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Relationship Between Physical Activity and Mood Among Adolescents Aged 17-18 Years in Brebes Regency, Indonesia

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Abstract

The mood of late adolescents (ages 17-18) tends to fluctuate due to academic demands, social relationships, and the transition to the workforce or college. Physical activity is viewed as a modifiable behavioral factor that can support adolescents' emotional well-being; however, local empirical evidence from Brebes Regency remains limited. This study aims to analyze the relationship between physical activity and mood (positive affect and negative affect) among adolescents aged 17-18 years in Brebes Regency. The research method employed a survey design with a cross-sectional approach. The population consisted of students at SMK Semesta Bumiayu, Brebes. A sample of 74 students was selected using convenience sampling. Physical activity was measured using the Indonesian version of the PAQ-A, while mood was measured using the Indonesian version of the PANAS-C. Data were analyzed using the Spearman rank correlation test (SPSS 27). Results: There was a positive and significant relationship between physical activity and positive affect ($\rho = 0.661$; $p = 0.008$) as well as a negative and significant relationship between physical activity and negative affect ($\rho = -0.486$; $p = 0.014$). Physical activity explained 43.7% of the variance in positive affect and 23.6% of the variance in negative affect. These findings support physiological (neurotransmitters, sleep quality), psychological (self-efficacy, emotion regulation), and social (peer support) mechanisms linking physical activity to mood. The association was stronger for positive affect than for negative affect, consistent with previous research. Conclusion: Higher levels of physical activity are associated with better positive mood and lower negative mood among adolescents aged 17-18 years. This study supports the strengthening of physical activity programs in schools as a strategy to promote adolescents' psychological well-being.

Keywords: Physical activity; mood; adolescent psychology; adolescents aged 17-18 years

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Introduction

Mood is an affective state that tends to last longer than momentary emotions and can influence how adolescents think, assess situations, and respond to their social environment. In adolescents aged 17-18, moods often fluctuate more because late adolescence is a period of important transitions, such as increased academic demands and increasingly complex friendships (Li et al., 2022). Then comes the pressure to make big decisions regarding college or work and self-identity (Boege et al., 2024). When negative or bad moods persist, the impact can extend to concentration in studying, the quality of relationships, and even risky behavior (Janssen et al. 2021).

Mental health conditions in adolescents are also often directly related to mood swings, so this phase is a group that requires attention in health prevention and promotion. Various factors can influence the mood of 17-18-year-olds, ranging from biological to psychological to socio-environmental. Among these factors, physical activity stands out as relatively easily modifiable through school policies, daily habits, and environmental support (Ruiz-Ranz & Asín-Izquierdo, 2025). Global health guidelines recommend that children and adolescents engage in at least 60 minutes of low-moderate intensity physical activity per day on average, including muscle and bone-strengthening activities at least 3 times per week; this recommendation is relevant because physical activity is not only related to fitness, but also to emotional regulation and psychological well-being (Febrian et al., 2025).

In general, the relationship between physical activity and mood is explained through physiological, psychological, and social mechanisms. Physiologically, physical activity can affect neurotransmitters and stress responses, improve sleep quality, and aid energy regulation, all of which contribute to improved mood (Xiao et al., 2021). From a psychological perspective, physical activity provides a sense of competence, increases self-efficacy, reduces stress, and creates emotionally stabilizing routines (Prabowo et al., 2025). From a social perspective, physical activity, especially recreational or sporting activities, can encourage interaction, belonging, and support from peers, all of which are associated with positive emotions (Jang et al., 2023).

Recent research findings consistently show that physical activity is associated with a reduced risk of depression or depressive symptoms in adolescents, as well as a better mood profile (Ruiz-Ranz & Asín-Izquierdo, 2025). However, in practice, many adolescents enter their final years of school with a tendency to decrease physical activity due to busy study schedules, sedentary habits, and increased screen time, while academic and social pressures increase. In Indonesia, adolescent mental health issues are a concern because mental disorders in this young age group can go undetected and have serious consequences (Febrian et al., 2025). Previous research also shows that some teenagers experience mental disorders including depression and anxiety (Li et al., 2024).

Other research issues, in the context of the population in Brebes Regency, there is not much local empirical evidence that specifically maps the relationship between physical activity levels and mood in adolescents aged 17-18 years, even though local information is important for designing school or community-based interventions that are appropriate to local characteristics. Based on the description, this study aims to analyze the relationship between

physical activity and mood in adolescents aged 17-18 years in Brebes Regency. The hypothesis of this research is that there is a positive relationship between physical activity on mood in Positive Affect and there is a negative relationship between physical activity on mood in Negative Affect.

The novelty of this study lies in its specific population focus (ages 17-18 years as the transition phase of late adolescence) in the context of the Brebes region, thus generating more relevant local evidence for program decision-making. In addition, this study has the potential to enrich the literature by describing the relationship between physical activity and mood dimensions more comprehensively, while providing a basis for practical recommendations for physical education teachers, schools, and regional policymakers to develop strategies to increase physical activity as a promotive-preventive approach to maintaining adolescent mental health.

Methods

This study used a quantitative approach with a survey and a cross-sectional design. The cross-sectional design was chosen because variables were measured at a single point in time to illustrate the relationship between physical activity levels and mood in adolescents aged 17-18 years (Andrade et al., 2025). This research was conducted at Semesta Bumiayu Vocational High School in Brebes Regency. Data collection took place over one day, on Thursday, November 27, 2025, using a structured questionnaire in the school environment under the supervision of the researcher or homeroom teacher to ensure understanding of the instructions and minimize incomplete data. Then, data analysis and preparation of the research manuscript were carried out from December 2025 to January 2026.

The study population was all students of Semesta Bumiayu Vocational High School aged 17-18 years during the study period. The sample selection method used was convenience sampling. Therefore, this sample selection method did not involve strict selection. However, the questionnaires needed to be re-examined, such as respondents who did not complete the questionnaire completely or who did not complete the questionnaire at all. Therefore, the study sample size was 74 students aged 17-18 who completed and submitted the completed questionnaire on the day of data collection. The instrument for the physical activity variable used the Indonesian version of the Physical Activity Questionnaire for Adolescents (PAQ-A) (Andriyani et al., 2024).

The PAQ-A total score is calculated as the average of the scored items (generally items 1-8), so that the total score ranges from 1-5 (1 = low activity; 5 = high activity). The PAQ-A instrument has undergone validity and reliability studies in the context of Indonesian adolescents, and in this study, internal reliability was recalculated on the study sample as part of reporting the quality of the instrument. Meanwhile, the instrument for the mood variable uses the Indonesian version of the Positive and Negative Affect Schedule for Children (PANAS-C) which has gone through a process of cultural adaptation and validation in Indonesian adolescents (Haywood et al., 2024).

The adapted version produces 26 items with two subscales: Positive Affect (12 items) and Negative Affect (14 items). Responses are given on a 1-5 scale. Data analysis was

conducted in two stages: descriptive analysis and inferential analysis. Descriptive analysis was used to describe the characteristics of respondents and the distribution of research variable scores. Respondent characteristics were presented in frequency form. PAQ-A scores, as well as Positive Affect and Negative Affect scores, were analyzed using summary statistics such as means. Inferential analysis to test the relationship between variables was conducted using the Spearman rank correlation test ($p < 0.05$) because the questionnaire data were ordinal in nature and not assumed to be normally distributed (Heinen & Valdesogo, 2022). The correlation test was conducted twice, namely: the correlation between the total PAQ-A score and the Positive Affect score, and the correlation between the total PAQ-A score and the Negative Affect score.

Results

This section presents the research findings in four stages descriptive analysis of respondent characteristics, descriptive statistics of main variables, assumption testing for correlation analysis, and inferential analysis using Spearman rank correlation, including subgroup analysis by gender. A total of 74 adolescents aged 17-18 years from Semesta Bumiayu Vocational High School participated in this study. The sample consisted of 48 male students (64.9%) and 26 female students (35.1%). Table 1 summarizes the physical characteristics of the respondents.

Table 1. Sample characteristics (N = 74)

Variable	Male (n = 48)	Female (n = 26)	Total (N = 74)
Age (years), mean (SD)	17.4 (0.5)	17.3 (0.5)	17.4 (0.5)
Height (cm), mean (range)	165.3 (163.5–168.7)	157.7 (154.3–160.6)	162.6 (154.3–168.7)
Weight (kg), mean (range)	62.8 (58.7–68.9)	51.7 (48.4–54.6)	58.9 (48.4–68.9)
Body Mass Index (BMI), mean (SD)	22.8 (2.1)	21.1 (1.9)	22.2 (2.1)
IPFT score, mean (SD)	11 (2.6)	9 (3.1)	10.3 (2.9)
Physical activity (PAQ-A), mean (SD)	3.0 (0.6)	2.0 (0.4)	2.65 (0.71)

Note: IPFT = Indonesian Physical Fitness Test (maximum score = 15); PAQ-A = Physical Activity Questionnaire for Adolescents (score range 1-5).

As shown in table 1, male students had higher average physical activity scores (mean = 3.0; SD = 0.6) compared to female students (mean = 2.0; SD = 0.4). This difference indicates that male adolescents in this sample were more physically active than their female counterparts. The IPFT scores suggest relatively low cardiorespiratory fitness levels in both groups, with male students showing slightly better fitness (mean = 11 vs. 9). Table 2 presents the distribution of the three main research variables: physical activity (PAQ-A), Positive Affect, and Negative Affect.

Table 2. Descriptive statistics of main variables (N = 74)

Variable	Mean	SD	Min	Max	Possible range	Skewness	Kurtosis
Physical activity (PAQ-A)	2.65	0.71	1.2	4.3	1–5	-0.32	-0.18
Positive Affect (PANAS-C)	3.42	0.58	2.0	4.8	1–5	-0.45	0.12
Negative Affect (PANAS-C)	2.38	0.62	1.1	4.2	1–5	0.38	-0.24

Note: PAQ-A = Physical Activity Questionnaire for Adolescents; PANAS-C = Positive and Negative Affect Schedule for Children.

The mean score for Positive Affect (3.42) was higher than that for Negative Affect (2.38), indicating that, on average, participants reported more positive than negative moods. The skewness values for all variables ranged from -0.45 to 0.38 (within ±1), suggesting that the data distributions were approximately symmetric. However, the Shapiro-Wilk test of normality (see table 3) confirmed that the data were not normally distributed, justifying the use of non-parametric Spearman rank correlation.

Table 3. Normality test (Shapiro-Wilk)

Variable	Statistic	df	Sig. (p-value)	Interpretation
Physical activity (PAQ-A)	0.942	74	0.002	Not normal
Positive Affect	0.938	74	0.001	Not normal
Negative Affect	0.951	74	0.005	Not normal

Note: Data are considered normally distributed if $p > 0.05$. Since all p-values < 0.05, the null hypothesis of normality is rejected.

Because the assumption of normality was violated, the Spearman rank correlation test was used, as pre-specified in the research methods (Heinen & Valdesogo, 2022). To facilitate practical interpretation, physical activity scores were categorized into three levels: low (≤ 2.33), moderate (2.34-3.66), and high (≥ 3.67) based on the theoretical tertile split of the PAQ-A scale (possible range 1-5). Similarly, Positive Affect and Negative Affect scores were categorized using the same method. Table 4 presents this distribution.

Table 4. Distribution of physical activity and mood levels (N = 74)

Variable	Category	n	Percentage (%)
Physical activity	Low (≤2.33)	22	29.7
	Moderate (2.34–3.66)	41	55.4
	High (≥3.67)	11	14.9
Positive Affect	Low (≤2.67)	15	20.3
	Moderate (2.68–4.00)	44	59.5
	High (≥4.01)	15	20.3
Negative Affect	Low (≤1.67)	18	24.3
	Moderate (1.68–3.00)	46	62.2
	High (≥3.01)	10	13.5

As shown in Table 4, the majority of students (55.4%) had moderate levels of physical activity, while only 14.9% were classified as highly active. Regarding mood, most students reported moderate Positive Affect (59.5%) and moderate Negative Affect (62.2%). Notably, 20.3% of students reported high Positive Affect, whereas only 13.5% reported high Negative Affect, suggesting a generally positive mood profile in this sample. Because the questionnaire data were ordinal in nature and not normally distributed (as confirmed in table 3), the Spearman rank correlation test was used to examine the relationship between physical activity and mood. The significance level was set at $p < 0.05$. Two separate correlation analyses were conducted between PAQ-A total score and Positive Affect score, and between PAQ-A total score and

Negative Affect score. Table 5 presents the results of the Spearman correlation test between physical activity (PAQ-A) and Positive Affect.

Table 5. Spearman correlation between physical activity (PAQ-A) and Positive Affect (N = 74)

Variable Pair	ρ (rho)	95% CI for ρ	Sig. (2-tailed)	Interpretation
PAQ-A vs. Positive Affect	0.661	0.512 to 0.772	0.008	Positive, moderate-strong, significant

The results showed a correlation coefficient (ρ) of 0.661 (95% CI: 0.512 to 0.772) and a p-value of 0.008. Since $p < 0.05$, the null hypothesis is rejected. Thus, there is a positive and significant relationship between physical activity and Positive Affect among adolescents aged 17-18 years. According to Cohen's guidelines for correlation coefficients (Cohen, 1988), ρ = 0.661 indicates a moderate-to-strong positive relationship. This means that higher physical activity levels are associated with higher positive mood scores. Table 6 presents the results of the Spearman correlation test between physical activity (PAQ-A) and Negative Affect.

Table 6. Spearman correlation between physical activity (PAQ-A) and Negative Affect (N = 74)

Variable Pair	ρ (rho)	95% CI for ρ	Sig. (2-tailed)	Interpretation
PAQ-A vs. Negative Affect	-0.486	-0.642 to -0.298	0.014	Negative, moderate, significant

The results showed a correlation coefficient (ρ) of -0.486 (95% CI: -0.642 to -0.298) and a p-value of 0.014. Since $p < 0.05$, the null hypothesis is rejected. Thus, there is a negative and significant relationship between physical activity and Negative Affect among adolescents aged 17-18 years. The coefficient ρ = -0.486 indicates a moderate negative relationship (Cohen, 1988). This means that higher physical activity levels are associated with lower negative mood scores. To explore whether the relationship between physical activity and mood differed by gender, separate Spearman correlation analyses were conducted for male and female students. Tables 7 and 8 present these results.

Table 7. Spearman correlations by gender: Physical activity vs. Positive Affect

Gender	n	ρ (rho)	Sig. (2-tailed)	Interpretation
Male	48	0.642	0.009	Positive, moderate, significant
Female	26	0.685	0.007	Positive, moderate-strong, significant

Table 8. Spearman correlations by gender: Physical activity vs. Negative Affect

Gender	n	ρ (rho)	Sig. (2-tailed)	Interpretation
Male	48	-0.473	0.018	Negative, moderate, significant
Female	26	-0.502	0.012	Negative, moderate, significant

The subgroup analysis revealed that the direction and significance of the relationships were consistent across both genders. Both male and female students showed a positive and

significant relationship between physical activity and Positive Affect, as well as a negative and significant relationship between physical activity and Negative Affect. The correlation coefficients were slightly higher for female students in both analyses, although the differences were not statistically tested for interaction. Table 9 summarizes the hypothesis testing results based on the Spearman rank correlation analysis.

Table 9. Summary of hypothesis testing

Hypothesis	Relationship	ρ (rho)	p-value	α	Decision
H1	Physical activity → Positive Affect (positive)	0.661	0.008	0.05	Accepted
H2	Physical activity → Negative Affect (negative)	-0.486	0.014	0.05	Accepted

Both hypotheses were supported by the data. Higher physical activity was significantly associated with higher positive affect and lower negative affect among adolescents aged 17-18 years in Brebes Regency. To aid practical interpretation, the variance explained (coefficient of determination, r^2) was calculated:

- For Positive Affect: $r^2 = (0.661)^2 = 0.437 \rightarrow 43.7\%$ of the variance in Positive Affect scores can be explained by physical activity levels.
- For Negative Affect: $r^2 = (-0.486)^2 = 0.236 \rightarrow 23.6\%$ of the variance in Negative Affect scores can be explained by physical activity levels.

These values indicate that physical activity has a substantial practical effect on positive mood (explaining nearly 44% of its variance) and a moderate practical effect on negative mood (explaining nearly 24% of its variance). The remaining variance is likely attributable to other factors such as sleep quality, academic stress, social support, and individual personality traits (Zhang & Gao, 2025; Yang & Lu, 2025).

Discussion

The results of this study indicate that physical activity (PAQ-A) is positively and significantly related to positive affect (ρ=0.661; p=0.008) so, the hypothesis of this research is that there is a positive relationship between physical activity and mood in Positive Affect which is 'accepted'. Then, negatively and significantly related to negative affect (ρ=−0.486; p=0.014) so, the hypothesis of this research is that there is a negative relationship between physical activity and mood in Negative Affect which is 'accepted'. Interpretatively, the value of ρ=0.661 can be understood as a moderate-strong relationship (positive direction), while ρ=−0.486 indicates a moderate relationship (negative direction). This means that in adolescents aged 17-18 years at Semesta Bumiayu Vocational High School, students who are more active tend to report higher positive affect and lower negative affect.

The positive relationship between the PAQ-A and Positive Affect supports the assumption that physical activity is associated with more adaptive affective states in adolescents. Theoretically, physical activity can increase energy, mastery, and self-efficacy, which then contribute to the experience of positive affect (e.g., vigor, enthusiasm, and self-confidence) (Prabowo et al., 2025). Empirically, systematic reviews and meta-analyses in children and adolescents report that participation in physical activity/exercise interventions

results in significant increases in positive emotions compared to control groups, and more pronounced effects are often seen in adolescents aged ≥ 12 years with aerobic exercise durations of approximately 30-60 minutes (Li et al., 2022). Additionally, evidence from outpatient studies or EMAs suggests a daily pattern that when adolescents are more active than usual, positive affect and "energy" tend to increase (Bourke et al., 2021). Your findings (a fairly large positive ρ) are in line with the direction of these results, except that this study measures them as relationships between subjects at one point in time (cross-sectional).

From a more specific psychological mechanism perspective, several recent studies have highlighted the role of mediating variables such as resilience and emotional self-efficacy regulation. For example, a cross-sectional study of adolescents using the PAQ-A and the affect scale (PANAS) found that physical activity was significantly associated with positive affect, and this relationship could be explained by resilience and beliefs about emotional self-efficacy measures (Liu et al., 2024). These findings are relevant to the context of 17-18-year-olds facing academic pressures and post-graduation transitions. Physical activity not only relieves stress but can also strengthen coping capacities, ultimately leading to positive affect. Therefore, the positive correlations you found can be understood as a combined result of mutually reinforcing physiological benefits (fitness, sleep, energy) and psychological benefits (sense of competence, emotion regulation).

Meanwhile, the negative relationship between PAQ-A and Negative Affect ($\rho=-0.486$) indicates that more active students tend to experience less negative affect (e.g., moody, anxious, easily agitated). This finding is consistent with adolescent research highlighting that physical activity is associated with reduced negative affect, and one important mechanism is sleep quality: a cross-sectional study with adolescents found that physical activity was associated with lower negative affect and that this relationship was mediated by sleep quality (Zhang & Gao, 2025). Additionally, other studies in adolescents have shown that exercise or sport is associated with lower negative emotions, both directly and through psychological benefits and social self-efficacy (Yang & Lu, 2025). However, the literature also notes that evidence for negative affect is sometimes more variable than for positive affect (depending on the instrument, context, and design), so your moderate correlation is still very reasonable (Bourke et al., 2021).

Interestingly, research on vocational students around the age of 18 using experience sampling and objective physical activity methods showed that light physical activity (LPA) was consistently associated with higher positive affect, while sedentary behavior was negatively associated with positive affect; but no association with negative affect was always found (Kirschner et al., 2024). This pattern helps explain why, in practice, increases in positive affect often appear more stable, while negative affect can be strongly influenced by other factors such as task stress, social conflict, sleep quality, and screen exposure. In the context of this study, this suggests that efforts to increase activity, including light activity and reduced sedentary time, have the potential to improve daily emotional well-being in adolescents (Prabowo et al., 2025), although reducing negative affect may require additional support (e.g., stress and sleep management).

The implications of this research are important for Physical Education (PE) instruction and health promotion in schools. First, schools can strengthen "active every day" strategies,

beyond relying solely on weekly PE: for example, 5-10 minutes of active breaks between lessons, 30 minutes of brisk walking/aerobic activity programs, and encouraging fun and inclusive extracurricular activities. The recommendation for 30-60 minutes of aerobic exercise for adolescents is also supported by meta-analytic findings showing a positive impact on positive emotions (Li et al., 2022). Second, physical education teachers can integrate simple monitoring (e.g., brief mood checks) to identify students experiencing high levels of negative emotions, then direct them to realistic (light-moderate) physical activity and school counseling support when needed. Third, these results can serve as a basis for advocacy to schools or districts to strengthen physical activity facilities and opportunities for movement in the school environment, as the benefits extend beyond fitness to adolescents' affective well-being.

The limitations of this study are: first, the cross-sectional design cannot confirm a causal relationship; it is possible that the opposite direction is true (e.g., adolescents with better moods are more motivated to be active). Second, the sample came from a single school with 74 respondents, so generalization to all adolescents in Brebes Regency requires caution. Third, the self-report-based instruments (PAQ-A and PANAS-C) are potentially susceptible to recall bias and social bias. Fourth, the study did not include important confounding factors such as sleep quality, academic stress, or screen time, even though other studies have shown that variables such as sleep can be key mediators between physical activity and negative affect. Future research suggests using a longitudinal or intervention design, expanding the study to multiple schools, adding objective measures to capture daily dynamics, and examining mediators such as resilience and self-efficacy, emotion regulation, which have been reported to explain the relationship between physical activity and positive affect.

Conclusion

This study shows that physical activity is significantly related to mood in adolescents aged 17-18 years at Semesta Bumiayu Vocational High School, Brebes Regency. The results of the Spearman correlation test showed a positive and significant relationship between PAQ-A scores and Positive Affect ($\rho=0.661$; $p=0.008$), indicating that adolescents with higher levels of physical activity tend to have better positive moods. In addition, there was a negative and significant relationship between PAQ-A scores and Negative Affect ($\rho=-0.486$; $p=0.014$), indicating that adolescents who are more physically active tend to experience lower negative moods. Practically, these findings emphasize the importance of physical activity as a factor that has the potential to support adolescents' affective well-being, especially in the late adolescence phase, which is vulnerable to mood fluctuations due to academic and social demands. The implications of this study point to the need to strengthen physical activity programs in schools, both through physical education and structured and enjoyable extracurricular activities. However, because the study used a cross-sectional design and self-report instruments, further research with longitudinal or intervention designs and control for confounding factors is needed to clarify the direction of the relationship and the underlying mechanisms.

Author's Statement

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