

ORIGINAL ARTICLE

THE CORRELATION BETWEEN PHYSICAL ACTIVITY AND SLEEP QUALITY WITH STRESS DURING THE COVID-19 PANDEMIC

Syahwal Ichwantoro¹, Fransisca Chondro^{2*}

ABSTRACTS

BACKGROUND

The COVID-19 pandemic has impacted negatively on lives all around the world. Indonesia implemented physical distancing and lockdown to prevent the spread of this virus. However, without realising it, the implementation of these rules can have a negative effect on physical and mental health, including stress. In a study of 113.285 people conducted in China, India, Spain, Italy, and Iran, stress was found to be prevalent in 53% of the population. Sudden changes in lifestyle (physical distancing and lockdown) can lead to less physical activity and poor sleep quality, both of which can lead to stress. Physical activity and sleep quality in the context of stress give inconsistent results. Therefore, researchers are interested in examining the correlation between physical activity and sleep quality with the incidence of stress during the COVID-19 pandemic.

METHODS

This study was using a cross-sectional approach and the subject of this study were teachers. In this study, physical activity was measured using the International Physical Activity Questionnaire Short Form, sleep quality was measured using the Pittsburgh Sleep Quality Index, and stress was measured using the Perceived Stress Scale. The data obtained was analysed using the chi-square and kolmogorov-smirnov test with a significance limit <0.05 .

RESULTS

Based on the data obtained from this study, it can be concluded that 54.1% subjects have a moderate physical activity, 90.2% subjects have a poor sleep quality, and 60.7% subjects have a mild stress level. Statistical analysis between physical activity and stress obtained $p = 1.0$ and between sleep quality and stress obtained $p = 0.883$.

CONCLUSIONS

According to the study's findings, there is no statistically significant correlation between physical activity and stress, and there is no correlation between sleep quality and stress during the COVID-19 pandemic.

KEY WORDS: COVID-19, Physical Activity, Sleep Quality, Stress

¹Medical Undergraduate Program, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia

²Physiology Department, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia

*Corresponding Author at:

Physiology Department, Faculty of Medicine, Universitas Trisakti, Jl. Kyai Tapa No.260, Grogol Petamburan, Jakarta Barat 11440, Indonesia
Email: fransisca_chondro@trisakti.ac.id

J Biomedika Kesehat 2022;5(2):89-94
DOI: 10.18051/JBiomedKes.2022.v5.89-94

pISSN: 2621-539X / eISSN: 2621-5470

This open access article is distributed under the Creative Commons Attribution 4.0 International (CC-BY 4.0)

ABSTRAK

Hubungan antara Aktivitas Fisik dan Kualitas Tidur dengan Stres di Masa Pandemi Covid-19

LATAR BELAKANG

Pandemi COVID-19 telah mengganggu kehidupan di seluruh dunia. Indonesia memberlakukan *physical distancing* dan *lockdown* untuk mencegah penyebaran virus ini. Namun tanpa disadari diberlakukannya aturan tersebut dapat berdampak pada kesehatan fisik dan mental, salah satunya adalah stres. Berdasarkan 16 penelitian yang dilakukan di China, India, Spanyol, Itali dan Iran didapatkan prevalensi kejadian stress sebesar 53% dengan jumlah populasi gabungan sebanyak 113.285 individu. Adanya perubahan gaya hidup secara tiba-tiba (*physical distancing* dan *lockdown*) dapat menyebabkan penurunan aktivitas fisik dan mempengaruhi kualitas tidur yang dapat menyebabkan stres. Penelitian terkait aktivitas fisik dan kualitas tidur dengan stress masih memberikan hasil yang bervariasi. Oleh karena itu, peneliti tertarik untuk meneliti hubungan antara aktivitas fisik dan kualitas tidur dengan kejadian stress di masa pandemi COVID-19.

METODE

Penelitian ini menggunakan desain *cross-sectional* dengan guru sebagai subjek penelitiannya. Penilaian aktivitas fisik menggunakan International *Physical Activity Questionnaire Short Form*, penilaian kualitas tidur dengan *Pittsburgh Sleep Quality Index* dan penilaian stress menggunakan *Perceived Stress Scale*. Selanjutnya data dianalisa dengan uji *chi-square* dan *kolmogorov-smirnov* dengan batas kemaknaan $< 0,05$.

HASIL

Pada penelitian ini didapatkan sebagian besar responden memiliki aktivitas fisik sedang yaitu 54,1%, memiliki kualitas tidur buruk sebanyak 90,2% dan yang mengalami stress ringan sebanyak 60,7%. Pada analisis statistik antara aktivitas fisik dengan stress didapatkan $p=1,0$ dan antara kualitas tidur dengan stress didapatkan $p=0,883$.

KESIMPULAN

Berdasarkan hasil penelitian, diketahui tidak terdapat hubungan yang bermakna secara statistik antara aktivitas fisik, kualitas tidur dan stress di masa pandemi COVID-19.

KATA KUNCI: COVID-19, Aktivitas Fisik, Kualitas Tidur, Stres

INTRODUCTION

The Coronavirus 19 (COVID-19) pandemic has disrupted the daily lives of people around the world. To prevent the spread of COVID-19, self-isolation and closure of business premises related to public activity spaces have been carried out.⁽¹⁾ The rapid spread of COVID-19 and the high mortality rate can threaten the physical and mental health of the community.⁽²⁾ In 16 studies from China, India, Spain, Italy, and Iran found that the prevalence of depression was 20%, anxiety at 35%, and stress was 53% in the total population of 113,285 people.⁽³⁾ Sudden lifestyle changes can increase the occurrence of depression, anxiety and depression. Stress during the COVID-19 pandemic has a negative effect on sleep quality.⁽⁴⁾ Prolonged isolation at home can also increase a sedentary lifestyle and reduce the amount of daily physical activity carried out.⁽⁵⁾ A decrease in the amount of physical activity can be a risk factor that negatively affects sleep quality and contribute to stressful events because physical activity stimulates the production of endorphins to improve mood and suppress mood stress hormones such as adrenaline and cortisol.^(6,7) Several studies have shown a relationship between physical

activity and lower psychological distress.^(8,9) Stanton R et al.⁽¹⁰⁾ showed that decreased physical activity and sleep quality increase the likelihood of stress during the COVID-19 pandemic. Fauziyah NF et al.⁽¹¹⁾ showed a significant relationship between poor sleep quality and stress during the COVID-19 pandemic. Jahrami H et al.⁽¹²⁾ also showed no relationship between sleep quality and stress during the COVID-19 pandemic. The study by Ernsten L et al.⁽¹³⁾ showed that decreased physical activity during the COVID-19 pandemic did not affect the relationship between mental health and sleep disorders. Likewise, the results of Dobler CL et al.⁽¹⁴⁾ also stated that there was no relationship between changes in physical activity and stress during the COVID-19 pandemic. The existence of differences of opinion regarding the relationship between physical activity and sleep quality with stress during the COVID-19 pandemic makes researchers interested in bringing up this topic for research. It is hoped that people's quality of life can also improve their quality of life with an increased understanding of the relationship between physical activity, sleep quality, and stress during the COVID-19 pandemic.

METHODS

This research is an observational analytic study with a cross-sectional approach and was carried out from October 29, 2021 - November 30, 2021, with a total of 61 teachers and students as respondents who met the inclusion and exclusion criteria, filled out the questionnaire completely, with a total sampling technique. The inclusion criteria in this study were teachers aged 22-59 years, both male and female, who were willing to sign an informed consent, while the exclusion criteria were respondents with a history of diagnosis of mental disorders, disabilities, taking sleeping pills, having a history of diagnosis of sleep disorders, and have a chronic disease. For the measurement of physical activity, the IPAQ-SF (International Physical Activity Questionnaire Short Form) questionnaire was used by asking about physical activity in the last seven days, which would be converted into the amount of Metabolic Equivalent of Task (MET) minutes/week. Respondents with a MET value of 600 are included in the low physical activity level category, MET values 601-2999 are included in the moderate physical activity category and MET values 3000 are included in the heavy physical activity group. The PSQI (Pittsburgh Sleep Quality Index) questionnaire was used to determine sleep quality, with a score of 5 for good and > 5 for poor sleep quality. For measuring stress levels, the PSS-10 questionnaire (Perceived Stress Scale) is used, which consists of 10 questions with six negative questions and four positive questions that will be added up and interpreted, namely for a total score of 0-13 included in the mild stress category, a score of 14-26 is included. In the category of moderate and severe stress for a score of 27-40. The data obtained were analyzed univariately and bivariate using IBM SPSS 25 with Chi-square and Kolmogorov-Smirnov tests. This research was carried out after obtaining ethical clearance from the Research Ethics Commission of the Faculty of Medicine, Universitas Trisakti, Jakarta number: 80/KER-FK/IX/2021.

RESULTS

This research has been carried out by distributing google forms. Respondents who took part in this study were teachers and students of

Table 1. Frequency distribution of sociodemographic characteristics, physical activity, sleep quality and stress

Frequency Distribution	Frequency (n)	Percentage (%)
Characteristic of Respondent		
Gender		
Male	25	41
Female	36	59
Age		
Adult	45	73.8
Pre-elderly	16	26.2
Education level		
Bachelor	52	85.2
Post graduate	9	14.8
Marital status		
Single	4	6.6
Married	52	85.2
Divorced	5	8.2
Physical activity		
Low Physical Activity	28	45.9
Medium Physical Activity	33	54.1
High Physical Activity	0	0
Sleep quality		
Good	6	9.8
Poor	55	90.2
Stress		
Mild	37	60.7
Moderate	24	39.3
Severe	0	0

SMPN 108 and 187 West Jakarta, a total of 61 respondents who met the inclusion and exclusion criteria and had filled out the questionnaire completely.

Table 1 shows the sociodemographic characteristics of the respondents, where the number of female respondents is 59% and is dominated by adult age (73.8%), with the majority of marital status being married and the education level of more than 85% is a bachelor. In addition, 54.1% of respondents have low levels of physical activity, and the remaining 45.9% have moderate levels of physical activity, with more than 90% having poor sleep quality and 60.7% experiencing mild stress.

Table 2 shows that of the 28 respondents with low physical activity levels, 60.7% experienced mild stress. Similar results were also obtained from respondents with medium-high physical activity; as many as 60.6% of respondents experienced mild stress. In the statistical test between physical activity and stress, p-value = 1.0 means no significant relationship

Table 2. Relationship between physical activity and sleep quality with stress

	Stress (n(%))		p/Sig
	Mild	Moderate-Severe	
Physical activity			
Low	17(60.7%)	11(39.3%)	1.0*^
Medium-High	20(60.6%)	13(39.4%)	
Sleep quality			
Good	5(83.3%)	1(16.7%)	0.883^^
Poor	32(58.2%)	23(41.8%)	

* :chi-square test ; ^^ : Kolmogorov- Smirnov test; ^ : cell merging

exists between physical activity and stress during the COVID-19 pandemic. In the analysis between sleep quality and stress, it was found that the number of respondents with good sleep quality who experienced moderate-severe stress was only 16.7%, while respondents with poor sleep quality who experienced moderate-severe stress were much more, namely 41.8%. Therefore, it can be concluded that respondents with poor sleep quality are more likely to experience moderate-to-severe stress when compared to those who have good sleep quality. In the bivariate test between sleep quality and stress, p-value = 0.883 means there is no significant relationship between sleep quality and stress during the COVID-19 pandemic.

DISCUSSION

Based on the data obtained, it can be seen that the number of respondents who experienced moderate-to-severe stress from respondents with low or moderate-high levels of physical activity was not much different. The number of respondents with low physical activity who experienced moderate-severe stress was 39.3%, and respondents with moderate-high physical activity who experienced moderate-severe stress were 39.4%. It can be concluded that physical activity is not the only factor that can cause stress during the pandemic. This is supported by research conducted by Maharani AS in 2021, which states that there is no relationship between physical activity and stress during the COVID-19 pandemic and physical activity is not the main factor that can cause stress during the pandemic.⁽¹⁵⁾ In addition, Xiong et al. also revealed that stress during the COVID-19 pandemic could occur due to several other factors such as economic problems, work, chronic illness, and close acquaintances or people who are confirmed positive for COVID-19.⁽¹⁶⁾ However, this is different from the results of research by Setiawan H et al. in 2021, which

showed a significant relationship between physical activity and stress. According to him, someone with a low level of physical activity is more at risk of experiencing stress compared with moderate and heavy levels of physical activity. Different results were also obtained in the study by Carriedo et al., which stated a significant relationship between physical activity and psychological well-being. According to the study, someone who does moderate-to-heavy physical activity as recommended by the WHO has better mental resilience so that they have milder symptoms of depression. These different results may be due to differences in the research's timing and the respondents' characteristics. Carriedo et al. conducted research in Spain when implementing a national lockdown. Research by Setiawan H et al. was conducted in Indonesia in February 2021, where at that time, the incidence of COVID-19 was at its peak, while this study was conducted in November 2021, when active cases and transmission of COVID-19 had begun to decline. In addition, Setiawan H et al.'s research involves hospital employees who work full-time offline. In contrast, this study involves respondents who are school teachers who work hybrid both offline and online.^(17,18)

This study also found that the quality of sleep did not have a significant relationship with stress during the COVID-19 pandemic. In this study, 90.2% of research subjects had poor sleep quality and most experienced mild stress levels. However, let's examine further the distribution of the data obtained. It can be seen that the number of respondents with poor quality who experience moderate-to-severe stress is much higher than respondents with good sleep quality. However, there is no statistically significant relationship. This illustrates that sleep quality is not the main factor causing stress during the COVID-19 pandemic. The results of this study are supported by research

conducted by Sarwiyata TW in 2021, which states that there is no relationship between sleep quality and stress during the COVID-19 pandemic. Stress during the COVID-19 pandemic is also influenced by several factors such as economic problems, work, having a chronic illness, and having close acquaintances or people who are confirmed positive for COVID-19.^(16,19) These results are not in line with the current theory, where when facing stressors, the body releases epinephrine, norepinephrine and cortisol hormones which can affect the central nervous system to increase alertness which can worsen a person's sleep quality which also affects the stress experienced. The results of this study are also different from the results of a study conducted by Bessie VA et al. in 2021, which stated that there was a significant relationship between sleep quality and stress during the COVID-19 pandemic. Research by Varma P et al. also described a significant relationship between sleep quality and stress and anxiety levels. It is said that respondents with poor sleep quality have more than three times the risk of experiencing anxiety and depression disorders and are almost three times more likely than normal people to experience stress. Therefore, one of the efforts that can be made to improve people's mental health during the COVID-19 pandemic is to enhance sleep quality. This difference in results can be caused by differences in the research time and the respondents' characteristics. In Bessie et al.'s study, respondents are hospital nurses who work full-time offline and are tasked with caring for patients, including patients with COVID-19 infection. In contrast, in this study, the respondents were school teachers who work both offline and online, and their work has a risk of contact or exposure to a much smaller number of COVID-19 patients. In addition, in terms of the timing of its implementation, the research by Bessie VA et al. was conducted in September-November 2020, where at that time, the incidence of COVID-19 was at its peak, while this study was conducted in November 2021, where active cases and transmission of COVID-19 has started to decline.^(20,21)

The limitation of this study is that it was conducted when the COVID-19 pandemic had been running for more than a year, and there had been a decline in positive cases of COVID-19,

resulting in the subjects being studied being more adaptable to the pandemic situation and the stressors it caused. In addition, the IPAQ-SF research instrument relies heavily on the memory of research subjects to remember how long they do physical activity. This study does not consider other variables that affect stress levels during the COVID-19 pandemic.

CONCLUSIONS

Based on the results of research on the relationship between physical activity and sleep quality with stress during the COVID-19 pandemic conducted at SMPN 187 and 108 West Jakarta, it can be concluded that the number of female respondents was more, namely 59%, with the majority being adults, which was 73.8 %, marital status as much as 85.2%. More than 85% have an undergraduate education level. Based on the results of data analysis, it can be concluded that there is no statistically significant relationship between physical activity and stress during the COVID-19 pandemic, and there is no statistically significant relationship between sleep quality and stress during the COVID-19 pandemic with a positive correlation direction. But has a weak relationship strength. Researchers suggest that further research be conducted on physical activity, sleep quality and stress with different research subjects and more or under other conditions.

ACKNOWLEDGEMENT

Thank you to the teachers and students who are willing to participate in the research.

AUTHORS CONTRIBUTION

The process of determining the concept and design of the research; SI and FC; data collection: SI; data analysis and interpretation process: SI and FC; preparation of the manuscript draft: FC. The last revised manuscript was reviewed and approved by both researchers.

FUNDING STATEMENT

This research was carried out with the researcher's personal funds.

CONFLICT OF INTEREST

Competing interests: No relevant disclosures.

REFERENCES

1. Dunca GE, Aver AR, Seto E, et al. Perceived change in physical activity levels and mental health during COVID-19: Findings among adult twin pairs. *PLoS ONE*. 2020;15(8). Available from: <https://doi.org/10.1371/journal.pone.0237695>
2. Rajkumar RP. COVID-19 and mental health: A review of the existing literature. *Asian J. Psychiatr.* 2020;52:102066. Available from: <https://doi.org/10.1016/j.ajp.2020.102066>
3. Lakhan R, Agrawal A, Sharma M. Prevalence of depression, anxiety, and stress during COVID-19 pandemic. *J. Neurosci Rural Pract.* 2020;11(4):519–25. doi: 10.1055/s-0040-1716442
4. Altena E, Baglioni C, Espie CA, et al. Dealing with sleep problems during home confinement due to the COVID-19 outbreak: Practical recommendations from a task force of the European CBT-I Academy. *J. Sleep Res.* 2020;29(4):1–7. doi: 10.1111/jsr.13052
5. Martínez-de-Quel Ó, Suárez-Iglesias D, López-Flores M, et al. Physical activity, dietary habits and sleep quality before and during COVID-19 lockdown: A longitudinal study. *Appetite*. 2021;158:1–6. doi: 10.1016/j.appet.2020.105019
6. Cellini N, Canale N, Mioni G, et al. Changes in sleep pattern, sense of time and digital media use during COVID-19 lockdown in Italy. *J. Sleep Res.* 2020;29(4):1–5. doi: 10.1111/jsr.13074
7. Sanches A, Costa R, Marcondes FK, et al. Relationship among stress, depression, cardiovascular and metabolic changes and physical exercise. *Fisioterapia em Movimento*. 2016;29(1):23–36. DOI: 10.1590/0103-5150.029.001.ao02
8. Ashdown-Franks G, Sabiston CM, Stubbs B. The evidence for physical activity in the management of major mental illnesses: A concise overview to inform busy clinicians' practice and guide policy. *Current Opinion in Psychiatry*. 2019;32(5):375–80. DOI: 10.1097/YCO.0000000000000526
9. Rodriguez-Ayllon M, Cadenas-Sánchez C, Estévez-López F, et al. Role of physical activity and sedentary behavior in the mental health of preschoolers, children and adolescents: A systematic review and meta-analysis. *Sports Med.* 2019;49(9):1383–410. Available from: <https://doi.org/10.1007/s40279-019-01099-5>
10. Stanton R, To QG, Khalesi S, et al. Depression, anxiety and stress during COVID-19: Associations with changes in physical activity, sleep, tobacco and alcohol use in Australian adults. *Int. J. Environ Res. Public Health*. 2020;17(11):1–13. doi: 10.3390/ijerph17114065
11. Fauziyah NF, Aretha KN. Hubungan kecemasan, depresi dan stres dengan kualitas tidur mahasiswa fakultas kedokteran selama pandemi Covid-19. *Herb-Medicine Journal*. 2021;4(2):42. doi: 10.30595/hmj.v4i2.10064
12. Erntsen L, Havnen A. Mental health and sleep disturbances in physically active adults during the COVID-19 lockdown in Norway: does change in physical activity level matter? *Sleep Med.* 2021;77:309–12. Available from: <https://doi.org/10.1016/j.sleep.2020.08.030>
13. Jahrami H, BaHammam AS, AlGahtani H, et al. The examination of sleep quality for frontline healthcare workers during the outbreak of COVID-19. *Sleep Breath*. 2021;25(1):503–11. doi: 10.1007/s11325-020-02135-9
14. Dobler CL, Krüger B, Strahler J, et al. Physical activity and mental health of patients with pulmonary hypertension during the COVID-19 pandemic. *J. Clin. Med.* 2020;9(12):4023. doi: 10.3390/jcm9124023
15. Maharani AS, Sudaryanto WT. Hubungan aktivitas fisik dan kesehatan mental pada usia dewasa muda di masa pandemi Covid-19. 2021;2:144–9. Available from: <http://eprints.ums.ac.id/id/eprint/89510>
16. Xiong J, Lipsitz O, Nasri F, et al. Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *J. Affect Disord.* 2020;277(January):55–64.
17. Setiawan H, Munawwarah M, Wibowo E, Covid-WHO. Hubungan aktivitas fisik dengan kebugaran dan tingkat stres pada karyawan back office rumah sakit omni Alam Sutera di masa pandemi Covid-19. *Physiotherapy Health Science*. 2021;3(21):1–10.
18. Carriedo A, Cecchini JA, Fernandez-Rio J, et al. COVID-19, psychological well-being and physical activity levels in older adults during the nationwide lockdown in Spain. *Am J Geriatr Psychiatry*. 2020;28(11):1146–55. DOI: 10.1016/j.jagp.2020.08.007
19. Sarwiyata TW, Muntadiroh M, W FB, Daniati E, et al. Hubungan tingkat stres pada pandemi Covid-19 terhadap kualitas tidur tenaga kesehatan RSI Unisma. 2021;10.
20. Bessie V, Buntoro I, Damanik EMB. Hubungan tingkat stres dengan kualitas tidur pada perawat selama pandemi COVID-19 di RSUD Prof. Dr. W Z Johannes Kupang. *Cendana Medical Journal*. 2021;9:16–23. Available from: <http://ejurnal.undana.ac.id/index.php/CMJ/article/view/4928/2844>
21. Varma P, Burge M, Meaklim H, et al. Poor sleep quality and its relationship with individual characteristics, personal experiences and mental health during the COVID-19 pandemic. *Int J Environ Res Public Health*. 2021;18(11):6030. DOI: <https://doi.org/10.3390/ijerph18116030>