

ORIGINAL ARTICLE

ASSOCIATION BETWEEN PHYSICAL ACTIVITY AND MENTAL HEALTH AMONG SCHOOL GOING ADOLESCENTS IN DHULIKHEL: A CROSS-SECTIONAL STUDY

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**ABSTRACT****Introduction:** Physical activity (PA) is important for both physical and mental health. However, many adolescents face mental health problems due to academic pressure, increased screen time, and lack of physical activity. The aim of the study was to find out the association between of physical activity and the presence of depression, anxiety, and stress among school adolescents in Dhulikhel.**Materials and Methods:** A cross-sectional study was conducted among 384 students aged 14–19 years from four schools in Dhulikhel using convenience sampling. Physical activity was measured using MVPAQ-A, and mental health was assessed using DASS-Y. Data was analyzed using SPSS version 25.**Results:** Among 384 adolescents, the mean age was 15.08 ± 1.09 years, with 50.8% females and 49.2% males. Most adolescents had normal mental health status (depression: 80.2%, anxiety: 74.7%, and stress: 83.3%), while 68.2% had moderate physical activity. Physical activity was significantly associated with depression ($\chi^2(6) = 21.813, p=0.001$), anxiety ($\chi^2(8)=22.149, p=0.005$), and stress ($\chi^2(6)=28.331, p<0.001$). Higher physical activity levels were associated with better mental health outcomes among adolescents.**Conclusion:** Higher physical activity was linked to better mental health among adolescents. Schools and public health programs should encourage regular physical activity to improve mental well-being. Further studies are needed to understand long-term effects and effective interventions.**Keywords:** Anxiety, Depression, Health Promotion, Mental health, School Students, Sedentary Behavior, Stress**INTRODUCTION**

Mental health is defined as a state of well-being in which individuals recognize their abilities, cope effectively with normal life stressors, work productively, and contribute to their communities.¹ Adolescence represents a critical developmental period characterized by rapid biological, psychological, and social changes, increasing vulnerability to mental health problems. Academic pressure, peer influence, excessive screen time, and sedentary lifestyles further heighten this risk.^{2,3} Promoting protective factors during this stage is therefore essential.

Physical activity (PA) is widely recognized as a key determinant of both physical and mental health and supports holistic adolescent development.² The World Health Organization (WHO) recommends that adolescents aged 10–19 years engage in at least 60 minutes of moderate-to-vigorous intensity aerobic

physical activity daily, along with muscle-strengthening activities at least three times per week.³ Despite these recommendations, global estimates indicate that one in eight adolescents experiences a mental disorder, accounting for approximately 12.5% of the global burden of disease.² In Nepal, the National Mental Health Survey 2020 reported that 5.2% of adolescents have diagnosed mental health disorders, while studies among high school students reveal a high prevalence of depressive symptoms (56.5%), stress (32.9%), and anxiety (24%).^{4,5}

Evidence suggests that regular PA contributes to improved psychological well-being by reducing symptoms of depression and anxiety, enhancing coping skills, and improving problem-solving abilities. Physiologically, PA stimulates the release of endorphins and other neurotransmitters associated with positive mood and

supports regulation of the hypothalamic pituitary adrenal (HPA) axis, thereby reducing stress responses.⁶ Furthermore, better psychosocial well-being has been associated with improved academic performance, whereas poor mental health is linked to lower grades and increased absenteeism.⁷

Mental health problems during adolescence can negatively affect academic performance, relationships, emotional development, and overall quality of life. Studies among school-going adolescents in Nepal have reported the presence of depression, anxiety, and stress symptoms, highlighting the need for early identification and preventive strategies.

In Nepal, increasing academic competition, examination pressure, changing family and social environments, and digital technology use have contributed to concerns regarding adolescent psychological well-being. Previous studies conducted among secondary and high school students have identified depression, anxiety, and stress as important public health concerns among Nepalese adolescents. Research from Kathmandu and other urban areas has assessed these mental health conditions using standardized tools such as the Depression, Anxiety and Stress Scale (DASS), demonstrating that school-based mental health assessment is important for early intervention.⁸

Although the mental health benefits of PA are well established, many Nepalese adolescents do not meet recommended activity levels, potentially compromising both their psychological well-being and academic outcomes. Therefore, this study aims to examine the association between physical activity and mental health among school-going adolescents in Dhulikhel.

MATERIAL AND METHODS

Study Design

This cross-sectional study was conducted among school-going adolescents aged 14–19 years in Dhulikhel from June 2024 to January 2025, involving four secondary schools: Purna Sanjiwani Lankhanamai Secondary School, Dhulikhel Emmanuel English Boarding School, Dhulikhel High School, and Mount View Boarding School.

Sampling and sample Size calculation

A total of 384 participants were included, with the sample size determined using $N = Z^2pq/d^2$ Cochran's formula, $N = Z^2pq/d^2$ where, $Z=1.96$ p =proportion (0.5) $q=1-p$ e =error (0.05), and participants were recruited through stratified random sampling methods, 96 students were taken from four different schools.

Data collection methods and tools

Data were collected using a structured questionnaire comprising three sections: Section A screened participants based on predefined eligibility criteria, Section B gathered socio-demographic information such as age, gender, occupation, education level, ethnicity, and comorbidities, and Section C assessed physical activity using the Modified Version of the Physical Activity Questionnaire for Adolescents (MVPAQ-A) and mental health using the Depression, Anxiety, and Stress Scale for Youth (DASS-Y). Modified version of the Physical Activity Questionnaire for Adolescents (MVPAQ-A), a self-administered 7-day recall instrument designed for adolescents aged 14–19 years. The questionnaire consists of eight items scored on a 5-point Likert scale. The overall PAQ-A score was calculated as the mean of the eight items, yielding a summary score ranging from 1 to 5, where higher scores indicate greater levels of physical activity. A score of 1 represents low physical activity, while a score of 5 represents high physical activity. MVPAQ-A demonstrated good test–retest reliability, with an intraclass correlation coefficient (ICC) of 0.78. Construct validity showed moderate correlations with the International Fitness and Inactivity Scale (IFIS; $r = 0.35$) and the Physical Activity and Sedentary Behavior Evaluation Scale (PASES; $r = 0.32$), indicating acceptable validity of the instrument. Depression, Anxiety, and Stress Scale–Youth (DASS-Y), a 21-item self-report questionnaire comprising three subscales: depression, anxiety, and stress, with seven items each. Items are rated on a 4-point Likert scale (0–3). Scores for each subscale are obtained by summing the respective items, with higher scores indicating greater levels of depression, anxiety, or stress. DASS-Y demonstrated good internal consistency, with Cronbach's alpha values of 0.89 for depression, 0.84 for anxiety, and 0.84 for stress. The scale also exhibited strong discriminant validity, with findings indicating superior discriminant validity compared to the DASS-21.

Ethical approval

Ethical approval was obtained from IRC-KUSMS (199/24), along with permission from school principals. Parents were informed about the study and gave written assent. Adolescents aged 14–19 who understood English were included. Those unwilling, Lower and upper limb fracture/trauma preceding 3 months were excluded.

Data analysis

Data were analyzed using SPSS version 25. Descriptive statistics were used, and the Chi-square test examined the association between physical activity and mental health.

RESULTS

Table 1: Demographic characteristics

Variables	N(%)
Age (Mean± S.D)	
15.08± 1.088	
14-16	273(71.1%)
17-19	111(28.9%)
Total	384(100%)
Gender	
Female	195(50.8%)
Male	189(49.2%)
Total	384(100%)
Ethnicity	
Tamang	97(25.3%)
Chhetri	94(24.5%)
Brahmin	50(13%)
Newar	82(21.4%)
Rai/Limbu	8(2.1%)
Dalit	49(12.8%)
Others	4(1%)
Total	384(100%)

A total of 384 adolescents aged 14–19 years participated in the study, with a mean age of 15.08 ± 1.09 years. There was an almost equal gender distribution, with 195 females (50.8%) and 189 males (49.2%) For ethnicity, the largest groups were Tamang (25.3%), Chhetri (24.5%), and Newar (21.4%). Brahmin (13%) and Dalit (12.8%) were also represented, while Rai/Limbu (2.1%) and Others (1%) made up the smallest groups.

Table 2: Mental health status

Variables	N (%)
Depression	
Normal	308(80.2%)
Mild	44(11.5%)
Moderate	30(7.8%)
Severe	2(0.5%)
Total	384(100%)
Anxiety	
Normal	287(74.7%)
Mild	42(10.9%)
Moderate	47(12.2%)
Severe	7(1.8%)
Extremely Severe	1(0.3%)
Total	384(100%)
Stress	
Normal	320(83.3%)
Mild	55(14.3%)

Moderate	7(1.8%)
Severe	1(0.3%)
Total	384(100%)

Most adolescents had normal mental health levels. About 80.2% had normal depression, 74.7% had normal anxiety, and 83.3% had normal stress. Only a small number showed mild to moderate symptoms, while severe cases were rare.

Table 3: Level of physical activity of adolescent

PA	N(%)
Low	60(15.6%)
Moderate	262(68.2%)
High	62(16.1%)
Total	384(100%)

68.2% of adolescent had moderate physical activity, while 16.1% had high and 15.6% had low physical activity.

Table 4: Association between physical activity and depression

Physical Activity	Normal n (%)	Mild n (%)	Moderate n (%)	Severe n (%)	Total
Low	37 (61.7)	16 (26.7)	6 (10.0)	1 (1.7)	60
Moderate	215 (82.1)	25 (9.5)	21 (8.0)	1 (0.4)	262
High	56 (90.3)	3 (4.8)	3 (4.8)	0 (0.0)	62
Total	308 (80.2)	44 (11.5)	30 (7.8)	2 (0.5)	384

Physical activity was significantly associated with depression ($\chi^2(6, N = 384) = 21.813, p = 0.001$, Cramér's $V = 0.169$). The prevalence of normal depression increased with physical activity level (61.7% low, 82.1% moderate, and 90.3% high physical activity).

Table 5: Association between physical activity and anxiety

Physical Activity	Normal n (%)	Mild n (%)	Moderate n (%)	Severe n (%)	Extremely severe n (%)	Total
Low	29 (48.3)	12 (20.0)	16 (26.7)	3 (5.0)	0 (0.0)	60
Moderate	208 (79.4)	25 (9.5)	25 (9.5)	3 (1.1)	1 (0.4)	262
High	50 (80.6)	5 (8.1)	6 (9.7)	1 (1.6)	0 (0.0)	62
Total	287 (74.7)	42 (10.9)	47 (12.2)	7 (1.8)	1 (0.3)	384

Physical activity was significantly associated with anxiety ($\chi^2(8, N = 384) = 22.149, p = 0.005$, Cramér's $V = 0.170$). Normal anxiety status increased with physical activity level (48.3% low, 79.4% moderate, and 80.6% high physical activity).

Table 6: Association between physical activity and stress

Physical Activity	Normal n (%)	Mild n (%)	Moderate n (%)	Severe n (%)	Total
Low	38 (63.3)	17 (28.3)	4 (6.7)	1 (1.7)	60
Moderate	226 (86.6)	32 (12.3)	3 (1.1)	0 (0.0)	261
High	56 (90.3)	6 (9.7)	0 (0.0)	0 (0.0)	62
Total	320 (83.6)	55 (14.4)	7 (1.8)	1 (0.3)	383

Physical activity was significantly associated with stress ($\chi^2(6, N = 383) = 28.331, p < 0.001$, Cramér's $V = 0.192$). Normal stress status increased with physical activity level (63.3% low, 86.6% moderate, and 90.3% high physical activity)

DISCUSSION

This study examined the association between physical activity and mental health among 384 school-going adolescents in Dhulikhel. Most participants 262 had moderate PA and showed normal levels of depression, anxiety, and stress.

The results showed that higher physical activity was linked to better mental health, while less active adolescents had more psychological distress. This supports previous studies, such as Santana et al., which also found that low physical activity is associated with higher anxiety, depression, and poorer quality of life.

Similarly, Booth et al. and Karakheti et al. observed that moderate to vigorous physical activity (MVPA) is linked to lower depressive symptoms and improved emotional functioning in adolescents.¹⁰ In line with Mahindru et al., this study also supports the role of PA in enhancing self-esteem, cognitive performance, and positive mood, suggesting that adolescents with higher activity levels experience improved mental well-being.⁶

Consistent with Nepal et al. findings in Palpa, a significant proportion of adolescents in Dhulikhel did not meet WHO Physical Activity recommendations, highlighting barriers such as limited school break times, lack of playgrounds, increased screen time, academic demands, domestic responsibilities, and sociocultural norms, particularly for female students.³ Our study observed significant negative correlations between PA and depression, anxiety, and stress reinforcing evidence that PA functions as a protective factor against mental health challenges.^{10,11,12} Globally, insufficient PA is prevalent, with 81% of adolescents aged 11–17 years not meeting WHO recommendations, a pattern reflected in our sample where 15.6% of adolescents reported low PA.^{15,16}

Methodological differences across studies may explain variations in findings. Unlike studies that utilized

accelerometer for objective PA measurement.^{6,10} Our study relied on self-reported questionnaires, which may be subject to recall bias. Additionally, research conducted in high-income countries, such as the Netherlands or Brazil, may not generalize to Nepal due to differences in socio-cultural, educational, and lifestyle factors.^{15,18} Our study focused specifically on adolescents aged 14–19 years, while some prior studies examined university students or clinical populations, highlighting developmental differences in coping strategies and responses to PA.^{9,17}

The finding of a significant association between physical activity and depression is consistent with previous studies showing that physically active adolescents experience fewer depressive symptoms. A systematic review and meta-analysis by Josefsson, T. and colleagues reported that physical activity has beneficial effects on depressive symptoms and psychological well-being.¹⁹ Similarly, World Health Organization emphasizes that regular physical activity among adolescents supports mental health and reduces the risk of depression.¹⁵

The present study also found a significant relationship between physical activity and anxiety. Normal anxiety levels were higher among adolescents with moderate and high physical activity. This agrees with findings from previous research indicating that regular exercise is associated with reduced anxiety symptoms in young people. Physical activity may reduce anxiety through improved sleep, regulation of stress hormones, and increased psychological resilience.^{19,20}

Similarly, physical activity showed a significant association with stress levels ($\chi^2(6, N = 383) = 28.331, p < 0.001$). Adolescents with higher physical activity had better stress status than those with low activity levels.¹⁹

The findings suggest important implications for schools and public health. Schools should encourage sports and physical activities and reduce barriers like lack of space and academic pressure. Increasing physical activity may help improve adolescents' mental health and academic performance.

Future studies should use objective measures of physical activity, examine long-term effects, and consider factors such as screen time, diet, sleep, and social support.

This study has some limitations, including its cross-sectional design, which cannot show cause and effect, and the use of self-reported data, which may have bias. It was also limited to one area and did not include other factors affecting mental health. However, the study

had strengths such as a large sample size and the use of validated tools (MVPAQ-A and DASS-Y), making the findings reliable

CONCLUSION

The study identified a significant association between physical activity and mental health status, including depression, anxiety, and stress. Adolescents with higher levels of physical activity demonstrated better mental health outcomes, with a greater proportion having normal depression, anxiety, and stress levels compared to those with low physical activity. These findings suggest that regular engagement in physical activity may play an important role in improving psychological well-being and reducing mental health problems among adolescents. Therefore, encouraging and supporting physical activity through schools, families, and community-based programs may help promote healthier lifestyles and better mental health among adolescents. Further studies are recommended to explore long-term effects and other factors influencing adolescent mental health.

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