nov 2021 jam 08.55

Untung Sujianto:

Your submission "EFFECT OF AEROBIC EXERCISE ON DEPRESSION AND CD4 COUNT IN

PEOPLE LIVING WITH HIV" for Jurnal Ners has been through the first step of

copyediting, and is available for you to review by following these steps.

1. Click on the Submission URL below.

2. Log into the journal and click on the File that appears in Step 1.

3. Open the downloaded submission.

4. Review the text, including copyediting proposals and Author Queries.

5. Make any copyediting changes that would further improve the text.

6. When completed, upload the file in Step 2.

7. Click on METADATA to check indexing information for completeness and

accuracy.

8. Send the COMPLETE email to the editor and copyeditor.

Submission URL:

https://e-journal.unair.ac.id/JNERS/author/submissionEditing/29952

Username: untung

This is the last opportunity to make substantial copyediting changes to the

submission. The proofreading stage, that follows the preparation of the

galleys, is restricted to correcting typographical and layout errors.

If you are unable to undertake this work at this time or have any questions,

please contact me. Thank you for your contribution to this journal.

Retnayu Pradanie, S.Kep., Ns., M.Kep.

(Scopus ID: 57201190282; h-index 2); Faculty of Nursing, Universitas

Airlangga

Phone +6281334226604

rena.unair@gmail.com

JURNAL NERS

http://e-journal.unair.ac.id/JNERS

0

0

0

0



untung71@fk.undip.ac.id <untung71@fk.undip.ac.id>

Kepada:Retnayu Pradanie, S.Kep., Ns., M.Kep.

Kam, 18 Nov 2021 jam 11.01

Dear Retnayu Pradanie

Thank you, I will immediately fix the article that has been submitted.

Sincerely

Untung Sujianto

Tampilkan pesan asli

[JN] Copyediting Review Acknowledgement

untung71/Email Masuk



Retnayu Pradanie, S.Kep., Ns., M.Kep. <rena.unair@gmail.com>

Kepada:Untung Sujianto

Kam, 25 Nov 2021 jam 14.13

Untung Sujianto:

Thank you for reviewing the copyediting of your manuscript, "EFFECT OF

AEROBIC EXERCISE ON DEPRESSION AND CD4 COUNT IN PEOPLE LIVING WITH HIV," for

Jurnal Ners. We look forward to publishing this work.

Retnayu Pradanie, S.Kep., Ns., M.Kep.

(Scopus ID: 57201190282; h-index 2); Faculty of Nursing, Universitas

Airlangga

Θ

Phone +6281334226604

rena.unair@gmail.com

JURNAL NERS

http://e-journal.unair.ac.id/JNERS

Jurnal Ners Vol. 16, No. 2, October 2021 urnai http://dx.doi.org/10.20473/jn.v16i2.29952

This is an Open Access article distributed under the terms of the <u>Creative Commons</u> <u>Attribution 4.0 International License</u> (cc

Original Research

Effects of Aerobic Exercise on Depression and CD4 Counts in People Living with HIV

Untung Sujianto

Universitas Diponegoro, Semarang, Indonesia

ABSTRACT

Introduction: HIV patients often experience psychological and physical disorders which greatly affect the adherence of people living with HIV/AIDS (PLWHA). This study aimed to assess the effects of aerobic exercise on the levels of depression and CD4 cell count of HIV patients.

Methods: This study used a pre-post quasi-experimental design with a control group. The sampling technique was consecutive sampling, with a total sample of 52 HIV respondents. Depression level was measured using the Beck Depression Inventory (BDI), while CD4 count was measured using the Pyma analyser. The aerobic exercise intervention was given three times a week with a duration of 20-30 minutes each for four weeks. The collected data were analysed using a paired sample t-test and an independent sample t-test.

Results: The results showed a significant difference in the mean value of depression before and after the intervention of aerobic exercise (M = 25.15 and M = 22.46, respectively) with p = 0.001. Similarly, there was a significant difference in the mean of CD4 counts between the control group (M = 303.38) and the intervention group (M = 305.38) after the intervention with p = 0.031.

Conclusion: Aerobic exercise is effective in reducing depression levels and increasing CD4 counts in HIV patients. Immune system cells circulate more rapidly and there is a boost in the production of macrophages, cells that can attack bacteria.

Cite this as: Sujianto, U. (2021). Effects of Aerobic Exercise on Depression and CD4 Counts in People Living with HIV. Jurnal Ners, 16(2). X-XX. doi:<u>http://dx.doi.org/10.20473/jn.v16i2.</u>29952

INTRODUCTION

http://e-journal.unair.ac.id/JNERS |

ARTICLE HISTORY

Received: October 6, 2021 Accepted: November 17, 2021

KEYWORDS

aerobic exercise; depression; CD4 count; HIV

CONTACT

Untung Sujianto ⊠ untung71@fk.undip.ac.id 🖃 Universitas Diponegoro, Semarang, Indonesia

Human Immunodeficiency Virus (HIV) is a virus that attacks the immune system and which can be contagious and deadly. HIV can occur due to several risk factors, including alternating drug injection equipment (drugs, alcohol, psychotropic substances and additives), free sex (heterosexual, homosexual) without a condom, transmission from infected mothers to children, perinatal and through transfusions (Kemenkes, 2017).

Various impacts can arise for HIV sufferers such as physical, social, emotional and spiritual problems. Most People Living with HIV/AIDS (PLWHA) experience changes in emotional status, one of which is depression. Demirel et al. (2018) stated that 31% of HIV/AIDS sufferers in Turkey experienced depression and up to 19% of them experienced mental disorders. The prevalence of depression in Indonesia is quite high, around 17-27%. Furthermore, approximately 5-10% of the general population experiences depression. The causes of depression in PLHWA patients are low CD4 count, adherence to ART, lack of physical activity, and community stigma (Demirel et al., 2018)

HIV directly destroys CD4 T cells (Cluster of Differentiation 4) which functions as body immunity and causes a primary infection which further accelerates the decrease in the number of CD4 lymphocytes in the blood. If the virus attacks CD4 T cells until their number drops below 200 per microliter, the body's immunity will be lost and become AIDS. Dianatisanab et al. (2018) stated that a CD4 cell count of <500 cells/ml or <200 cells/ml in PLWHA will cause severe depression. Factors that influence CD4 counts in PLWHA are baseline CD4 counts, medication adherence level, depression, and tuberculosis infection (Dianatinasab et al., 2018).

The number of people infected with HIV in 2012 was 35.3 million people and increased in 2018 to 37.9 million people worldwide; most of these people were at the age of 15-49 years old (UNAIDS, 2019). In Indonesia, there were 640,443 PLWHAs in 2018. The Indonesian Ministry of Health stated that the number of HIV/AIDS cases had reached 18,442 cases in 33 provinces with 3,708 deaths (Kemenkes, 2017).

Aerobic exercise is a physical activity that uses leg and arm muscle movements which are known to have many benefits. Regular movement can increase the release of neurotransmitters that is mediated by activation of Brain-derived Neurotrophic Factor (BDNF). Increased BDNF, VEGF, and IGF-1 as neurotrophic factors in the hippocampus are useful for nerve cell growth, increase regulation of stress hormones, namely cortisol on the hypothalamic-pituitary-adrenal (HPA) axis and decrease the release of pro-inflammatory cytokines so that depressive symptoms can be reduced and cells in the immune system will circulate more quickly in the body. There may also be a boost in the production of macrophages, which are cells that attack bacteria, which can increase CD4 counts in PLWHAs (Nosrat et al., 2017).

A study by Heissel et al. (2019) found that to assess aerobic exercise activity for depression and CD4 cell count, the evaluation could be done at week four. The study showed different results between the control group (SMD = -0.84, 95% CI = -1.57, -0.11, p = 0.02) and the intervention group (SMD = 0.90, 95% CI = -1.63, -0.30, p = 0.004, p < 0.001). Exercise can reduce symptoms of depression and anxiety in PLWHA. This therapy can also affect the CD4 count of HIV patients (Heissel et al., 2019).

The results of the study by Nosrat et al. (2017) showed significant differences in depression levels in both groups (F = 2.63, p = 0.05) and (F = 7.40, p < 0.001), with greater increases in resistance training compared to the control. Meanwhile, a study by Dianatisanab et al. (2018) found that after the aerobic exercise intervention programme, a significant difference in CD4 cell count was found between the two groups (p = 0.01). This means that aerobic exercise is effective in reducing levels of depression and increasing the CD4 count of HIV patients (Nosrat et al., 2017)

This study differs from previous studies in the type and design of the study, population, number of samples, place of study, and the variables measured. The researchers conducted the quasi-experimental research with a pre-post-test design with a control group. The population involved were males and females. The number of samples was also different, namely 52 patients diagnosed with HIV stage 1 and 2. These patients had their CD4 count checked first and were assessed for depression levels using Beck Depression Inventory (BDI) before receiving aerobic exercises. Research variables have never been carried out in a study that involves two variables, namely depression and CD4 cell count.

Providing aerobic exercise interventions to increase circulation in HIV patients is easy, effective and economical for all patients to do and has no side effects. Based on these descriptions, the researchers were interested in conducting a study to investigate the effects of aerobic exercise on depression levels and CD4 cell counts in HIV patients.

MATERIALS AND METHODS

This study used a quantitative method with a pre-posttest design with a control group. The sample size was calculated using a sample size formula to test the hypothesis for a mean of two populations (Notoatmodjo, 2005). This study involved 26 respondents each in the intervention and control groups, with a total of 52 respondents. These respondents were HIV patients undergoing outpatient treatment at the Voluntary Counselling and Testing (VCT) clinic. A consecutive sampling technique was used to recruit the samples. Consecutive sampling is a sampling technique that is performed by selecting all individuals encountered and meeting the criteria until the desired sample size is met (Jannaim & Asrizal, 2018).

The inclusion criteria of this study were: 1) HIV patients at stage 1 and II; 2) age >18 years old; 3) able to communicate well; 4) at least those who have been adhering to taking ARV drugs >6 months; 5) patients with a CD4 count >200 / ml; 6) patients who come with a

http://e-journal.unair.ac.id/JNERS |

JURNAL NERS

|--|

						0 1 11		, ,
Transof	Depression category	Frequency		M	Mean		CD	Demendentet
group		Before (%)	After (%)	Before (SD)	After (SD)	difference	Difference	test p-value
Intervention	Mild	4 (15.4)	11 (42.3)	05.45	22.46			
Ν	Moderate	16 (61.5)	10 (38.5)	25.15	22.46	-2.69	0.14	0.001
	Severe	6 (23.1)	5 (19.2)	(5.48)	(5.62)			
Control	Mild	5 (19.2)	6 (23.1)	24.12	25.00			_
	Moderate	16 (61.5)	13 (50.0)	24.12	25.00	0.88	1.00	0.179
	Severe	5 (19.2)	7 (26.0)	(5.99)	(6.99)			
	Independent t	-test p-value		0.341	0.001			

Table 2. Differences in CD4 counts between the intervention and control groups (pre- and post-test; N = 52)

				Mean Me % Before After Me (SD) (SD)		Maan			
Type of group	Category	n	%			difference	SD Difference	p-value	
	Increase	19	73.1	200.46	205.46				
Intervention	Standing	4	15.4	300.46	300.46	305.46	5.00	2.66	0.031
	Decrease	3	11.5	(38.70)	(01.50)				
	Increase	12	34.6	202.01	202.20			-	
Control	Standing	5	19.2	302.81	303.38	0.57	-1.58	0.523	
	Decrease	9	46.2	(02.98)	(01.40)				
Inde	pendent t-test p	-value		0.890	0.000				

companion who lives in the same house; and 7) patients who were depressed (moderate, severe).

Before conducting the research, the researcher first composed a research permit and research ethics approval letter from the Health Research Ethics Committee of the Faculty of Medicine, Diponegoro University which was addressed to the VCT Clinic Sobat Kupang. The Health Research Ethics Committee of the Health Polytechnic, Ministry of Health Kupang approved the study with a reference number of LB.02.03/1/0062/2020. After obtaining the research permit, the researchers began to conduct the study.

The researcher gave the Beck Depression Inventory questionnaire and filled it out to measure the level of depression. The instrument was written in the Indonesian language and had been tested for its validity and reliability with a Cronbach's alpha of 0.923, meaning that the measuring instrument was very reliable. The CD4 count was assessed using PIMA Analyzer before and after the intervention in both groups. The researchers identified respondents based on the predetermined criteria. The researchers explained the procedure for the research process, namely the first meeting of all samples was carried out by filling out a questionnaire on the demographic data of the respondents, assessing the level of depression, checking CD4 counts and teaching aerobic exercise techniques for 20-30 minutes.

This aerobic exercise intervention was given once at the beginning of the meeting, after which the researcher gave the SOP and the video of this exercise to be performed at home and monitored by a companion who lived in the same house as the respondents. Furthermore, the respondents filled out the checklist sheet that was provided by the researcher after the initial intervention. The exercise was carried out three times a week for four weeks. The aerobic exercise in this study consisted of three-movement sessions, namely: 1) Warm-up; slowly approaching the extent of joint movement, then hold for 8 counts in 10 seconds and finally relax, until the respondent feels a sufficient stretch without pain for 5-10 minutes involving the joints and muscles of the upper, in the lower body as well as the left and right sides of the body, without bouncing and breathing regularly; 2) core movements; raising hands forward, upward, sideways, backward, hand movements opening and crossing, pushing and pumping forward, upward and sideways, punching hand movements, forward, sideways, upward, downwards and crosses, one-handed or two-handed swinging motion, clapping, among others, the hands' clap, hands pat the thighs and shoulders; walk in the place, take a step or two, jump a foot or two to the side, forward and back, raise the knee, kick, back, forward, and sideways; and 3) Cooling (Grace et al., 2015).

The data was processed into a computer program system. The results were analysed using univariate and bivariate analysis. Univariate analysis was carried out on respondent characteristics data (gender, age, education, marital status, number of opportunistic infections (OIs), type of ARV, risk factors, initial CD4 count), while bivariate analysis was performed on the results of the Beck Depression Inventory value and CD4 count in the control group and the intervention group using the dependent samples t-test and independent samples ttest.

RESULTS

Respondent Characteristics

The results showed that the majority of respondents were aged 26-46 years old (n = 43; 65.4%), male (n =

27; 51.9%), high school graduates (n = 23; 44.2%), and unmarried (n = 31; 59.6%). Furthermore, 29 respondents had the type of ARV drug with the Evafirenz (EFV) based type (55.8%) and the other 23 had Nevirapine (NVP) based medicine (44.2%). As many as 51 respondents (98.1%) did not experience opportunistic infections or opportunistic infections <2, while the remaining (1.9%) had opportunistic infections \geq 2 types of infections.

Depression Level

Before the aerobic exercise intervention

The incidence of depression among HIV patients as shown in Table 1 was 23.1% in the intervention group and 19.2% in the control group. The overall mean of depression before the intervention was 25.15, which means that the level of major depression has the lowest score of 16 and the highest score of 36. From the results of the p-value in Table 1, it could be concluded that the incidence of depression between the control group and the intervention group is equivalent or has the same variance with a p-value >0.05.

After the aerobic exercise intervention

In the intervention group, the average level of depression was mild depression (42.3%) while in the control group, the highest level of depression was moderate depression (50.0%). The mean value of depression in the intervention group was 22.46, indicating a mild level of depression level, while in the control group, the mean value was 25.00, indicating a moderate level of depression. A significant change in the level of depression after the aerobic exercise intervention was indicated by a p-value <0.001.

Differences between the intervention and control groups

The depression level of HIV patients who received the aerobic exercise intervention decreased significantly by -2.69 with a p-value <0.05. Meanwhile, in the control group that did not receive the intervention, there was no significant change; the change was 0.88 with a p-value >0.05. Based on these results, it can be concluded that there was a significant change in the level of depression before and after the aerobic exercise in the intervention group.

CD4 Cell Counts

Before the Aerobic Exercise Intervention

The intervention group and the control group had CD4 values of >200ml/dL. The overall mean of CD4 cell count of HIV patients before the intervention was 300.4 for the intervention group and 302.81 for the control group. From the results of the p-value, it can be concluded that the incidence of depression between the control group and the intervention group is equivalent or has the same variance with p-value >0.05.

After the aerobic exercise intervention

There were differences in the CD4 counts between the control group and the intervention group after receiving aerobic exercise intervention. In the intervention group, the average CD4 count was 305.46, while in the control group, the average CD4 count was 303.38. A significant change in the CD4 cell counts after the aerobic exercise was indicated by a p-value <0.001.

Differences between the intervention and control groups

The analysis of differences in the mean values of CD4 counts between the control group and the intervention group showed that the CD4 count of HIV patients who received the aerobic exercise intervention increased significantly by 5.00 with a p-value <0.05. Meanwhile, in the control group who did not receive the aerobic exercise intervention, there was no significant change. The change was 0.57 with a p-value >0.05.

DISCUSSION

Aerobic Exercise on the Level of Depression

After the aerobic exercise intervention was carried out in the intervention group, the results of the tests showed that the depression level of HIV patients was significantly different. So, it could be concluded that aerobic exercise intervention was proven to be able to reduce depression levels in HIV patients. The results of this study are in line with the research conducted by Heissel et al. (2019) which showed that there were significant differences in the level of depression before and after the intervention with a p-value of 0.000.

Andreany stated that there was an effect of aerobic exercise on the level of depression with a p-value of 0.0002, which means that it was significant for the level of depression. Physical exercise that is performed can increase endorphin activity. Increasing endorphins will strengthen the body's natural immunity and improve mood and encourage body activity. Psychologically, the ability to show movement during exercise will increase self-confidence and self-esteem which affects mood. Regular physical exercise can help with faster recovery from stressors, thereby decreasing depression symptoms (Al-Qahtani et al., 2018).

Conceptually, a stressful situation in an individual will stimulate the hypothalamus to release neuropeptides that will activate the ANS (Autonomic Nerve System) and the pituitary to secrete corticosteroids and catecholamine which are hormones that react to stressful conditions. Increased levels of glucocorticoids will interfere with the immune system which causes the CD4 to decrease and make individuals more susceptible to infections and health conditions.

Increased levels of glucocorticoids will interfere with the immune system which causes the patient's CD4 to decrease and makes the patient more susceptible to infection and worsening health conditions (Benton & Karnik, 2019). There are several ways to handle depression in patients, one of which is to provide training

http://e-journal.unair.ac.id/JNERS |

JURNAL NERS

in the form of therapy, such as exercising and developing constructive copings to prevent depression in HIV patients (Safira et al., 2014).

Aerobic Exercise on the CD4 Counts

After the aerobic exercise intervention was carried out in the intervention group, the results of the tests showed that the CD4 count of HIV patients was significantly different. The results of this study are in line with research conducted by Dianatinasab et al. (2018) which showed the effect of aerobic exercise on increasing CD4 cell count (p<0.001).

Similarly, Yasirin et al. (2014) also stated in their study that there was an effect of aerobic exercise in the intervention group with a CD4 count of 1.7 cells / mm3. In the paper published by the Journal of the American Medical Association, it is stated that there is no drug now or in the future that promises to definitely provide and maintain health better than a habit of living constantly with exercises (Yasirin et al., 2014).

Metabolism is also related to endurance. Substances that function to maintain the stability of the body's immunity also come from the metabolic process. The results of protein metabolism function to maintain endurance. Protein substances come from foods that are eaten. The increase in CD4, which is part of the immune system, includes the impact of protein metabolism.

Aerobic exercise can increase metabolism in the body, including protein metabolism, so that it has an impact on the quality of the immune system. Immune system cells circulate rapidly in the body and there may also be a temporary boost in the production of macrophages - cells that attack bacteria. A decrease in CD4 cells from HIV sufferers who are not normal must be balanced with treatment in the form of drugs as well as exercise to increase metabolism in the body (Naoroibam et al., 2016). The results of this study prove the research hypothesis which states that giving aerobic exercise interventions can reduce depression levels and increase CD4 counts in HIV patients.

This study has limitations since it did not control for several confounding variables, such as other comorbidities or the use of drugs in HIV patients that may affect the patient's level of depression and CD4 cell count.

CONCLUSION

Based on the results of this study, it can be concluded that there is a significant change in the level of depression after the application of aerobic exercise between the control group and the intervention group with a p-value of < 0.05. Similarly, there is a significant difference in CD4 cell counts between the intervention group and the control group after the intervention with a mean difference of 5.00 and 0.57, respectively. They were significant mean differences in the mean values of depression and CD4 counts between the intervention group and the control group before and after the intervention of aerobic exercises. Aerobic exercise had effects on reducing depression levels and increasing CD4 counts in HIV patients.

For the nursing profession it is recommended that nurses to be able to provide one alternative action, namely aerobic exercise in reducing depression levels and increasing CD4 cell counts. Nurses can increase their knowledge and skills by learning various nonpharmacological therapies as independent actions of nurses. Families can be involved in the exercise so that they can assist the patient in doing the exercise. For further researchers the results of this study can be used as a basis for further researchers to conduct more studies by controlling the confounding variables and adding a larger sample size with a longer period of intervention.

REFERENCES

- Al-Qahtani, A. M., Shaikh, M. A. K., & Shaikh, I. A. (2018). Exercise as a treatment modality for depression: A narrative review. *Alexandria Journal* of *Medicine*, 54(4), 429–435. https://doi.org/10.1016/j.ajme.2018.05.004
- Benton, T. D., Kee Ng, W. Y., Leung, D., Canetti, A., & Karnik, N. (2019). Depression among Youth Living with HIV/AIDS. *Child and Adolescent Psychiatric Clinics of North America*, 28(3), 447–459. https://doi.org/10.1016/j.chc.2019.02.014
- Demirel, O. F., Mayda, P. Y., Yıldız, N., Sağlam, H., Koçak, B. T., Habip, Z., Kadak, M. T., Balcıoğlu, & Kocazeybek, B. (2018). Self-stigma, depression, and anxiety levels of people living with HIV in Turkey. *European Journal of Psychiatry*, 32(4), 182–186.
- https://doi.org/10.1016/j.ejpsy.2018.03.002
- Dianatinasab, M., Fararouei, M., Padehban, V., Dianatinasab, A., Alimohamadi, Y., Beheshti, S., AminiLari, Z., & AminiLari, M. (2018). The effect of a 12-week combinational exercise program on CD4 count and mental health among HIV infected women: A randomized control trial. *Journal of Exercise Science and Fitness*, 16(1), 21–25. https://doi.org/10.1016/j.jesf.2018.02.001
- Grace, J. M., Semple, S. J., & Combrink, S. (2015). Exercise therapy for human immunodeficiency virus/AIDS patients: Guidelines for clinical exercise therapists. *Journal of Exercise Science and Fitness*, 13(1), 49–56. https://doi.org/10.1016/j.jesf.2014.10.003
- Heissel, A., Zech, P., Rapp, M. A., Schuch, F. B., Lawrence, J. B., Kangas, M., & Heinzel, S. (2019). Effects of exercise on depression and anxiety in persons living with HIV: A meta-analysis. *Journal* of Psychosomatic Research, 126(August), 109823. https://doi.org/10.1016/j.jpsychores.2019.1098 23
- Jannaim, J., Dharmajaya, R., & Asrizal, A. (2018). Pengaruh Buerger Allen Exercise Terhadap Sirkulasi Ektremitas Bawah Pada Pasien Luka Kaki Diabetik. Jurnal Keperawatan Indonesia, 21(2), 101-108. https://doi.org/10.7454/jki.v21i2.652

ps://u01.01g/10.7454/Jki.v2112.052

http://e-journal.unair.ac.id/JNERS |

JURNAL NERS

Kemenkes. (2017). Laporan Perkembangan HIV-AIDS. 1–565.

- Naoroibam, R., Metri, K., Bhargav, H., Nagaratna, R., & Nagendra, H. (2016). Effect of Integrated Yoga (IY) on psychological states and CD4 counts of HIV-1 infected Patients: A Randomized controlled pilot study. International Journal of Yoga, 9(1), 57. https://doi.org/10.4103/0973-6131.171723
 Nosrat, S., Whitworth, J. W., Dunsiger, S. I., SantaBarbara, N. J., & Ciccolo, J. T. (2017). Acute
- Nosrat, S., Whitworth, J. W., Dunsiger, S. I., SantaBarbara, N. J., & Ciccolo, J. T. (2017). Acute effects of resistance exercise in a depressed HIV sample: The exercise for people who are immunocompromised (EPIC) study. *Mental Health* and *Physical Activity*, 12, 2–9. https://doi.org/10.1016/j.mhpa.2016.12.002
- Notoatmodjo, S. (2005). *Metodologi penelitian* kesehatan (Vol. 205, Issue 25). https://doi.org/2005
- https://doi.org/2005 Safira, N., Lubis, R., & Rasmaliah, R. (2014). Faktorfaktor yang berhubungan dengan kepatuhan penderita HIV/AIDS mengonsumsi obat antiretroviral (ARV) di klinik voluntary counseling and testing (VCT) RSUP H. Adam Malik Medan tahun 2014. *Portal Garuda*, 1–10.
- UNAIDS. (2019). 2018 GLOBAL HIV STATISTICS. 2(1), 1–6.
- Yasirin, A., Rahayu, S., Junaidi, S., & Artikel, I. (2014). Latihan Senam Aerobik dan Peningkatan Limfosit CD4 pada Penderita HIV. 3(3), 1–6.