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Is Adolescent Physical Literacy Linked to Their Mental Health?

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ABSTRACT

Background: More than 10% of adults in Indonesia experience mental and emotional disorders. Previous research has concluded that mental health is related to a person's physical literacy. ***Objectives:*** *This study explores the relationship between physical literacy and mental health among adults in Semarang City, Indonesia, emphasizing the mediating role of various physical literacy domains.* ***Methods:*** *This observational study used a cross-sectional design with 610 participants chosen by stratified selection. Physical literacy and mental health were evaluated using the Perceived Physical Literacy Questionnaire (PPLQ) and the Self-Reporting Questionnaire (SRQ-20), respectively. All data acquired during interviews with trained enumerators were then processed using Stata. The data was then evaluated with the Spearman Rank test.* ***Results:*** *The study included more women than men. They were largely high school and college students who weren't yet married. The respondents' physical literacy remained moderate, while their mental health remained good/free of unhealthy mental issues. Bivariate analysis revealed that higher levels of physical literacy were linked to better mental health outcomes, particularly in the categories of physical ability, knowledge, and motivation. Age and education levels also have a substantial impact on mental health.* ***Conclusions:*** *Physical literacy has a substantial impact on mental health among adults in Semarang City.*

Keywords: Knowledge, Mental Health, Motivation, Physical Activity, Physical Literacy

INTRODUCTION

Mental health issues are still a global concern, and they are included in one of the goals of achieving the SDGs.(United Nations, 2024) Target 3.4 of SDG's states that by 2030, premature deaths due to non-communicable diseases must be reduced by one-third through prevention, treatment, improving mental health, and community welfare.(United Nations, 2024) All countries are committed to achieving sustainable development targets by 2030, including Indonesia.

Indonesia Basic Health Research Data in 2018, more than 19 million people in Indonesia over the age of 15 experience mental and emotional disorders, and more than 12 million people over the age of 15 experience depression (Ministry of Health, 2018). Worse, the death rate due to suicide per 100,000 population in 2019 reached 2.55 (WHO, 2020). Although lower than in 2013, the downward trend occurred very slowly. Data in Semarang City states that in 2020 there were 4,172 patients with severe mental disorders who received services at the Health Center. Meanwhile, mental health services at health centers and hospitals in Semarang

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City in 2020 showed 63,684 visits from patients with mental disorders (Semarang District Health office, 2021).

A previous study mentioned a link between mood and exercise (Aurélio et al., 2005). Physical activity has a beneficial effect on the prevention and treatment of various diseases, including psychiatric illnesses such as depressive and anxiety disorders. Physical activity can reduce the risk of mental health issues (Bell et al., 2019a; Fortnum et al., 2018a; Tang et al., 2023a).

The prevalence of physical inactivity in Indonesia has increased significantly from 26.1% (2013) to 33.5% (2018) and 37.4% (2023). A similar trend is observed in Central Java Province, with physical inactivity rising from 29.5% in 2018 to 30.4% in 2023. Compared to rural areas (34.5%), urban residents exhibit higher levels of physical inactivity (39.4%) (Health Development Policy Agency, 2023; Health Research and Development Board, 2013; Ministry of Health, 2019). Physical activity is an important factor for health outcomes, and the main determinant is physical literacy. Physical literacy is associated with higher participation in physical activity and less time in sedentary behavior (Cairney et al., 2019; Clark et al., 2022). Physical literacy is a developing approach to remodeling the promotion of physical activity participation across the lifespan(Jones et al., 2017).

The widely adopted definition of physical literacy refers to the motivation, confidence, physical competence, knowledge, and understanding to value and take responsibility for engaging in physical activities for life (Holler et al., 2023a; Whitehead, 2010, 2019; Whitehead & Maude, 2016). It emphasizes the holistic development of an individual's capacities to promote lifelong physical activity and well-being. Physical literacy is increasingly recognized as vital for promoting long-term health and wellbeing (Jones GR, 2017; Tang et al., 2023b).

This study aims to measure the correlation between physical literacy and mental health issues on adults in urban area, by also analyzing the relationship each domain of physical literacy and mental health issues.

METHODS

This observational study employed a cross-sectional design, targeting a population of adults aged over 18 years as respondents. A stratified random sampling technique was utilized to select participants, ensuring that distinct subgroups within the adult population were represented. Data collection was conducted through face-to-face surveys carried out in August and September of 2024. A total of 610 respondents participated in the study, all of whom provided informed consent prior to enrollment, confirming their willingness to be included in the research.

The survey used the Perceived of Physical Literacy Questionnaire (PPLQ) which comprised a variety of carefully constructed questions designed to measure multiple dimensions relevant to physical literacy. Specifically, the PPLQ included six questions assessing Physical Competency (PCO), three questions focusing on Understanding (UND), six questions on Motivation (MOT), six questions addressing Confidence (CON), six questions related to Physical Activity Behavior (PAB), and seven questions measuring Knowledge (KNO)(Holler et al., 2023b). Additionally, a self-reporting questionnaire (SRQ) containing 20 questions was utilized to assess the mental health of the respondents, providing critical insights into the psychological well-being of the adult population(Devision of Mental Health World Health Organization, 1994; Prasetio et al., 2022; *SRQ Self-Reporting Questionnaire*, n.d.). Furthermore, demographic variables such as age, education, marriage status, and occupation were also measured in the survey to facilitate a good understanding of the population characteristics and their potential influence on mental health outcomes. Data collected from the surveys were subsequently processed and analyzed using the Rank Spearman test and linear regression techniques to identify relationships between variables.

The study received ethical approval from the Ethics Committee of Universitas Dian Nuswantoro, under the registration number 02211/UNIVERSITAS DIAN NUSWANTORO/2024, ensuring compliance with ethical standards throughout the research process.

RESULTS AND DISCUSSION

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Characteristics

Table 1. The characteristics of respondents (n=610)

Variable	Category	f (%)
Gender	Male	236 (38.7)
	Female	374 (61.3)
Age	18-24	240 (39.34)
	25-34	164
	35-44	96 (15.74)
	>44	110 (18.03)
Marriage Status	Single	337 (57.7)
	Married	258 (42.3)
	Widow/widower	15 (2.46)
Education level	No School	3 (0.5)
	Elementary school	14 (2.3)
	Junior High School	26 (4.3)
	Senior High School	202 (33.1)
	Diploma	41 (6.7)
	Bachelor	314 (51.5)
	Master	8 (1.3)
	Doctoral	2 (0.3)
Occupation	Student	241 (39.5)
	Private employees	162 (26.6)
	Housewife	82 (13.4)
	Entrepreneur	57 (9.3)
	Civil Servant	10 (3.3)
	Another	48 (7.9)

The demographic profile can provide valuable insights into the characteristics and potential preferences of the study population. Table 1 shows that the gender distribution is higher in females (61.3%) compared to males (38.7%). In terms of age, the majority of participants fall within the 18-24 age range (39.34%), followed by those in the 25-34 (26.89%), and the older age groups, 35-44 and above 44, are less represented at 15.74% and 18.03%, respectively.

Regarding marital status, the participants are fairly balanced but lean towards being single (57.7%), 42.3% are married, and 2.46% are widows/widowers. The education level data indicates a high level of educational attainment among participants, with over half holding a bachelor's degree (51.5%). Smaller percentages have attained higher education degrees such as a master's (1.3%) or doctoral (0.3%) level.

Occupational data reveals a diverse range of employment statuses. Students are the largest group at 39.5%, indicating a significant proportion of young and potentially academically involved individuals. This is followed by private employees (26.6%), while roles such as housewives (13.4%) and entrepreneurs (9.3%) also contribute notable representation. Smaller groups include civil servants (3.1%), and a minimal representation from police/military personnel (0.2%) and other categories (7.9%).

Table 2 describes the answers to PPLQ questions from respondents, divided into six domains: physical competence (PCo), understanding (Und), motivation (Mot), confidence (Con), physical activity behavior (PAB), and Knowledge (Kno). They show varying perceived physical competency. A notable proportion agree or strongly agree with statements related to muscle power (56.4%) and the ability to lift heavy objects (69.3%). However, fewer respondents believe they can run continuously for 30 minutes or engage in endurance activities, with only around 37.7% feeling confident in these areas. Endurance activities, such as distance running, see moderate agreement (57.6%) but still indicate significant space for improvement in perceived endurance.

Respondents generally have a positive perspective toward understanding the benefits of physical activity. The vast majority see a purpose in regular physical activity (78.7%) and have a high appreciation for people who engage in it regularly (86.1%). There is also strong support for workplace initiatives to promote physical activity (82.9%).

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In the motivation domain, they have high percentages agreeing or strongly agreeing that they plan to be active because of enjoyment (54.2%) and the belief that it is beneficial (85.4%). Many also cite the importance of physical activity as an integral part of life (56.4%) and acknowledge its positive experiences (65.4%).

Physical Literacy

Table 2. The description of the physical literacy domain of respondents

Item	Strongly agree (%)	Agree (%)	Neutral (%)	Dis-agree (%)	Strongly Disagree (%)
Physical Competency (PCo)					
1. I have a lot of muscle power.	13.3	43.1	34.8	7.7	1.1
2. I can run for at least 30 min minutes without stopping.	11.8	25.9	28.7	29.2	4.4
3. It is easy for me to lift heavy objects (e.g., a full beverage crate).	23.1	46.2	19.7	8.5	2.5
4. I would do well in a test of muscle strength.	12.8	41.5	33.0	10.5	2.3
5. I can be physically active for a long period without getting tired.	11.3	32.1	35.1	19.5	2.0
6. I am good at endurance activities (e.g., distance running, aerobics, cycling, swimming, or cross-country skiing).	13.8	43.8	28.7	11.6	2.1
Understanding (Und)					
1. I see a purpose in engaging in physical activity regularly.	29.2	49.5	17.4	2.8	1.1
2. I feel a lot of appreciation for people engaging in regular physical activity.	44.6	41.5	10	1.8	2.1
3. I think initiatives in companies to increase physical activity (e.g., company walking day) make sense.	39.5	43.4	12.1	3.3	1.6
Motivation (Mot)					
"I plan to be physically active on a regular basis in the coming weeks and months …"					
1. … because I simply enjoy it.	13.9	40.3	36.9	7.9	1.0
2. … because the positive consequences are simply worth the effort.	31.5	49.5	17.4	1.3	0.3
3. … because physical activity is simply part of my life.	18.0	38.4	34.3	6.4	3.0
4. … because it is good for me.	34.9	50.5	12.6	1.5	0.5
5. … because it gives me experiences that I wouldn't want to miss.	20.3	45.1	28.7	4.9	1.0
6. … because I have good reasons for it	25.4	47.4	23.0	2.8	1.5
Confidence (Con)					
"I still engage in planned physical activities even if …"					
1. … I am tired.	2.3	21.5	35.1	34.3	6.9
2. … I feel depressed.	3.8	23.6	28.9	35.2	8.5
3. … I am annoyed about something.	3.9	33.0	30.8	26.7	5.6
4. … I can't find anyone to do sports with me.	8.4	32.0	29.0	23.9	6.7
5. … weather is bad.	3.1	17.7	31.0	39.0	9.2
6. … an interesting TV program is running	5.7	25.1	36.1	26.6	6.6

Physical Activity Behavior (PAB)	**mean**	**SD**
1. Doing light physical activities like walking for recreation, exercise, or leisure (minutes per week)	183.57	333.91 (0-3360)
2. Doing vigorous physical activities like aerobics, running, fast cycling, or fast swimming (minutes per week)	89.83	218.71 (0-2940)
3. Doing moderate physical activities like carrying light loads, bicycling at a regular pace, or swimming at ordinary speed (minutes per week)	94.08	238.63 (0-2940)

Knowledge (Kno)	**True (f,%) score 1**	**False (f,%) score 0**
1. Up to what age is muscle strength trainable? [40, 50, 60, 70, 80, 90, ***always***]	178 (29.18)	432 (70.82)
2. According to the physical activity guidelines, at least how many minutes per week should you	24 (3.93)	586 (96.07)

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perform activities that involve a slight increase in breathing and pulse rate (e.g., brisk walking)? [30 min (½ hour), 45 min (¾ hours), 60 min (1 h hour), 75 min (1 ¼ hours), 90 min (1½hours), 120 min (2 h hours), ***150 min (2½ hours)***, 180 min (3 h hours), 240 min (4 h hours)]		
3. Pure strength training (without endurance training) also has health benefits. [***true***, false]	526 (86.23)	84 (13.77)
4. A physically inactive lifestyle increases the risk of suffering the following diseases:		
a. breast cancer	122 (20.00)	488 (80.00)
b. dementia	264 (43.28)	346 (56.72)
c. hypertension	530 (86.89)	80 (13.11)
5. Women need different strength exercises than men to build muscle. [true, ***false***]	109 (17.87)	501 (82.13)
6. Physical activity can improve the course of the following diseases:		
a. diabetes mellitus type II	302 (49.51)	308 (50.49)
b. Parkinson's disease	184 (30.16)	426 (69.84)
c. Joint wear (arthrosis)	448 (73.44)	162 (26.56)
d. Heart failure	332 (54.43)	278 (45.57)
7. Strength training is suitable for losing weight (body fat). [***true***, false]	523 (85.74)	87 (14.26)

Self-confidence in maintaining physical activity despite challenges is moderate. Around 23.8% continue exercising even when tired and a similar percentage (27.4%) when feeling annoyed. Less engagement is noted when facing bad weather (20.8%) or interesting TV programs (30.8%), suggesting external factors significantly affect activity levels.

In terms of behavior, respondents engage in a moderate amount of physical activity weekly. They spend an average of 183.57 minutes on light activities and around 89.83 minutes on vigorous activities, describing engagement across a spectrum of intensities.

Knowledge about physical activity and its benefits varies. While a high percentage understand the health benefits of strength training (86.23%) and the connection between physical inactivity and diseases like hypertension (86.89%), fewer are aware of specific guidelines or the impact of inactivity on diseases such as breast cancer (20.00%). Additionally, misconceptions about gender-specific strength exercises and the impact of physical activity on diseases like diabetes and Parkinson's.

Mental health problem

The mental health problem in this study was measured by the Self-Reporting Questionnaire 20 (SRQ-20), which was developed by the World Health Organization (WHO) as a tool to screen for mental health problems in primary healthcare settings. It was designed to identify common mental disorders, such as depression and anxiety, among adults, allowing for early detection and intervention. The SRQ-20 consists of 20 yes/no questions related to emotional distress and somatic symptoms, making it a straightforward and quick screening instrument that can be used by healthcare providers who may not specialize in psychiatry (Devision of Mental Health World Health Organization, 1994; Prasetio et al., 2022; *SRQ Self-Reporting Questionnaire*, n.d.). It is commonly used for mental health screening in Indonesia.

Table 3. The description of the mental health problem measured by SRQ-20

Items	Yes	
	f	%
1. Do you often have headaches?	247	40.49
2. Is your appetite poor?	135	22.13
3. Do you sleep badly?	231	37.87
4. Are you easily frightened?	123	20.16
5. Do you feel nervous, tense, or worried?	178	29.18
6. Do your hands shake?	101	16.56
7. Is your digestion poor?	125	20.49
8. Do you have trouble thinking clearly?	156	25.57

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Items	Yes	
	f	%
9. Do you feel unhappy?	92	15.08
10. Do you cry more than usual?	81	13.28
11. Do you find it difficult to enjoy your daily activities?	92	15.08
12. Do you find it difficult to make decisions?	150	24.59
13. Is your daily work suffering?	71	11.64
14. Are you unable to play a useful part in life?	77	12.62
15. Have you lost interest in things?	78	12.79
16. Do you feel that you are a worthless person?	71	11.64
17. Has the thought of ending your life been on your mind?	34	5.57
18. Do you feel tired all the time?	121	19.84
19. Do you have uncomfortable feelings in your stomach?	110	18.03
20. Are you easily tired?	201	32.95

Table 3 reveals several key findings regarding mental health concerns in this population. The most prevalent symptoms were headaches (40.49%) and feelings of being easily tired (32.95%), indicating a significant number of individuals experiencing physical manifestations of stress or mental distress. Additionally, issues like sleeping poorly (37.87%) and feeling nervous or worried (29.18%) are also common among the respondents.

While less frequent, symptoms such as a poor appetite (22.13%), trouble thinking clearly (25.57%), and feelings of unhappiness (15.08%) are noteworthy, reflecting emotional distress and potential signs of mood disorders within the population. The data also shows a concerning, number of individuals reporting suicidal thoughts (5.57%).

Table 4. The Descriptive Statistics of the PPLQ and SRQ-20

Variable	Mean	SD	Min	Max	Skew	Kurt
Physical Literacy	65.02	11.01	24.69	95.87	-0.05	-0.09
Physical Competencies	69.63	15.19	20	100	-0.09	0.05
Understanding	82.88	15.23	20	100	-0.13	2.69
Motivation	75.99	13.24	20	100	-0.16	0.45
Confidence	57.82	14.79	20	100	-0.09	0.12
Physical Activity Behavior	55.40	37.25	0.00	100	-0.13	-1.49
Knowledge	48.39	16.26	16.67	100	0.77	0.11
Mental health	4.05	4.54	0.00	20.00	1.31	1.07

Physical Literacy Questionnaire (PPLQ) and mental health scores provide valuable insights into the participants' capabilities and psychological status. The physical literacy average score is 65.02, reflecting a moderate level of physical literacy among participants, indicating varied engagement and competencies in physical activities. The analysis of subdomains reveals that participants have a strong understanding (mean score of 82.88) and motivation (mean score of 75.99) towards physical activities, which suggests a general appreciation and internal drive to engage in such activities. Conversely, knowledge scores, with a mean of 48.39, suggest potential gaps. In terms of mental health, the average score of 4.05 coupled with a positive skew indicates that while many participants experience low levels of psychological distress, some individuals with significantly higher distress levels need attention, such as 5.57%of respondents reporting suicidal thoughts (table 3 number 17).

Table 5. Correlation between age, education, physical literacy and mental health

Independent variable:	Dependent variable: mental health	
	Coefficient correlation	p-value
Age	-0.33*	0.000
Education	0.15*	0.000
Physical Literacy	-0.17*	0.000
Physical Competencies	-0.33*	0.000
Understanding	-0.01	0.747

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Motivation	-0.09*	0.030
Confidence	-0.03	0.414
Physical Activity Behavior	-0.07	0.074
Knowledge	-0.10*	0.010

Table 5 shows that age, education, and physical literacy are correlated to mental health. Particularly in physical literacy, the three domains, namely physical competency, motivation, and knowledge have a significant correlation to mental health. Physical Competency has a significant negative association, indicating that increased physical abilities are associated with better mental health. Knowledge about physical activity also correlates negatively, suggesting that better-informed individuals tend to have better mental health outcomes. Motivation shows a smaller yet significant correlation, implying that the internal drive to engage in physical activity may enhance mental health. Although Understanding, Confidence, and Physical Activity Behavior have weaker correlations, they still contribute to the overall picture of how physical literacy impacts mental health. These cumulative findings suggest that improvements across these domains of physical literacy could collectively foster better mental health outcomes. Thus, interventions focusing on enhancing physical competencies and knowledge, while also fostering motivation, could be effective strategies for mental health promotion. The composite influence of these domains underscores the importance of a holistic approach to advancing physical literacy as a means of supporting mental health.

Mental health issues are a global issue that is important to pay attention to. Nearly one billion individuals across the globe are affected by various mental disorders, ranging from addiction and dementia to schizophrenia. Two of the most prevalent conditions, anxiety, and depression, significantly impact global productivity, causing huge economic losses that highlight the urgent need for effective interventions and policies to address mental health challenges worldwide.(Moitra et al., 2023; The Lancet Global Health, 2020)

This study found that the average mental health score in SRQ-20 items indicates low to moderate distress levels, but some respondents exhibit significant psychological issues, including suicidal ideation that need. Physical literacy was revealed as a significant predictor of mental health. Adolescents and children who have higher physical literacy tend to enjoy better mental health.(Bell et al., 2019b; Fortnum et al., 2018b; Ma et al., 2021; United Nations, 2024) In the adult population, this study revealed the correlation between physical literacy and some domains such as knowledge, physical competency, and motivation. The negative correlation between physical literacy and mental health issues, suggests that enhancing physical literacy can lead to better mental health outcomes.

The study underscores the importance of a comprehensive approach to improving physical literacy as a pathway to better mental health. Interventions aimed at enhancing physical competency, expanding knowledge, and building motivation might enhance mental health outcomes. Recognizing the influence of these domains calls for holistic, integrated strategies bridging physical health and psychological well-being, thereby supporting the broader goals of health promotion in line with the SDGs.

A recent study on university students linked physical literacy with mental factors and discovered the mediating role of resilience in the relationship between physical literacy and mental health.(Ma et al., 2021) The higher physical activity levels are associated with increased psychological well-being.(Granero-Jiménez et al., 2022) Therefore, it advocates for enhancing physical literacy at universities as part of a comprehensive strategy to bolster the well-being and mental health of undergraduates.(Ma et al., 2021)How to encourage physical activity? Motivation plays a crucial role in physical activity, with intrinsic motivation identified as the most critical factor for starting and maintaining exercise. Men were primarily motivated by enjoyment and competition, while women prioritized physical appearance and social relationships.(Granero-Jiménez et al., 2022)

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CONCLUSION

This study provides an initial picture that physical literacy is correlated with mental health and requires follow-up to develop physical literacy programs, especially in urban communities. Given that physical literacy research related to mental health in urban adults is still rare, it is necessary to look at various settings and analyse demographic factors in depth to develop appropriate programs to improve physical literacy.

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