



ORIGINAL SCIENTIFIC ARTICLE

NEGATIVE CORRELATION BETWEEN OUTDOOR CYCLING PHYSICAL ACTIVITY AND DEPRESSION LEVELS DURING THE COVID-19 PANDEMIC AMONG MEMBERS OF MALANG CYCLING COMMUNITY

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Abstract

The purpose of the study is to analyze the relationship between the habit of outdoor cycling activities and the level of depression during the COVID-19 pandemic among the members of the bicycle community in Malang City.

Materials and methods. This research is correlational, with a cross-sectional study approach. A total of 125 subjects from the bicycle community in Malang City voluntarily participated to become respondents in this study. The measurement of cycling physical activity habits was carried out using the International Physical Activity Questionnaire (IPAQ), while the measurement of the level of depression used the Hamilton Depression Rating Scale (HDRS). Measurements of physical activity habits and depression levels were performed at the same time. The data analysis used the Pearson product-moment model using statistical software package for social science (SPSS) version 17.0 with a set significance level ($p \leq 0.05$).

Results. The results showed that there was a negative correlation between the habit of outdoor cycling activities and the level of depression ($r = -0.604$; $p \leq 0.001$) and showed a strong correlation between the two variables.

Conclusions. Based on the results of the study, there is a negative correlation between the habit of outdoor cycling activities and the level of depression during the COVID-19 pandemic among the members of the bicycle community in Malang City.

Keywords: physical activity, cycling, depression, COVID-19, pandemic.

Introduction

Globally, there were 336,790,193 confirmed cases of Coronavirus Disease (COVID-19), including 5,560,718 deaths, which were reported to the World Health Organization (WHO) (WHO, 2022). Meanwhile, the first confirmed case in Indonesia appeared in March 2020 and the prevalence continues to increase by 455,000 confirmed cases with a mortality rate of more than 14,000 people (Kemenkes, 2020). COVID-19 is caused by infection of the SARS-CoV-2 virus. This virus can be transmitted through the air or ob-

jects contaminated with droplets from people infected with COVID-19 (WHO, 2020). Transmission of this virus is quite easy and fast. The speed of transmission and uncontrolled spread causes fear and interfere with the human ability to meet needs in all fields of life (Dominski & Brandt, 2020). In response to this, the government made rules for people to carry out activities at home during the pandemic. However, this will have an impact on changing people's lifestyles into inactivity (Balanzá-Martínez et al., 2020). Increased sedentary behavior is marked by a 35% increase in internet streaming online users, 39% distance learning or online during the COVID-19 pandemic (Kominfo, 2020). During the pandemic, the physical activity of the population in Indonesia also decreased by more than 50 and it is estimated that 28% of the world population (1.4 billion people) remain physically inactive (Guthold et al., 2018).

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A prolonged COVID-19 pandemic can have an impact on increasing the prevalence of depression (33.7%), stress (29.6%), and anxiety (31.9%) compared to before the pandemic (Twenge & Joiner, 2020). Ettman et al. (2020) also stated that social isolation increased symptoms of depression 3 times, which reached 27.8% during the pandemic compared to before the pandemic which reached 8.5%. Depression is an emotional response caused by a loss of identity for individuals and is not easy to recover (eg lost a job, failed exams, lack of social interaction), because it harms the individual's cognitive system (Sanderson et al., 2020). Physiological depression will increase the secretion of the hormone cortisol which harms all body systems. Depression causes a decrease in the monoamine neurotransmitter system (serotonin, norepinephrine, dopamine) in the brain that occurs slowly accompanied by a reduced functional response to antidepressant therapy and increases chronic and psychological stress (Park et al., 2019). Depression due to lack of physical activity, excessive anxiety, boredom, and chronic and psychological stress will cause mental disorders to death. Excessive depression during a pandemic has a negative and independent impact on people's mental health (B  uerle et al., 2020).

Increased physical activity and exercise are very useful in relieving stress both in physically and psychologically that affect mental health (Maugeri et al., 2020). WHO (2020), recommends physical activity outdoors during the COVID-19 pandemic while maintaining health protocols. Regular outdoor physical activity is beneficial in improving mental health, immune system, and anti-inflammatory system (Althoff et al., 2017). This is also recommended by the issuance of the Decree of the Minister of Health of the Republic of Indonesia Number HK.01.07/MENKES/382/2020, during the COVID-19 pandemic the public is still encouraged to do physical activity, physical exercise, and sports to increase endurance and risk factors for disease (Kemenkes, 2020). Aerobic exercise (cycling) is a physical movement that uses energy derived from burning fat that involves oxygen and takes oxygen without causing fatigue (Palar et al., 2015). Outdoor cycling is a phenomenon of physical activity of choice that is widely practiced by the Indonesian people during the pandemic, as evidenced by the increase in bicycle sales during the COVID-19 pandemic by 1000% (ITDP, 2020). Cycling is a sports activity and alternative mode of transportation of choice for the community because it can be adapted to pandemic social distancing or health protocols by not having direct physical contact and has benefits for psychological health (Teixeira & Lopes, 2020).

Cycling is a low, moderate to high-intensity exercise designed for health benefits, especially during a pandemic (Ryu et al., 2020). The enactment of government regulations regarding outdoor sports while still implementing health protocols has made exercise (cycling) a lifestyle that is often practiced by individuals of all ages (Saatchian et al., 2021). Cycling exercise or outdoor cycling habits have antidepressant effects that are beneficial for reducing depression resulting from the interaction of several neurophysiological mechanisms, such as hormones, neurotrophins, and inflammatory biomarkers (Leyland et al., 2019). Exercise can increase the secretion of Brain-derived neurotrophic factor (BDNF), Insulin-Like Growth Factor-1 (IGF-1), and Vascular endothelial growth factor (VEGF) as a neurotrophic fac-

tor in the hippocampus that is useful for nerve cell growth, increasing stress hormone regulation (Pranoto et al., 2020; Berry et al., 2018; Kraus et al., 2004), namely cortisol by decreasing the activation of the Hypothalamus-Pituitary-Adrenal axis (HPA-axis), and decreasing the release of pro-inflammatory cytokines so that symptoms of depression can be reduced (Andarianto et al., 2022; Arat & Wong, 2017). In addition, regular outdoor cycling exercises will maximize the synthesis of pleasure hormones, namely an increase in endorphins and serotonin (Sharifi et al., 2018). On this basis, *the purpose of this study* was to analyze the relationship between the habit of outdoor cycling physical activity on the level of depression during the COVID-19 pandemic in members of the bicycle community in Malang.

Materials and methods

Study participants

This research is correlational with a cross-sectional study approach. The cross-sectional study approach is applied by connecting the dependent variable with the independent variable simultaneously. The independent variable in this study was the habit of cycling physical activity, while the dependent variable was the level of depression. A total of 125 subjects, male and female aged 18-45 years from the bicycle community in Malang City participated voluntarily as respondents in the study. Prior to participating, all subjects received information both orally and in writing about the study. The informed consent was obtained prior to the conduct of the research.

Study organization

The instrument used to measure the habit of cycling physical activity is the International Physical Activity Questionnaire (IPAQ), while the instrument to measure the level of depression is the Hamilton Depression Rating Scale (HDRS). Measurements of physical activity habits and levels of depression were carried out at the same time. The distribution of IPAQ and HDRS scores is shown in Table 1 and Table 2.

Table 1. International Physical Activity Questionnaire score distribution

HDRS Score	Level of Physical Activity
≤ 600 METS	Low
601-1500 METS	Moderate
1501-3000 METS	High

IPAQ: International Physical Activity Questionnaire

Table 2. Hamilton Depression Rating Scale score distribution

HDRS Score	Severity of Depression
0- 7	Normal
8-17	Low depression
18-24	Moderate depression
25 and above	Severe Depression

HDRS: Hamilton Depression Rating Scale

Statistical analysis

Statistical analysis using Statistical software package for the social sciences (SPSS) version 17.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics including means, standard deviations and percentages were calculated. The Shapiro-Wilk test was applied to the normality test, while to find the relationship between outdoor cycling activity habits and depression levels, the Pearson's product-moment correlation test was used. All statistical analyzes used a significant level ($p \leq 0.05$).

Results

Based on the results of the study obtained data on age, cycling community, cycling habits, depression levels and the relationship between outdoor cycling physical activity habits and depression levels which are presented in Tables 3-6 and Figure 1.

Table 3. Results of the analysis of the percentage of respondents' age

No	Age	Amount	Percentage
1	18-25	75	60.0%
2	26-30	18	14.4%
3	31-35	12	9.6%
4	36-40	9	7.2%
5	41-45	11	8.8%
	Total	125	100%

Table 4. Results of the analysis of the percentage of respondents' bicycle communities

No	Bike Community	Amount	Percentage
1	MTB Malang	25	20%
2	Malang Strattos Community	25	20%
3	Minionminitreng Malang	25	20%
4	Fed Ngalam	25	20%
5	Strolling Bastrad	25	20%
	Total	125	100%

Table 5. Overview of cycling habits

No	Cycling Habits	Amount	Percentage
1	Low	47	37.6%
2	Moderate	50	40.0%
3	High	28	22.4%
	Total	125	100%

Table 6. Description of depression levels categories

No	Depression Levels	Amount	Percentage
1	Normal	27	21.6%
2	Low depression	37	29.6%
3	Moderate depression	35	28.0%
4	Severe Depression	26	20.8%
	Total	125	100%

Based on the results of the Pearson correlation analysis (Figure 1), it shows that there is a negative correlation between the habit of outdoor cycling physical activity and the level of depression ($r = -0.604$; $p \leq 0.001$) and shows a strong correlation between the two variables.

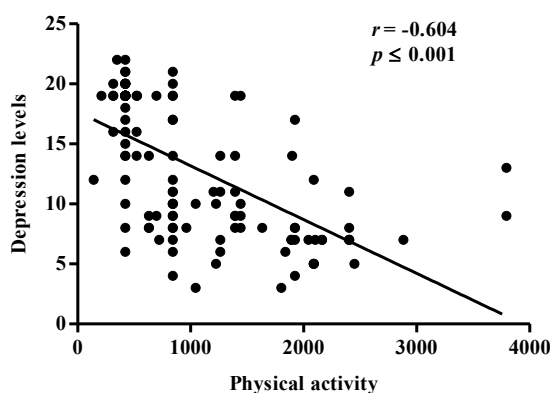


Figure 1. Results of correlation analysis between outdoor cycling physical activity habits and levels of depression. Pearson correlation coefficients (r) and p -values are shown in graph.

Dicussion

This study aims to analyze the correlation between outdoor cycling habits and depression levels during the COVID-19 pandemic among members of the Malang bi-cycle community. The findings reveal that there is a negative correlation between outdoor cycling habits and depression levels during the COVID-19 pandemic among members of the Malang bicycle community. This result was confirmed by Meyer et al. (2019), that cycling exercise at both moderate and preferred intensity can reduce levels of depression and anxiety. Ai et al. (2021) strengthen that physical exercise such as cycling while still implementing health protocols could improve mental health during the COVID-19 pandemic. Outdoor physical activity, (such as walking and cycling) is generally associated with lower depression, tension, anger, and confusion than indoor physical activity (Bowler et al., 2010; Dunton et al., 2015), and has been associated with improved emotional well-being, including in adolescents (Pasanen et al., 2014). Wright et al. (2021), physical activity during the coronavirus pandemic may counter the negative effects of coronavirus fear on adolescent mental health and well-being.

COVID-19 causes increased levels of anxiety and depression in healthy patients and people detected after stay-at-home orders in several countries (Hu et al., 2020; Huang & Zhao, 2020; Li et al., 2020; Ozamiz-Etxebarria et al., 2020). A study in college students showed that daily physical activity conferences have a beneficial effect in reducing stress and anxiety caused by COVID-19 (Hu et al., 2020; Zhang, et al., 2020). Exercise as an intervention for anxiety and depression has been demonstrated in animal studies and clinical trials in humans. The underlying mechanisms, include regulation of BDNF, D-beta-hydroxybutyrate (D-BHB), synaptic transmission, the hypothalamic-pituitary-adrenal axis (HPA-axis), tryptophan hydroxylase, glycogen synthase kinase-3 beta pathway (GSK3 β / β -catenin), neuroinflammation, oxidative stress, peroxisome proliferator-activated receptor-gamma coactivator 1 alpha (PGC-1 α) and peroxisome proliferator-activated receptor gamma (PPARgamma) (Hu et al., 2020; Pranoto et al., 2020).

During the COVID-19 pandemic, adults are more prone to depression because of the increasing economic and social needs and the closure of public spaces which cre-

ates emotional stress. Immature emotional mastery makes individuals in adulthood more susceptible to depression. Psychosocial factors during the COVID-19 pandemic occur very often with many respondents having to be dismissed suddenly by the company which causes respondents to experience a decrease in income. The declining income of respondents made the level of depression increase due to the increasing needs during the COVID-19 pandemic. Increasing age makes the work system and control in the body decrease, making it difficult for individuals to control when there is pressure (Schaakxs et al., 2017). This is following the study with the most respondents aged 18-25 totaling 55 people consisting of 5 women and 50 men with a percentage (59.7%) with the most respondents' occupations being female students (16.6%) followed by employees, private sector (16.3%) and self-employed (15.4%).

During the COVID-19 pandemic, women experienced the most severe depression, which amounted to 7 respondents. Gender differences also cause differences in depression levels. generally, women experience twice as much depression as men, because women have more difficulty controlling emotional states when stress occurs than men (Salk et al., 2017). In addition, women are more prone to depression because in women their emotional control and mood often change, plus women who experience menstruation every month make their emotional control more unstable.

During the COVID-19 pandemic, the closure of public spaces and the application of social restrictions made individuals reduce their physical activity outdoors. The pressures arising from COVID-19 and the social restrictions imposed have a detrimental impact on mental health by increasing fear and will lead to depressive disorders (Chi et al., 2020). This makes people in Malang switch to physical activities outside the room, namely by cycling, increasing bicycle users in Malang because many individuals experience boredom just sitting at home. Many community members think cycling is very fun because they can exercise by enjoying nature, as evidenced by many members of the cycling community with destinations such as tourist attractions, namely Batu City and nature tourism.

The road bike community represents a low percentage of depression because high cycling habits and long distances make their bodies better prepared to deal with COVID-19. Cycling communities that only cycled short distances have a fairly high percentage of major depression rates. Road bikes will maximize muscle work when pedaling because of a straight position when riding. Road racing bicycles will be beneficial for health if done regularly. Road racing bicycles will produce vibrations that the body will respond to for health benefits. Vibration during road cycling will be responded to by the muscles which then activate the neuromuscular system and will stimulate an increase in the respiratory system (Viellehner & Potthast, 2020). An increase in the respiratory system will increase the maximum oxygen consumption (VO_{2max}) of the rider. The increase in VO_{2max} causes the rider's aerobic capacity to increase which is beneficial for cardiovascular endurance so that the rider will last longer when cycling long distances or cycling marathons. Limitations in this study, the research method used is descriptive-analytic cross-sectional, this method is only used by researchers only to find a correlation or relationship between two variables, namely outdoor cycling habits

with depression levels during the pandemic, and for physical activities other than outdoor cycling researchers cannot control. The sample in this study was only 125 people, at least the sample population was taken due to the COVID-19 pandemic and social restrictions, and questionnaires were also distributed online of avoiding the spread of COVID-19.

Conclusions

The current study concluded that there is a negative correlation between the habit of outdoor cycling physical activity and the level of depression during the COVID-19 pandemic in members of the bicycle community in Malang City. Low cycling habits will increase the risk of depression, whereas high cycling habits will decrease the risk of depression. Outdoor cycling physical activity that is carried out regularly, measurably and continuously will maximize the work of the heart, lungs, metabolism, and brain which is very beneficial for individual mental health.

Conflicts of interest

All authors declare that there is no conflict of interest.

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НЕГАТИВНА КОРЕЛЯЦІЯ МІЖ ФІЗИЧНОЮ АКТИВНІСТЮ У ФОРМІ ЇЗДИ НА ВЕЛОСИПЕДІ НА ВІДКРИТОМУ ПОВІТРІ ТА РІВНЕМ ДЕПРЕСІЇ ПІД ЧАС ПАНДЕМІЇ COVID-19 СЕРЕД ЧЛЕНІВ СПІЛЬНОТИ ВЕЛОСИПЕДИСТІВ МІСТА МАЛАНГ (ІНДОНЕЗІЯ)

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 7 с., 6 табл., 1 рис., 42 джерела.

Мета дослідження полягає в аналізі взаємозв'язку між звичкою до різних форм їзди на велосипеді на відкритому повітрі та рівнем депресії під час пандемії COVID-19 серед членів спільноти велосипедистів міста Маланг (Індонезія).

Матеріали та методи. Це дослідження є кореляційним, у ньому використовується перехресний підхід до дослідження. У цьому дослідженні добровільно брали участь загалом 125 осіб із числа представників спільноти вело-

сипедистів міста Маланг (Індонезія). Вимірювання показників звичок до фізичної активності у формі їзди на велосипеді проводили з використанням Міжнародної анкети з фізичної активності (IPAQ), а для вимірювання рівня депресії використовували шкалу Гамільтона для оцінки депресії (HDRS). Вимірювання показників звичок до фізичної активності та рівнів депресії проводили одночасно. Для аналізу даних використовували коефіцієнт кореляції

Пірсона із застосуванням статистичного програмного забезпечення для суспільних наук (SPSS) версії 17.0 із заданим рівнем значущості ($p \leq 0,05$).

Результати. Результати показали наявність негативної кореляції між звичкою до різних форм їзди на велосипеді на відкритому повітрі та рівнем депресії ($r = -0,604$; $p \leq 0,001$), а також показали сильну кореляцію між обома змінними.

Висновки. На підставі одержаних результатів дослідження зроблено висновок про наявність негативної кореляції між звичкою до різних форм їзди на велосипеді на відкритому повітрі та рівнем депресії під час пандемії COVID-19 серед членів спільноти велосипедистів міста Маланг (Індонезія).

Ключові слова: фізична активність, їзда на велосипеді, депресія, COVID-19, пандемія.

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