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The Role of Physical Activity for Adolescent Mental Health in Indonesia: A Systematic Review

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Abstract Mental health disorders are a threat to adolescents, and in Indonesia, awareness of the importance of mental health among adolescents is still low. Regular, high-intensity physical activity interventions play a role in preventing mental health disorders in adolescents. This article aims to analyze the effect of physical activity on adolescent mental health in Indonesia. This research is a literature review using the PRISMA diagram method. The articles used were sourced from several SINTA and Scopus-indexed scientific journals in the last 5 years. Of the 1470 articles obtained during the article search process, further identification, screening, article eligibility assessment, and overall article assessment were carried out. The review results obtained eight articles that were relevant to the inclusion criteria and the accuracy of the research study. Five studies showed that high-intensity physical activity had an effect on mental health, emotional intelligence, and reduced levels of stress, depression, and anxiety, while the other three studies showed that daily physical activity with mild to moderate intensity and inconsistent intensity did not have a positive impact on adolescents' mental health. Exercise or physical activity of at least moderate intensity and conducted consistently is one of the attempts adopted by those suffering from mental health issues.

Keywords Physical Activity, Mental Health, Adolescents, Stress, Emotional Intelligence

1. Introduction

Mental health disorders are a threat to the well-being of adolescents [1-2], because mental health is one of the basics of the definition of health [3]. Mental health disorders are influenced by several factors, including individual, family, and community environmental factors with high levels of social dysfunction [4-7]. Mental health disorders are recognized as one of the largest drivers of the global burden of disease among adolescents [8], accounting for 5–12% of the global burden of disease, 16% of the burden of illness and injury in youth, and contributing 45% to youth disability [9-10]. Mental health disorders have a prevalence of approximately 1 in 7 people globally [11], with 1 in 4 people estimated to suffer from a mental health disorder at some stage in their lives [9]. In addition, around 10–20% of people with mental health disorders in the world experience frequent anxiety and depression [1]. Half of people with mental health disorders have symptoms before

the age of 14 [8], and about 62–75% of mental health disorders appear before the age of 25 [10].

Awareness of the importance of mental health in Indonesia is still very low [12]. In Indonesia, around 6-7% of the population aged 15 years and over experience mental health disorders [13]. Based on the results of the Basic Health Research in 2018, it shows that more than 19 million people over the age of 15 experience mental and emotional disorders, and more than 12 million people over the age of 15 experience depression [14]. About 93% of people with mental health disorders show symptoms of depression in the age range of 14–18 years, and 7% of people with mental health disorders show symptoms in the age range of 10–13 years [15].

According to the World Health Organization (WHO), adolescence is around 10–19 years old, while according to the National Population and Family Planning Agency, adolescence is around 10–24 years old [15-16]. In this age range, adolescents experience a transition period from childhood to adulthood, which has an impact on drastic changes in their physical, emotional, biological, and social abilities. Therefore, adolescents' ability to manage emotions and cope with problems is relatively immature, so they tend to feel insecure, uneasy, and easily anxious [17-18]. Mental health disorders in adolescents in Indonesia are caused by loneliness (about 7%), anxiety (about 5%), and not having close friends (about 3%) [19]. Traumatic and stressful events during childhood can also increase the risk of mental health disorders during adolescence, such as depression, bipolar disorder, substance abuse, and even the worst impact, suicide [19-25].

Based on previous data and problems, it is very important to intervene in the occurrence of mental health disorders in adolescents as a group that is vulnerable to low emotional control, anxiety, depression, and suicide. Mental health problems in adolescents, if not treated properly, will pose a more severe risk in the future [27]. Most mental health disorders occur during adolescence, so early detection and intervention are very important for adolescents to prevent lifelong relapse and other significant disorders [2]. Interventions are provided to adolescents to reduce and prevent the long-term adverse effects of mental health disorders [8].

Interventions in the form of physical activity can comprehensively reduce adolescent mental health [1]. In addition, physical activity also plays a role, as an effort to prevent mental health disorders in adolescents through health behaviors is considered very effective in minimizing the symptoms of mental health disorders [10], [28]. According to the WHO, physical activity in young people aged 5–17 years should be at least 60 minutes with moderate to vigorous physical intensity every day [29]. Adolescents who engage in regular physical activity every day are able to reduce anxiety and depression compared to adolescents who lack physical activity [30]. Consistent sports participation during adolescence can reduce stress, depressive symptoms, generalized anxiety symptoms, social anxiety, and loneliness [27]. Sport environments can also be an ideal place to address and improve an individual's mental health [10].

Although previous reviews showed the positive impact of physical activity on mental health, there are some other studies that show that there is no influence between physical activity and mental health. Therefore, it is important to do research from various sources of previous research literature to identify and analyze the influence of physical activities on mental-health disorders in adolescents in Indonesia as seen from mental health and emotional intelligence as well as anxiety, stress and depression.

2. Methods

This research article is a literature review sourced from several SINTA and Scopus-indexed scientific databases. The source of the study was obtained from Google Scholar, Garuda Portal, Springer, and Science Direct. Inclusion criteria used as a source of review are research articles published in 2019–2023, examining physical activity and mental health in adolescents. Exclusion criteria were that the articles were not primary research articles, published before 2019, and did not discuss physical activity and mental health in adolescents. Keywords used in this article include physical activity AND sport AND mental health. The literature search strategy and research data extraction used the PRISMA flowchart method with several stages, namely identification, screening, eligibility, and inclusion (Figure 1).

The initial keyword search was based on titles and abstracts only. The publication range is between 2019 and 2023 and includes only research articles. From the identification process, 1470 articles were obtained. Then checking for duplication of articles and articles with the same title in several journals was eliminated until 1123 articles were obtained. Next, an article screening process was carried out based on the title and abstract to eliminate articles that did not discuss physical activity and mental health in adolescents until 96 articles were obtained. In the next stage, the articles were read and reviewed as a whole and identified the type of physical activity, duration of physical activity, type of mental health, respondents, research design, and research results until 43 articles were obtained. The final total of articles that have been reviewed and used as a source of study amounted to 8 articles. These articles were relevant to the title and purpose of this literature review. The final stage is to integrate the results of the analysis and write the results of the review of several source articles into a scientific discussion.

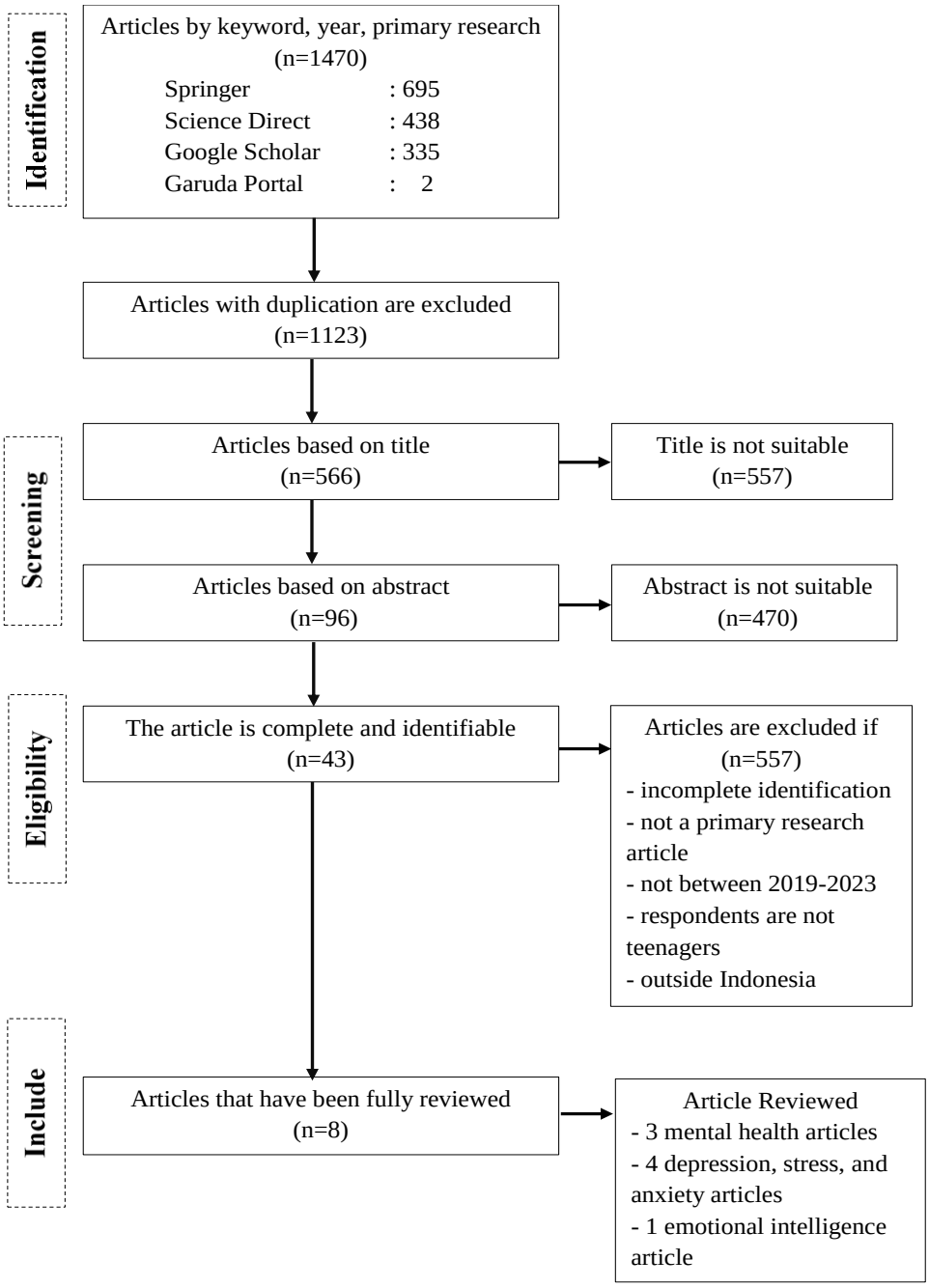

Figure 1. PRISMA Flowchart for Data Extraction

3. Results and Discussion

After extracting the article data, eight published articles met the study inclusion criteria. Articles were identified based on the researcher's name, year of publication, article title, region or research location, research method, number of respondents, physical activity, and research results. The results of the analysis are presented in Table 1.

Mental health problems, including stress, excessive anxiety, and depression [31], are risk factors for suicide [32]. A person experiencing anxiety has symptoms such as excessive worry about something uncertain, difficulty sleeping, and even nausea and shortness of breath [13]. Experiencing mental health problems early in life has been shown to have severe consequences for one's quality of life and well-being, including poorer social functioning, increased substance abuse, impaired performance, stunted academic achievement, unemployment, suicide risk, and self-harm [10], [26]. This is supported by the high prevalence of mental health disorders in the adolescent age group, as mental health still receives less attention [33].

Table 1. Results of Identification of Research Articles related to Physical Activity and Mental Health for Adolescents

Researchers (Year)	Location	Method	Respondents	Physical Activity	Results
Farahdina Bachtiar, Condrowati, Purnamadyawati, Diah Tika Anggraeni, Khairunnisa Larasati, Alya Sukma Bakti Meilana, Nur Fadilah (2023)	Depok, Jawa Barat	Desain Cross sectional Pearson's correlation data analysis technique	93 teenagers	Physical activity scores were expressed as MET-min per week, then categorized into 'low', 'medium', and 'high' over 7 days. Collected with IPAQ-SF and DASS-21 questionnaires	The results showed that physical activity was not associated with mental health (anxiety, stress, and depression). The level of physical activity of adolescents is in the low category, while many aspects of mental health experience stress, anxiety, and depression.
Winda Irna Oktaviana, Wahyu Indra Bayu, Herri Yusfi (2022)	Palembang, Sumatera Selatan	Correlation description Chi-Square data analysis technique	348 students at SMKN 4 Palembang grade 10 and 11	Low, moderate, and high physical activity as measured by the International Physical Activity Questionnaire (IPAQ)	The results showed that there was no relationship between physical activity and anxiety levels in adolescents (SMKN 4 Palembang grades 10 and 11).
Ahmad Chaeroni, Nurlan Kusmaedi, Amung Ma'mun, Dian Budiana (2021)	Bandung, Jawa Barat	Pre-test and post-test Univariate analysis of data	44 adolescent boys aged 16–19 years	The physical activity program includes physical fitness exercises, aerobics, push-ups, sit-ups, school physical education, and extracurricular activities.	The results of the data analysis showed that there was an increase in the mean level of adolescent mental health by 3.3182 and an increase in the standard deviation from 4.04781 to 4.22391. This means that physical activity can affect the improvement of adolescent mental health.
Delvya Intan Kusumawardhani, Indra Himawan Susanto, Pudjijuniarto, Yetty Septiani Mustar (2021)	Magetan, Jawa Tengah	Descriptive quantitative with the survey method Descriptive data analysis technique	740 students of SMAN 1 Karas Magetan who were selected by cluster random sampling.	Physical activity was measured using the Global Physical Activity Questionnaire (GPAQ) and then categorized into heavy work, moderate travel, heavy recreation, and moderate recreation.	The average physical activity level of adolescents in SMAN 1 Karas was in the high activity category, and their mental health was in the good category. Therefore, there is a correlation between high physical activity and good mental health.
Anissa Suci Maharani (2021)	Surakarta, Jawa Tengah	Cross sectional Spearman correlation data analysis technique	70 students of the Faculty of Public Health, Universitas Muhammadiyah Surakarta	Physical activity during the pandemic	The results showed that physical activity had no effect on mental health problems in adolescents during the COVID-19 pandemic.
Evi Tri Wahyuni, Yeni Koto, Indri Sarwili (2021)	Depok, Jawa Barat	Cross sectional Spearman correlation data analysis technique	67 youth organizations 025/005, Gandul, Depok	Physical activity was measured by the Physical Activity Questionnaire for Adolescents.	The results showed that there was a relationship between physical activity and emotional intelligence in adolescents.
Gusti Ayu Ardhia Candra Trikusuma, Luh Made Karisma Sukmayanti Suarya (2020)	Tabanan, Bali	Regression analysis	123 adolescents aged 12-18 years	Frequency of yoga during the last 3 months, as measured by a questionnaire	Based on the results of the regression equation, it is known that the frequency of yoga practice has an effective contribution of 10.9% to predicting anxiety, and 89.1% is influenced by other variables
Ricko Johanes Poluakan, Aaltje E. Manapiring, Fatimawali (2020)	Manado, Sulawesi Utara	Cross sectional Pearson's correlation data analysis technique	60 students specializing in Occupational Health and Safety at the Faculty of Public Health, Sam Ratulangi University.	Physical activity (exercise) that is done daily	The results showed a significant relationship between sports activities and stress among college students

From the analysis that has been done, 3 studies state that there is no relationship between physical activity and mental health, while 5 other research articles state that there is a relationship between physical activity and mental health. Physical activity is a form of movement by the body as a result of muscle movement and requires more energy than the normal state of the body [34]. Most physical activity among respondents was measured using the International Physical Activity Questionnaire (IPAQ) instrument.

Physical Activity on Mental Health

The results of research by Kusumawardhani et al. [35] show that the mental health of students at SMAN 1 Karas, Magetan, is dominated by low psychological pressure (around 37%), psychological pressure that is more than usual (24%), high psychological pressure to disturb enough (23%), and severe psychological pressure to interfere with daily activities (around 9%). This cannot be separated from the influence of physical activity that is often carried out by students in the form of helping parents go to the fields to farm, so that the average domain MET-minutes per week is in the high category of 4054.7 MET-minutes per week. With a high level of physical activity, it affects the improvement of mental health in adolescents, so that the majority of adolescents at SMAN 1 Karas experience low psychological stress.

In line with this, research by Caeroni et al. [36] showed an increase in the average mental health of adolescents after doing regular physical activity. The physical activities applied in this study were fitness and aerobic exercises, push-ups and sit-ups independently during breaks, and being active in sports and extracurricular learning. Based on the results of the data analysis, it is known that the average value of the mental health level of adolescent boys aged 16–19 years was initially 64.8182, then increased to 68.1364 with an initial standard deviation value of 4.04781 and a final standard deviation value of 4.22391. This figure shows a positive effect of physical activity on adolescent mental health in the Bandung area of West Java.

Both studies were supported by Zhang et al. [26], who stated that physical activity is the most popular intervention to improve physical and mental health and has great potential to reduce stress and mental health problems. Regular physical activity can affect a person's work capacity, physical fitness, and mental health [13]. Research by Rodriguez-Ayllon et al. [37] showed a correlation between physical activity and mental health disorders such as depression, anxiety, and stress. In addition, Cho [38] showed that interventions in the form of physical education programs in schools can improve adolescents' mental health.

Zou's research [39] showed that physical activity in adolescents can affect mental health directly but also through three separate pathways: the mediating effect of mental toughness, the mediating effect of academic stress, and the mediating effect of the mental toughness chain on academic stress. A study of adolescents in Algeria showed that physical activity was significantly associated with adolescents' mental health. Physical activity plays an important role in the management of mild-to-moderate mental health conditions, including depression and anxiety [40]. Research by Dore et al. [27] showed that groups of adolescents who focus on one or more sports intensively for many hours each day will experience high levels of competitiveness and be less prone to mental health problems.

Physical activity has a positive relationship with adolescent mental health [41]. Moderate to high-intensity physical activity can affect mental health indicators such as improving mental well-being, reducing stress levels, reducing sleep difficulties, and reducing feelings of loneliness in adolescents [42]. Physical activity in adolescents can have the greatest effect on adolescent mental health for a duration of 105 minutes but decreases when physical exercise time exceeds 105 minutes [39].

Physical Activity on Emotional Intelligence

Emotions are the internal experiences of individuals expressed in facial expressions and physical movements and are classified under the umbrella of mental health. Emotional intelligence is closely related to adolescents' ability to manage relatively immature emotions [18]. However, adolescence is considered an ideal period for developing positive emotions in each individual [43]. Based on the results of research by Wahyuni [44], it shows that adolescents in Gandul Village, Depok, who do strenuous physical activities such as running, cycling, and aerobics have high emotional intelligence, such as being able to control emotions, adapt to new environments, and understand the feelings of others.

This is supported by research that shows that adolescent participation in sports can improve their emotional well-being [43]. It stated that physical activity in the form of karate training can affect emotional function [45]. Bell et al. [46] also stated that emotional problems in adolescents, such as symptoms of depression and anxiety, can be reduced by increasing physical activity. The development of positive emotions is found in the group of adolescents who do physical activity compared to the group of adolescents who do not do physical activity [43].

Regular and appropriate physical activity can change the structure and function of the brain, increasing the concentration of dopamine, serotonin, and neropineferrin in the brain, which are useful for controlling individual emotions. In addition, regular physical activity can help develop positive emotions. This is because physiologically, physical activity can increase the transmission of monoamine synapses and the secretion of endorphins, which have an effect on reducing pain and increasing the active state of the brain, so that it can improve mood the day after exercise [43].

Physical Activity on Anxiety, Stress and Depression

Depression is a mood disorder with the highest incidence in adolescents. Depression and anxiety are major health problems that affect quality of life and lead to possible suicide [26]. Stress in adolescents contributes to psychological and physiological health disorders and illnesses and decreases the quality of life of individuals [47,48]. In recent years, the rate of depression among adolescents has increased and has become a silent killer targeting adolescents [49]. Physical activity, as the most popular health-promoting intervention, has great potential to reduce stress and other mental health problems [50].

Research by Chaeroni et al. [36] states that physical quality has an effect on improving mental health because increased activity provides psychological benefits, which include reduced levels of stress, anxiety, and depression. This is supported by research from Trikusuma and Suarya [51], which shows that physical activity in the form of yoga practice can reduce anxiety by 10.9%. In addition, research by Yudistira [52] showed a decrease in the intensity of anxiety through swimming exercise interventions in a group of adolescent boys. Research by Poluakan et al. [53] shows that students who do sports activities with high intensity and good exercise time management can reduce stress levels.

The research is supported by research from Gu [49], which states that participation in regular physical activity can help adolescents relieve stress and expand relationships so as to reduce the likelihood of depression in adolescents. Consistent physical activity can optimize growth and development, improve body balance and flexibility, maintain bones, muscles, and joints, improve the work of the heart and lung muscles, control body weight, and be able to control stress by reducing anxiety and lowering depression levels [44], [54]. Physical activity has the potential to reduce depression through moderate-intensity physical activity. Physical activity can be used as a natural anti-depressant that can reduce anxiety and depression [33]. Physical activity can have a direct positive effect on mood and feelings of energy [55]. In addition, physical activity can be a distraction from negative thoughts and stress related to coronavirus fears [56].

A study conducted in Iran showed that adolescents with increased physical activity were able to reduce psychological distress, anxiety levels, and symptoms of depression that adolescents may experience [57]. Research by McMahon et al. [58] showed that groups of adolescents who engage in sports activities have lower levels of depression and anxiety and higher levels of well-being than groups of adolescents who do not engage in sports activities.

Despite its positive role in various aspects of mental health, physical activity has also been found to have no correlation with adolescent mental health, based on several studies. Research by Bachtiar et al. [31] showed no relationship between physical activity and mental health because the majority of adolescents who were research subjects in Depok, West Java, did light physical activity, so some adolescents showed mild, moderate, and severe stress symptoms. Research by Oktaviana et al. [59] also states that there is no relationship between physical activity and anxiety levels in adolescents. This happened because the COVID-19 pandemic prevented SMKN 4 Palembang students from doing physical activity, thus increasing their anxiety. Research by Maharani [60] shows that physical activity has no effect on adolescent mental health problems during the COVID-19 pandemic. This is supported by research by Wright et al. [61], which shows that physical activity is not associated with anxiety.

Some factors that can be seen from the analysis of these articles are different forms of physical activity. In addition, there are several factors that hinder physical activity in adolescents, such as lack of motivation, self-confidence, and individual identity [29]. The absence of influence between physical activity and mental health is also influenced by light physical activity, but many mental health problems are experienced. This is evidenced by the activity restrictions during the COVID-19 pandemic, which led to limited physical activity and increased psychological stress in the community [2]. Letting the body continue to stand still without doing physical activity can trigger an increase in risk factors for depressive symptoms. This statement is supported by Amana's research, which shows an increase in depression due to a decrease in a person's physical activity [62].

These activity restrictions were supported by government policies during the COVID-19 pandemic, which had a negative impact on physical activity and mental health. In addition, the increased time spent using electronic devices such as gadgets and computers leads to an increased risk of depression and poorer health [63]. Maugeri et al. [64] showed that quarantine in Italy led to a significant reduction in total weekly physical activity and energy expenditure in all age groups, and this reduction had a negative impact on psychological well-being. Townsend [65] suggested that lockdowns during the COVID-19 pandemic had disproportionate and damaging effects on the lives, mental health, and well-being of adolescent groups globally. The imposition of large-scale restrictions during the COVID-19 pandemic led to increased stress, depression, anxiety, emotional exhaustion, and fear [66], [67], [68].

Seeing the differences in the findings of these research results, it is necessary to conduct research comprehensively and holistically on all variables that will occur in the future. In this case, mixed-methods research is important to provide in-depth analysis both in terms of scientific testing through treatment and qualitative analysis in the form of interviews and forum group discussions (FGDs) related to why and how the findings were obtained. Research with mixed methods is a merger and combination of quantitative and qualitative methods that complement or perfect each other [69]. Future researchers also need to pay close attention to factors that bias research, such as sampling

techniques, moderator variables, and FITT (frequency, intensity, time, and type). This aims to provide much more accurate research results.

4. Conclusions

An analysis of the literature of five studies showed that physical activity with average high intensity can have a positive effect on mental health, emotional intelligence and reduced levels of stress, depression and anxiety. This is because the physical activity performed by adolescents is of mild to moderate intensity and is not consistently performed every day, so the physical activities do have no positive impact on their mental health.

REFERENCES

[1] D. Hurley, M. S. Allen, C. Swann, A. D. Okely, and S. A. Vella, "The Development, Pilot, and Process Evaluation of a Parent Mental Health Literacy Intervention Through Community Sports Clubs," *J. Child Fam. Stud.*, vol. 27, no. 7, pp. 2149–2160, 2018, doi: 10.1007/s10826-018-1071-y.

[2] J. Okuyama *et al.*, "Mental Health in Children and Adolescents during Covid-19 Pandemic," *Exp. Med*, vol. 253, no. 3, pp. 203–215, 2021, doi: 10.1620/tjem.253.203. Correspondence.

[3] I. Rindi Yani, E. E. Pratiwi, M. Maryono, and Y. Nurdiantami, "The Relationship Between Physical Activity and Mental Health in Adults During the COVID-19 Pandemic: A Literature Review," *J. Kesehat. Tambusai*, vol. 2, no. 3, pp. 144–149, 2021, doi: 10.31004/jkt.v2i3.2100.

[4] CDC, "Fast Facts: Preventing Adverse Childhood Experiences," Center of Disease Control and Prevention. [Online]. Available: https://www.cdc.gov/violenceprevention/aces/fastfact.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc. gov%2Fviolenceprevention%2Facestudy%2Ffastfact.html.

[5] N. F. Trygg, P. E. Gustafsson, and A. Månsdotter, "Languishing in the crossroad? A scoping review of intersectional inequalities in mental health," *Int. J. Equity Health*, vol. 18, no. 1, pp. 1–13, 2019, doi: 10.1186/s12939-019-1012-4.

[6] M. K. Hargreaves, C. P. Mouton, J. Liu, Y. E. Zhou, and W. J. Blot, "Adverse childhood experiences and health care utilization in a low-income population," *J. Health Care Poor Underserved*, vol. 30, no. 2, pp. 749–767, 2019, doi: 10.1353/hpu.2019.0054.

[7] D. Walsh, G. McCartney, M. Smith, and G. Armour, "Relationship between childhood socioeconomic position and adverse childhood experiences (ACEs): A systematic review," *J. Epidemiol. Community Health*, vol. 73, no. 12, pp. 1087–1093, 2019, doi: 10.1136/jech-2019-212738.

[8] S. A. Vella *et al.*, "Ahead of the game protocol: A multi-component, community sport-based program targeting prevention, promotion and early intervention for mental health among adolescent males," *BMC Public Health*, vol. 18, no. 1, pp. 1–12, 2018, doi: 10.1186/s12889-018-5319-7.

[9] M. C. F. da S. Candido, C. A. A. Ventura, A. R. F. Furegato, J. L. F. Santos, and M. A. Candido, "Mental Illness, Mental Disability, and the Exercise of Human Rights: Key Differences and Similarities According to Mental Health Administrators and Managers Within Brazil," *J. Hum. Rights Soc. Work*, vol. 5, no. 1, pp. 12–21, 2020, doi: 10.1007/s41134-019-00101-4.

[10] B. Patafio, D. Skvarc, P. Miller, and S. Hyder, "Evaluating a Sport-Based Mental Health Literacy Intervention in Australian Amateur Sporting Adolescents," *J. Youth Adolesc.*, vol. 50, no. 12, pp. 2501–2518, 2021, doi: 10.1007/s10964-021-01513-0.

[11] S. Dattani, L. Rodés-Guirao, H. Ritchie, and M. Roser, "Mental Health," Our World in Data. [Online]. Available: https://ourworldindata.org/mental-health

[12] Center for Public Mental Health, "The Urgency of Improving Mental Health in Society," Faculty of Psychology UGM. [Online]. Available: https://cpmh.psikologi.ugm.ac.id/2020/07/24/urgensi-peningkatan-kesehatan-mental-di-masyarakat/

[13] M. Baadiah, S. Winarni, A. Mawarni, and C. T. Purnami, "Relationship Between Physical Activity and Anxiety Level with Menstrual Cycle Disorders In College Students," *J. Kesehat. Masy.*, vol. 9, no. 3, pp. 338–343, 2021, doi: 10.14710/jkm.v9i3.29340.

[14] Ministry of Health, "Ministry of Health Exposes Mental Health Problems in Indonesia," Ministry of Health of the Republic of Indonesia. [Online]. Available: https://sehatnegeriku.kemkes.go.id/baca/rilis-media/20211007/1338675/kemenkes-beberkan-masalah-permasalahan-kesehatan-jiwa-di-indonesia/

[15] S. A. Melina and C. K. Herbawani, "Factors Affecting Adolescent Mental Health During the Covid-19 Pandemic: A Literature Review," *Media Kesehat. Masy. Indones.*, vol. 21, no. 4, pp. 286–291, 2022, doi: 10.14710/mkmi.21.4.286-291.

[16] L. T. Lubis, L. Sati, N. N. Adhinda, H. Yulianirta, and B. Hidayat, "Improving the Mental Health of Children and Adolescents through Islamic Worship," *Al-Hikmah Jurnal Agama dan Ilmu Pengetah.*, vol. 16, no. 2, pp. 120–129, 2019, doi: 10.51339/isyrof.v3i1.292.

[17] R. Andriani, Suhrawardi, and Hapisah, "The Relationship Between the Level of Knowledge and Attitudes of Adolescents With Premarital Sexual Behavior," *J. Inov. Penelit.*, vol. 2, no. 10, pp. 3441–3446, 2022, [Online]. Available: https://stp-mataram.e-journal.id/JIP/article/view/1341

[18] H. Kim, Y. J. Lee, and S. J. Jung, "Trends in Depressive Symptoms and Suicidality of South Korean Adolescents: Comparison of Expected and Observed Prevalence During the COVID-19 Pandemic," *J. Adolesc. Heal.*, vol. 73, no. 1, pp. 79–87, 2023, doi: 10.1016/j.jadohealth.2023.02.014.

[19] B. A. Pamungkas and A. D. Kamalah, "Gambaran Tingkat Depresi Pada Remaja : Literature Review," *Pros. Semin. Nas. Kesehat.*, vol. 1, pp. 1332–1341, 2021, doi: 10.48144/prosiding.v1i.832.

[20] D. Mayo *et al.*, "The role of trauma and stressful life events among individuals at clinical high risk for psychosis: A

review," *Front. Psychiatry*, vol. 8, no. April, pp. 1–17, 2017, doi: 10.3389/fpsyt.2017.00055.

[21] B. Misiak, M. Krefft, T. Bielawski, A. A. Moustafa, M. M. Sąsiadek, and D. Frydecka, "Toward a unified theory of childhood trauma and psychosis: A comprehensive review of epidemiological, clinical, neuropsychological and biological findings," *Neurosci. Biobehav. Rev.*, vol. 75, pp. 393–406, 2017, doi: 10.1016/j.neubiorev.2017.02.015.

[22] E. Crouch, J. C. Probst, E. Radcliff, K. J. Bennett, and S. H. McKinney, "Prevalence of adverse childhood experiences (ACEs) among US children," *Child Abus. Negl.*, vol. 92, no. April, pp. 209–218, 2019, doi: 10.1016/j.chiabu.2019.04.010.

[23] E. Fuller-Thomson, S. L. Baird, R. Dhrodia, and S. Brennenstuhl, "The association between adverse childhood experiences (ACEs) and suicide attempts in a population-based study," *Child. Care. Health Dev.*, vol. 42, no. 5, pp. 725–734, 2016, doi: 10.1111/cch.12351.

[24] L. Leza, S. Siria, J. J. López-Goñi, and J. Fernández-Montalvo, "Adverse childhood experiences (ACEs) and substance use disorder (SUD): A scoping review," *Drug Alcohol Depend.*, vol. 221, no. December 2020, pp. 1–10, 2021, doi: 10.1016/j.drugalcdep.2021.108563.

[25] M. T. Merrick, K. A. Ports, D. C. Ford, T. O. Afifi, E. T. Gershoff, and A. Grogan-Kaylor, "Unpacking the impact of adverse childhood experiences on adult mental health," *Child Abus. Negl.*, vol. 69, pp. 10–19, 2017, doi: 10.1016/j.chiabu.2017.03.016.

[26] X. Zhang, M. H. E. M. Browning, Y. Luo, and H. Li, "Can sports cartoon watching in childhood promote adult physical activity and mental health? A pathway analysis in Chinese adults," *Heliyon*, vol. 8, no. 5, pp. 1–6, 2022, doi: 10.1016/j.heliyon.2022.e09417.

[27] I. Doré *et al.*, "Years Participating in Sports During Childhood Predicts Mental Health in Adolescence: A 5-Year Longitudinal Study," *J. Adolesc. Heal.*, vol. 64, no. 6, pp. 790–796, 2019, doi: 10.1016/j.jadohealth.2018.11.024.

[28] S. M. Rice, R. Purcell, and P. D. McGorry, "Adolescent and Young Adult Male Mental Health: Transforming System Failures Into Proactive Models of Engagement," *J. Adolesc. Heal.*, vol. 62, no. 3, pp. S9–S17, 2018, doi: 10.1016/j.jadohealth.2017.07.024.

[29] L. McLean and R. Penco, "Physical activity: Exploring the barriers and facilitators for the engagement of young people in residential care in Ireland," *Child. Youth Serv. Rev.*, vol. 119, no. September, p. 105471, 2020, doi: 10.1016/j.childyouth.2020.105471.

[30] K. L. Piercy *et al.*, "The physical activity guidelines for Americans," *JAMA - J. Am. Med. Assoc.*, vol. 320, no. 19, pp. 2020–2028, 2018, doi: 10.1001/jama.2018.14854.

[31] F. Bachtiar *et al.*, "The Relationship between Physical Activity and Adolescent Mental Health during the Covid-19 Pandemic," *Malahayati Nurs. J.*, vol. 5, no. 2, pp. 503–514, 2023, doi: 10.33024/mnj.v5i2.7982.

[32] A. Zulaikha and N. Febriyana, "Suicide in Children and Teenagers," *J. Psikiatri Surabaya*, vol. 7, no. 2, p. 62, 2018, doi: 10.20473/jps.v7i2.19466.

[33] S. J. H. Biddle, S. Ciaccioni, G. Thomas, and I. Vergeer, "Physical activity and mental health in children and adolescents: An updated review of reviews and an analysis of causality," *Psychol. Sport Exerc.*, vol. 42, no. August, pp. 146–155, 2019, doi: 10.1016/j.psychsport.2018.08.011.

[34] A. Naufal, "Effect of Physical Activity on Depressed Patients," *J. Ilm. Kesehat. Sandi Husada*, vol. 10, no. 2, pp. 285–287, 2019, doi: 10.35816/jiskh.v10i2.172.

[35] D. I. Kusumawardhani, I. H. Susanto, Pudjijuniarto, and Y. S. Mustar, "Physical Activity and Mental Health of High School Students on New Life Adaptation," *J. Sport. Saintika*, vol. 6, no. 1, pp. 39–53, 2021.

[36] A. Chaeroni, N. Kusmaedi, A. Ma'mun, and D. Budiana, "Physical Activity: Does it Impact Physical Fitness and Mental Health?," *Jurna Sport. Saintika*, vol. 6, no. 1, pp. 54–62, 2021.

[37] M. Rodriguez-Ayllon *et al.*, "Role of Physical Activity and Sedentary Behavior in the Mental Health of Preschoolers, Children and Adolescents: A Systematic Review and Meta-Analysis," *Sport. Med.*, vol. 49, no. 9, pp. 1383–1410, 2019, doi: 10.1007/s40279-019-01099-5.

[38] O. Cho, "Impact of Physical Education on Changes in Students' Emotional Competence: A Meta-analysis," *Int. J. Sports Med.*, vol. 41, no. 14, pp. 985–993, 2020, doi: 10.1055/a-1192-5812.

[39] J. Zou, "An Empirical Analysis of the Effects of Physical Exercise on Adolescent Mental Health and Its Mediating Mechanisms," *J. Environ. Public Health*, pp. 1–11, 2022, doi: 10.1155/2022/2482884.

[40] F. Mouissi, "Physical Activity and Sport and Their Impact on Mental Health of Algerian Adolescents," *J. Phys. Educ. Sport. Heal. Recreat.*, vol. 5, no. 1, pp. 39–42, 2016.

[41] F. K. W. Ho, L. H. T. Louie, C. B. Chow, W. H. S. Wong, and P. Ip, "Physical activity improves mental health through resilience in Hong Kong Chinese adolescents," *BMC Pediatr.*, vol. 15, no. 1, pp. 1–9, 2015, doi: 10.1186/s12887-015-0365-0.

[42] V. T. da Solidade, V. M. S. Do Nascimento, D. P. M. Oliveira, M. C. de S. Ribas, R. A. C. Sampaio, and R. J. D. S. Silva, "School physical activity and mental health in school-aged brazilian adolescents: A systematic review," *Rev. Bras. Cineantropometria e Desempenho Hum.*, vol. 23, pp. 1–13, 2021, doi: 10.1590/1980-0037.2021V23E82866.

[43] J. Li, Z. Huang, W. Si, and T. Shao, "The Effects of Physical Activity on Positive Emotions in Children and Adolescents: A Systematic Review and Meta-Analysis," *Int. J. Environ. Res. Public Health*, vol. 19, no. 21, pp. 1–18, 2022, doi: 10.3390/ijerph192114185.

[44] E. T. Wahyuni, Y. Koto, and I. Sarwili, "Frequent Intense Physical Activity Can Improve Emotional Intelligence in Adolescents," *Indones. Sch. J. Nurs. Midwifery Sci.*, vol. 1, no. 03, pp. 106–112, 2021, doi: 10.54402/isjnms.v1i03.60.

[45] R. Kurniawan, E. Yusti Sianti, A. Annisaa, and S. Rohana, "Karate: Effective tools to improve social, emotional, and executive functions of students with autism," *J. Sport. J. Penelit. Pembelajaran*, vol. 8, no. 1, pp. 29–43, 2022, doi: 10.29407/js_unpgri.v8i1.17684.

[46] S. L. Bell, S. Audrey, D. Gunnell, A. Cooper, and R.

Campbell, "The relationship between physical activity, mental wellbeing and symptoms of mental health disorder in adolescents: A cohort study," *Int. J. Behav. Nutr. Phys. Act.*, vol. 16, no. 1, pp. 1–12, 2019, doi: 10.1186/s12966-019-0901-7.

[47] Hendrayana, Y., Hidayat, Y., Tresnadiani, D., & Hambali B., "Life quality of students majoring in sports education and its comparison with other students," Cakrawala Pendidikan: Jurnal Ilmiah Pendidikan, vol. 41, no. 3, pp. 630-642, 2022, doi: 10.21831/cp.v41i3.45917

[48] M. Maury-Mora, M. T. Gómez-Villarino, and C. Varela-Martínez, "Urban green spaces and stress during COVID-19 lockdown: A case study for the city of Madrid," *Urban For. Urban Green.*, vol. 69, pp. 1–15, 2022, doi: 10.1016/j.ufug.2022.127492.

[49] J. Gu, "Physical Activity and Depression in Adolescents: Evidence from China Family Panel Studies," *Behav. Sci. (Basel).*, vol. 12, no. 71, pp. 1–13, 2022, doi: 10.3390/bs12030071.

[50] S. R. Chekroud *et al.*, "Association between physical exercise and mental health in 1·2 million individuals in the USA between 2011 and 2015: a cross-sectional study," *The Lancet Psychiatry*, vol. 5, no. 9, pp. 739–746, 2018, doi: 10.1016/S2215-0366(18)30227-X.

[51] G. A. A. C. Trikusuma and L. M. K. S. Suarya, "The Role of Frequency of Yoga Practice on Anxiety Levels in Adolescents in Tabanan Regency," *Psikol. Udayana*, vol. 1, no. 1, pp. 187–195, 2020, [Online]. Available: https://ojs.unud.ac.id/index.php/psikologi/article/download/57838/33786

[52] S. Yudhistira, A. M. P. Nuhriawangsa, and M. Fanani, "Effect of Kale (Ipomea Reptans Poor.) Intake and Swimming Exercise on the Degree of Anxiety and Depression Intensity in Adolescent Males," *Media Gizi Indones. (National Nutr. Journal)*, vol. 16, no. 3, pp. 287–295, 2021.

[53] R. J. Poluakan, A. E. Manampiring, and Fatimawali, "The Relationship Between Exercise and Circadian Rhythm and Stress," *J. BiomedikJBM*, vol. 12, no. 2, p. 102, 2020, doi: 10.35790/jbm.12.2.2020.29441.

[54] K. D. Desyanti and F. T. Bambang Kuntjoro, "Analysis of Student Physical Activity on Physical Fitness in the Pandemic Era," *J. Pendidik. Olahraga dan Kesehat.*, vol. 9, no. 3, pp. 281–286, 2021, [Online]. Available: https://ejournal.unesa.ac.id/index.php/jurnal-pendidikan-jasmani/article/view/42154

[55] Y. Liao, C. P. Chou, J. Huh, A. Leventhal, and G. Dunton, "Examining acute bi-directional relationships between affect, physical feeling states, and physical activity in free-living situations using electronic ecological momentary assessment," *J. Behav. Med.*, vol. 40, no. 3, pp. 445–457, 2017, doi: 10.1007/s10865-016-9808-9.

[56] K. Mikkelsen, L. Stojanovska, M. Polenakovic, M. Bosevski, and V. Apostolopoulos, "Exercise and mental health," *Maturitas*, vol. 106, no. September, pp. 48–56, 2017, doi: 10.1016/j.maturitas.2017.09.003.

[57] Amalnath G and Shija K, "Correlation between Mental Health and Physical Activity among Adolescents," *Int. J. Sci. Res.*, vol. 11, no. 9, pp. 120–125, 2022, doi: 10.21275/SR22901190237.

[58] E. M. McMahon *et al.*, "Physical activity in European adolescents and associations with anxiety, depression and well-being," *Eur. Child Adolesc. Psychiatry*, vol. 26, no. 1, pp. 111–122, 2017, doi: 10.1007/s00787-016-0875-9.

[59] W. I. Oktaviana, W. I. Bayu, and H. Yusfi, "Relationship between Physical Activity and Anxiety Level," *J. Ilmu Keolahragaan Undiksha*, vol. 10, no. 2, pp. 162–168, 2022, doi: 10.23887/jiku.v10i2.44115.

[60] A. S. Maharani, "The Relationship between Physical Activity and Mental Health in Young Adults during the Covid-19 Pandemic," Universitas Muhammadiyah Surakarta, 2021. [Online]. Available: https://eprints.ums.ac.id/89510/

[61] L. J. Wright, S. E. Williams, and J. J. C. S. Veldhuijzen van Zanten, "Physical Activity Protects Against the Negative Impact of Coronavirus Fear on Adolescent Mental Health and Well-Being During the COVID-19 Pandemic," *Front. Psychol.*, vol. 12, no. March, pp. 1–10, 2021, doi: 10.3389/fpsyg.2021.580511.

[62] D. R. Amana, Wilson, and E. Hermawati, "Relationship between Physical Activity Level and Depression Level in Second Year Students of Medical Study Program, Faculty of Medicine, Tanjungpura University," *J. Cerebellum*, vol. 6, no. 4, p. 94, 2021, doi: 10.26418/jc.v6i4.47800.

[63] C. S. Tao *et al.*, "The Impact of physical activity on mental health outcomes during the COVID-19 pandemic," *Sci. Briefs Ontario COVID-19 Sci. Advis. Table*, vol. 3, no. 62, pp. 1–17, 2022, [Online]. Available: https://covid19-sciencetable.ca/science-briefs/

[64] G. Maugeri *et al.*, "The impact of physical activity on psychological health during Covid-19 pandemic in Italy," *Heliyon*, vol. 6, no. 6, p. e04315, 2020, doi: 10.1016/j.heliyon.2020.e04315.

[65] E. Townsend, "Debate: The impact of school closures and lockdown on mental health in young people," *Child Adolesc. Ment. Health*, vol. 25, no. 4, pp. 265–266, 2020, doi: 10.1111/camh.12428.

[66] S. K. Brooks *et al.*, "The psychological impact of quarantine and how to reduce it: rapid review of the evidence," *Lancet*, vol. 395, no. 10227, pp. 912–920, 2020, doi: 10.1016/S0140-6736(20)30460-8.

[67] D. Jimenez-Pavon and C. J. Lavie, "Physical exercise as therapy to fight against the mental and physical consequences of COVID-19 quarantine: Special focus in older people," *Prog. Cardiovasc. Dis.*, vol. 63, no. January, pp. 386–388, 2020, [Online]. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7118448/pdf/main.pdf

[68] Y. T. Xiang *et al.*, "Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed," *The Lancet Psychiatry*, vol. 7, no. 3, pp. 228–229, 2020, doi: 10.1016/S2215-0366(20)30046-8.

[69] Mustaqim, *Quantitative Qualitative or Mixed Methods Research Methods An Alternative Approach*. Jepara: Universitas Islam Nahdatul Ulama Jepara, 2016.