ORIGINAL ARTICLE

Physical Therapy Journal of Indonesia (*PTJI*) 2023, Volume 4, Number 2: 222-226
E-ISSN : 2722-6034 ; P-ISSN : 2722-0125

The relationship between physical activity towards anxiety and stress levels among college students

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Received: 2023-06-01
Accepted: 2023-08-28
Published: 2023-10-03

ABSTRACT

Background: A healthy body condition is a vital thing everyone needs, which can be achieved by doing enough physical activity. As final-year students who will end their studies in college, students will make a final project, commonly called a thesis. While finishing their thesis, students are at risk of experiencing anxiety and stress disorders. Anxiety and stress, when they occur continuously, irrationally, uncontrollably, and with increased intensity, anxiety, and stress can interfere with daily activities and lead to further mental disorders. This study aims to determine the relationship between physical activity and anxiety and stress levels in final-year students.

Methods: This cross-sectional analytic study was conducted from November 2022 to February 2023. The sample was collected using a stratified random sampling technique, with 98 final-year students preparing their thesis. Physical activity was measured using the global physical activity questionnaire (GPAQ), anxiety level used the Hamilton anxiety rating scale (HARS), and stress level used the perceived stress scale (PSS).

Results: Based on *Spearman's rho* analysis test, the results show that there was a relation between physical activity and anxiety level (p=0.000) with moderate correlation strength (r = -0.459), and there was a relation between physical activity and stress level (p=0.001) with low correlation strength (r=-0.331).

Conclusion: There was a relationship between physical activity and anxiety and stress levels in final-year students of the Medical Faculty, Universitas Udayana, Bali, Indonesia.

Keywords: anxiety levels, college students, physical activity, stress level.
Cite This Article: Saputri, D.M., Artini, I.G.A., Kinandana, G.P., Widnyana, M. 2023. The relationship between physical activity towards anxiety and stress levels among college students. *Physical Therapy Journal of Indonesia* 4(2): 222-226. DOI: 10.51559/ptji.v4i2.146

BACKGROUND

Physical activity is any body movement produced by skeletal muscles that requires energy expenditure, including during leisure time, moving from one place to another, or as a part of one's job.[1,2] According to the World Health Organization (WHO), 1 out of 4 adults do not meet the globally recommended physical activity levels (at least 150-300 minutes of moderate intensity or 75-150 minutes of vigorous intensity). Even in the adolescent age group, over 80% of the world's adolescent population is not physically active.[2]

A narrative review study by Kandola et al. stated that physical activity is associated with reduced anxiety symptoms in the general population and can be used to treat anxiety symptoms.[3] This is aligned with general population studies, which show that people who engage in more physical activity have a lower risk of being diagnosed with anxiety disorder and reduced symptoms of frequent and severe anxiety.[4] Anxiety is a reaction of the mind and body to danger or an unfamiliar situation involving discomfort, distress, or fears that are felt before an important event.[5] The symptoms include increased heart and breathing rates, trembling, sweating, weakness, and fatigue.[6]

Anxiety is a part of life and will affect almost everyone at some time and to some degree in their lives, which will then function as an emotion to help a person be more aware of danger or threat and help to adapt to their surroundings.[5] However, if anxiety is sustained, irrational, uncontrollable, and increasing, it can interfere with daily activities. This situation is referred to as an anxiety disorder. Besides anxiety, another emotional disorder that can occur is stress. Stress is the body's response to pressure, triggered when experiencing something new, unexpected, or threatening or when it feels like you have less control over a situation. Like anxiety, stress is a phenomenon that every individual will inevitably experience. Persons who experience stress will continue to think hard about how to solve the problems they encounter. This is a form of defense adaptation response. Stress can have both positive and negative impacts. The positive effects are an increase in creativity and development within a person, as long as the level of stress experienced is still at normal borders. The negative impacts are that a person will experience a decrease in cognitive aspects in the form of concentration and attention, excessive feelings of sadness, poor behavior, self-demotivation, and others.[7]

According to the large population-based survey, up to 33.7% of the population experiences an anxiety disorder during their lifetime.[8] Anxiety disorders are the most common mental disorder in the United States, affecting up to 40 million

people aged 18 years and older, or about 18.1% of the population each year. As for stress incidence, its prevalence worldwide is also quite high. About 75% of American adults experience severe stress, which increases yearly.[9] The prevalence rate of anxiety in Indonesia itself has increased every year. Based on basic health research in 2018, individuals who experienced symptoms of depression and anxiety were 9.8%. That data increased compared to 2013, which totaled 6% of the population aged 15 years and older or around 14 million people.[10] Meanwhile, the prevalence of stress in Indonesia is around 1.33 million people. This number reaches 14% of the total population, with severe stress levels reaching 1-3%.[11]

As final-year students who will end their studies in college, they will generally make a final project or what is commonly called a thesis. While finishing their thesis, students are at risk of experiencing anxiety and stress disorders. Therefore, this study aims to determine whether there is a relationship between physical activity and anxiety and stress levels in final-year students.

METHODS

This research method was a cross-sectional study. In this cross-sectional study, variable measurement was only done once without being a follow-up. The independent variable was physical activity. The dependent variables are anxiety and stress levels. This study was conducted at the Medical Faculty, Universitas Udayana, Denpasar, Bali, in November 2022-February 2023. The sample was collected using a stratified random sampling technique by collecting total population data and selecting it based on inclusion and exclusion criteria, grouping it into the specified strata, and then taking a random sample from each stratum. The inclusion criteria for this study are final-year students who are preparing their final project and are cooperative and willing to participate. The exclusion criteria are samples with a history of mental disorders diagnosed by a psychologist or psychiatrist before. In this study, the strata determined were based on gender, which are women and men, with the determination of sample size for each stratum being 49 students. Thus, the total subjects in this study were 98 students.

Physical activity was measured using the global physical activity questionnaire (GPAQ), calculated from the last month since students compiled their final project. The GPAQ measures physical activity using the METs (Metabolic Equivalents) classification method, consisting of 16 items in 3 domains: activities at work, traveling to and from various places, and recreational activities. Interpretation of GPAQ results then divided into three categories, namely low (<600 METs), moderate (600-3000 METs), and high (>3000 METs) physical activity categories.

Anxiety was measured using the Hamilton anxiety rating scale (HARS) questionnaire. HARS was first introduced by Max Hamilton in 1959 with a validity value of 0.93 and a reliability value of 0.97.[12] HARS consists of 14 question items, where each object consists of 5 different point levels, and the interpretation of the final total score is (<14) no anxiety, (14-20) mild anxiety, (21-27) moderate anxiety, (28-41) severe anxiety, and (42-56) very severe anxiety.

Stress was measured using the perceived stress scale (PSS) questionnaire. The first PSS was developed by Cohen in 1983, with the Indonesian version of the questionnaire's Alpha Cronbach coefficient value being 0.81. PSS consists of 10 question items where each item consists of 5 different point levels, and the interpretation of the final total score is (1-14) mild stress, (15-26) moderate stress, and (27-40) severe stress.

The study began by explaining the study's purpose, procedures, and benefits to the sample and then asking for the sample's consent to participate. The first measurement was to measure the level of physical activity, then the level of anxiety, and finally, measure the stress level of the research subjects. This research was conducted by distributing questionnaires online.

Statistical tests used in this study were univariate analysis and bivariate analysis using SPSS 26.0. Univariate analysis was conducted to see a general picture of age, gender, study program, physical activity, anxiety, and stress levels. Bivariate analysis was conducted to analyze the relationship between physical activity and anxiety level and to analyze the relationship between physical activity and stress level. The bivariate analysis used was the *Spearman rho* test.

RESULTS

The research subjects in this study were the final year students at the Medical Faculty, Universitas Udayana, selected using a stratified random sampling technique with inclusion and exclusion criteria fulfilled by 98 participants. The characteristics of respondents are shown in Table 1. It can be seen that out of 98 student samples, 45 students (45.9%) were dominant in doing low-intensity physical activity, followed by moderate-intensity physical training with 32 students (32.7%), and high-intensity physical activity with 21 students (14.5%). Based on anxiety level, it can be seen that the dominance is a sample with no anxiety, namely a total of 45 students (45.9%), followed by mild anxiety with 26 students (26.5%), and moderate anxiety with 20 students (20.4%). Based on the stress level, it can be seen that the dominant sample has an average stress level of 71 students (72.4%).

Table 2 shows the cross-tabulation between physical activity and anxiety level, showing that the sample of students with low physical activity predominantly has a moderate anxiety level, totaling 16 students. While students with moderate and high physical activity, both dominant have mild anxiety levels and tend to be absent. Most students with severe anxiety levels are obtained from students with low physical activity. Low physical activity also obtained one sample with a very severe anxiety level.

The cross-tabulation between physical activity and stress level in Table 3 shows that samples with low activity predominantly have a moderate stress level, totaling 36 students. Likewise, students with moderate and high physical activity also dominantly have moderate stress levels. In contrast, students with severe stress levels are obtained from samples with low physical activity.

The results of Spearman's rho analysis test of physical activity with anxiety can be seen in Table 4. The value obtained is p=0.000 (p<0.001), meaning a significant

relationship exists between the two variables. The correlation coefficient value r=-0.439 indicates a unidirectional relationship with moderate correlation strength between physical activity and anxiety. This means that the higher the students' physical activity level, the lower their anxiety level.

The results of Spearman's rho analysis test of physical activity with stress can be seen in Table 4. The value obtained is p=0.001 (p<0.001), meaning a significant relationship exists between the two variables. The correlation coefficient value r=-0.331 indicates a unidirectional relationship with low correlation strength between physical activity and stress. This means that the higher the physical activity level, the lower the stress level.

DISCUSSION

Final-year students have passed several previous semesters and are in the final semester of their studies. This study shows that out of 98 final year students of the Medical Faculty, Udayana University, students dominantly do low-intensity physical activity, about 45 students. These results aligned with previous research by Habut et al. (2016) and Arta and Fithroni (2022), where both studies showed that most samples had low physical activity categories.[13,14]

Low physical activity levels in final-year students can be caused by various factors such as laziness, lack of motivation, fatigue, boredom, not having sports facilities, etc. Support from the closest people and the surrounding environment can make people enthusiastic about doing physical activity. Another factor is the limited time or busyness faced by medical faculty students due to various tasks and educational systems that make students not prioritize physical activity.[15] Medical students spend more of their free time studying and resting. They consider academics more important than doing physical activity.[16]

This study also found that the male sample had a fairly high average level of physical activity. In previous studies, most of them showed differences in the habits and motivations to get active and exercise in women and men. Men tend to perform physical activity mainly for social and competitive reasons. In addition, they prefer to exercise outdoors and in public places such as gyms and fitness clubs. Conversely, women are more likely to exercise at home, practicing aerobics, dancing, yoga, pilates, or doing squats, planks, and jumping jacks.[17]

Table 1. Characteristics of respondents

Characteristics	Frequency (n)	Percentage (%)
Age		
20	3	3.1
21	50	51.0
22	43	43.9
23	2	2.0
Gender		
Male	49	50.0
Female	49	50.0
Physical activity		
Low	45	45.9
Moderate	32	32.7
High	21	21.4
Anxiety levels		
None	45	45.9
Mild	26	26.5
Moderate	20	20.4
Severe	6	6.1
Very severe	1	1.0
Stress levels		
Mild	22	22.4
Moderate	71	72.4
Severe	5	5.1

Table 2. Cross table of physical activity on anxiety levels

Physical Activity	Anxiety Levels										Total	
	None		Mild		Moderate		Severe		Very Severe			
	n	%	n	%	n	%	n	%	n	%	n	%
Low	13	13.3	10	10.2	16	16.3	5	5.1	1	1.0	45	45.9
Moderate	16	16.3	12	12.2	3	3.1	1	1.0	0	0.0	32	32.7
High	16	16.3	4	4.1	1	1.0	0	0.0	0	0.0	21	21.4
Total	45	45.9	26	26.5	20	20.4	6	6.1	1	1.0	98	100.0

Table 3. Cross table of physical activity on stress levels

Physical Activity	Stress Levels						Total	
	Mild		Moderate		Severe			
	n	%	n	%	n	%	n	%
Low	4	4.1	36	36.7	5	5.1	45	45.9
Moderate	11	11.2	21	21.4	0	0.0	32	32.7
High	7	7.1	14	14.3	0	0.0	21	21.4
Total	22	22.4	71	72.4	5	5.1	98	100.0

Table 4. ***Spearman's*** **correlation results**

Variable correlation	Correlation coefficient (*r*)	*P*-value
Physical activity with anxiety levels	-0.439	0.000
Physical activity with stress levels	-0.331	0.001

This study shows that many final-year Medical Faculty at Universitas Udayana students have mild and moderate anxiety levels. These results are aligned with previous research by Akhnaf et al. (2022) and Fariza (2022).[18,19] This study also found that the average female sample had a higher level of anxiety than the male sample. This follows the theory by Sunaryo that generally, a man has a strong mentality towards something that is considered threatening to him.[19] Women have more sensitive emotions that will affect their feelings of anxiety. Women are also considered more sensitive to problems, so women's coping is worse than men.[20]

This study shows that final-year students of the Faculty of Medicine, Universitas Udayana, predominantly have a moderate stress level. These results align with Alfian's (2018) and Ambarwati et al. (2017) research.[21,22] This study also found that female samples tended to have higher stress levels than male samples. This is strengthened by Kaplan and Sadock's theory that women are at twice the risk of experiencing stress due to hormonal differences and differences in psychosocial stressors for women and men.[22]

This study found a relationship between physical activity and anxiety levels from the Spearman rho analysis test results, which showed a value of p=0.000. These results aligned with previous research by Marcellino, where the results obtained p<0.005, meaning there is a relationship between physical activity and anxiety.[23] Another study that showed similar results was researched by Ilmi, which obtained a value of p=0.000 and r=-0.371, which means there is a relationship with a weak correlation.[24]

Physical activity is known to have an anxiolytic effect on the body. An anxiolytic is an anti-anxiety agent used to reduce emotional tension or the effects of anxiety. When blood circulation increases to the brain due to physical activity, it can provide a physiological response to the hypothalamic-pituitary-adrenal (HPA) axis that affects anxiety levels.[25]

Physical activity can also increase the production of brain-derived neurotrophic factor (BDNF).[17] BDNF is a neurotrophin vital for the survival, growth, and maintenance of neurons in key brain circuits involved in emotional and cognitive functions. Physical activity here plays a role in increasing central neuroplastic adaptation by optimizing the increase in BDNF. The ability of physical activity to increase the release of BDNF function will further improve the integrity of dendrites and activate other cell pathways that contribute to the plasticity process, which then becomes very important in the homeostatic processes that are necessary for the maintenance, repair, and reorganization of damaged circulation during depression and anxiety.[26]

This study found a relationship between physical activity and stress levels from the Spearman rho analysis test results, which showed a value of p=0.001. These results aligned with previous research by Eureka (2019), where the results obtained p=0.000, which means a relationship exists between physical activity and stress level.[27] Another study that showed similar results was research by Chandra (2021) that obtained p=0.007, which means a significant relationship between physical activity and stress.[28]

Humans will experience a process called a coping mechanism to overcome stressful events. Coping changes the interpretation of a stressful event to make it less overwhelming. Coping uses a person's behaviour and thoughts to manage the person-environment interaction.[29] There are two main ways to cope with stress problem-focused coping and emotion-focused coping. Problem-focused coping is a physical action to change a stressful event, and here physical activity can be a positive coping mechanism. Physical activity regulating stress response can also be through the HPA axis or circulating glucocorticoids. The HPA axis is important in developing adaptive responses to physical and psychological stress. Engaging in physical activity or exercise can alter the release of corticotrophin-releasing factor (CRF) from the hypothalamus and ACTH from the anterior pituitary. These findings suggest that activities that cause changes in the HPA axis modulate stress reactivity and anxiety in humans.[30]

The limitation of this study is that researchers do not control other variables that can affect anxiety and stress in students, such as social factors, family and neighbourhood support factors, and individual personality type factors in dealing with anxiety and stress.

CONCLUSION

Based on this research, it can be concluded that there was a relationship between physical activity and anxiety levels among final-year students of the Medical Faculty of Universitas Udayana. Moreover, there was a relationship between physical activity and stress levels among final-year Medical Faculty students at Universitas Udayana.

ETHICAL CLEARANCE

The Research Ethics Commission, Faculty of Medicine, Universitas Udayana, stated that this research is ethically feasible with number 2642/UN14.2.2.VII.14/LT/2022.

CONFLICT OF INTEREST

This study has no conflict of interest.

FUNDING

This study did not receive specific funding from public, commercial, or non-profit funding agencies.

ACKNOWLEDGEMENT

The authors would like to thank all parties involved in this research.

AUTHOR CONTRIBUTIONS

DMS prepares study designs, collects data, processes data, and writes manuscripts. IGAA, GPK, and MW are directing data collection and revising the manuscript.

REFERENCE

1. Permatadewi PB, Nugraha MHS, Saraswati NLPGK, Putra, IPYP. Association between nutritional status and physical activity level towards short-term memory ability in elementary school students. Physical Therapy Journal of Indonesia. 2023; 4(1): 95-101.
2. World Health Organization (WHO). Physical activity. World Health Organization. 2021; 1-8.
3. Kandola A, Vancampfort D, Herring M, Rebar A, Hallgren M, Firth J, et al. Moving to beat anxiety: Epidemiology and therapeutic issues with physical activity for anxiety. Current psychiatry reports. 2018; 20(8): 1-9.
4. Baumeister SE, Leitzmann MF, Bahls M, Dörr M, Schmid D, Schomerus G, et al. Associations of leisure-time and occupational physical activity and cardiorespiratory fitness with incident and recurrent major depressive disorder, depressive symptoms, and incident anxiety in a general population. The Journal of Clinical Psychiatry. 2017; 78(1): 41–47.
5. Jovanovic T, Michopoulos V. What Is Anxiety? Signs, Causes, Symptoms. Anxiety. 2021.
6. Hasibuan SM, Rian R. Pengaruh tingkat gejala kecemasan terhadap indeks prestasi akademik pada mahasiswa angkatan 2016 Fakultas Kedokteran Universitas Muhammadiyah Sumatera Utara. Jurnal Biomedik : *JBM*. 2019; 11(3): 137–143.
7. Wahyudi R, Bebasari E, Nazriati E. Hubungan kebiasaan berolahraga dengan tingkat stres pada mahasiswa Fakultas Kedokteran Universitas Riau Tahun Pertama. Jurnal Online Mahasiswa (JOM) Bidang Kedokteran. 2015; 2(2): 1–11.
8. Bandelow B, Michaelis S. Epidemiology of anxiety disorders in the 21st century. Dialogues in Clinical Neuroscience. 2015; 17(3): 327-335.
9. American Psychological Association. Stress in America: Stress and decision-making during the pandemic. APA. 2021.
10. Kementerian Kesehatan Republik Indonesia. Hasil Utama Riset Kesehatan Dasar. Kemenkes RI. 2018
11. Legiran L, Azis MZ, Bellinawati N. Faktor risiko stres dan perbedaannya pada mahasiswa berbagai angkatan di Fakultas Kedokteran Universitas Muhammadiyah Palembang. Jurnal Kedokteran dan Kesehatan. 2015; 2(2): 197–202.
12. Ramdan IM. Reliability and validity test of the Indonesian version of the Hamilton anxiety rating scale (HAM-A) to Measure Work-related Stress in Nursing. Jurnal Ners. 2019; 14(1): 33-40.
13. Habut MY, Putu I, Nurmawan S, Ayu I, Wiryanthini D. Hubungan indeks massa tubuh dan aktivitas fisik terhadap keseimbangan dinamis pada Mahasiswa Fakultas Kedokteran Universitas Udayana. Majalah Ilmiah Fisioterapi Indonesia. 2016; 2(1): 45–51.
14. Arta RD, Fithroni H. Hubungan tingkat stres dan aktivitas fisik terhadap kebugaran jasmani pada mahasiswa semester akhir di Universitas Negeri Surabaya. Jurnal Kesehatan Olahraga. 2021; 9(3): 261–270.
15. Aritonang JP, Widiastuti IAE, Harahap IL. Gambaran tingkat aktivitas fisik Mahasiswa Pendidikan Dokter Fakultas Kedokteran Universitas Mataram di Masa Pandemi COVID-19. E-Journal Kedokteran Indonesia. 2022; 10(1): 58–63.
16. Luciano F, Cenacchi V, Vegro V, Pavei G. COVID-19 lockdown: Physical activity, sedentary behaviour and sleep in Italian medicine students. European Journal of Sport Science. 2021; 21(10): 1459-1468.
17. Maugeri G, Castrogiovanni P, Battaglia G, Pippi R, D'Agata V, et al. The impact of physical activity on psychological health during the Covid-19 pandemic in Italy. Heliyon. 2020; 6(6): 1-8.
18. Akhnaf AF, Putri RP, Vaca A, Hidayat NP, Az-Zahra RI, Rusdi A. Self Awareness dan kecemasan pada mahasiswa tingkat akhir. Jurnal Muara Ilmu Sosial, Humaniora, dan Seni. 2022; 6(1):107–118.
19. Fariza Y. Gambaran tingkat kecemasan pada mahasiswa semester akhir dalam mengerjakan skripsi di masa pandemi Covid-19. Semarang: Universitas Islam Sultan Agung. 2022.
20. Paputungan FF, Gunawan PN, Pangemanan DHC, Khoman JA. Perbedaan tingkat kecemasan berdasarkan jenis kelamin pada tindakan penumpatan gigi. E-CliniC. 2019; 7(2): 71-76.
21. Alfian MR. Hubungan kebiasaan berolahraga dengan tingkat stres Mahasiswa Program Studi Ilmu Keperawatan Stikes Sari Mulia Banjarmasin. Banjarmasin: Stikes Sari Mulia. 2018.
22. Ambarwati PD, Pinilih SS, Astuti RT. Gambaran tingkat stres mahasiswa. Jurnal Keperawatan Jiwa. 2017; 5(1): 40–47.
23. Marcellino YS. Pengaruh aktivitas fisik terhadap kecemasan pada Mahasiswa Fakultas Kedokteran Universitas Pelita Harapan selama masa pandemi Covid-19. Tangerang: Universitas Pelita Harapan. 2021.
24. Ilmi M. Hubungan aktivitas fisik dengan kecemasan pada Mahasiswa Fakultas Keperawatan Universitas Andalas selama Pembelajaran Daring. Padang: Universitas Andalas. 2021.
25. Reigal RE, Páez-Maldonado JA, Pastrana-Brincones JL, Morillo-Baro JP, Hernández-Mendo A, Morales-Sánchez V. Physical activity is related to mood states, anxiety state and self-rated health in covid-19 lockdown. Sustainability (Switzerland). 2021; 13(10): 1-10.
26. Phillips C. Brain-Derived Neurotrophic Factor, Depression, and Physical Activity: Making the Neuroplastic Connection. Neural Plast. 2017; 2017: 1-18.
27. Eureka AN. Pengaruh tingkat aktivitas fisik terhadap tingkat stres pada Mahasiswa di Fakultas Kedokteran Universitas Pembangunan Nasional Veteran Jakarta Tahun 2019. Jakarta: Universitas Pembangunan Nasional Veteran. 2019.
28. Chandra CJ. Hubungan aktivitas fisik dengan tingkat stres pada Mahasiswa Fakultas Kedokteran Universitas Pelita Harapan. Tangerang: Universitas Pelita Harapan. 2021.
29. Wike HK. Examining The Relationship Between Physical Activity, Psychological Well-Being, and Stress in a College Population. Chattanooga: The University of Tennesse. 2015.
30. Anderson E, Shivakumar G. Effects of exercise and physical activity on anxiety. Frontiers in Psychiatry. 2013; 4(27): 1-4.