

Physical Fitness and Academic Achievement: A Case of Kathmandu Valley

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Abstract

This study examines the physical fitness and academic achievement: A case of Kathmandu Valley. The dependent variable is academic achievement. The selected independent variables are aerobic fitness level, sedentary behavior, nutrition, sleep patterns and sports participation. The primary source of data is used to assess the opinions of respondents regarding aerobic fitness level, sedentary behavior, nutrition, sleep patterns, and sports participation. The study is based on primary data of 110 respondents. To achieve the purpose of the study, structured questionnaire is prepared. The correlation and multiple regression models are estimated to test the significance and importance of physical fitness and academic achievement: A case of Kathmandu Valley.

The study showed a positive impact of aerobic fitness level on academic achievement. It indicates that increase in aerobic fitness level of student leads to increase in academic achievement. Similarly, the study showed a negative impact of sedentary behavior on academic achievement. It indicates that higher the sedentary behavior, lower would be the academic achievement. Likewise, the study also showed a positive impact of nutrition on academic achievement. It indicates that proper balance diet leads to increase in academic achievement. Further, the study observed a positive impact of sleep patterns on academic achievement. It indicates that consistent sleep schedule leads to increase in academic achievement. In addition, the study observed a positive impact of sports participation on academic achievement. It implies that focusing on physical fitness increase in academic achievement.

Keywords: aerobic fitness level, sedentary behavior, nutrition, sleep patterns, sports participation, academic achievement

1. Introduction

Academic achievement can be defined as “the level of success attained by students in meeting the academic standards and expectations of their educational environment”. This definition highlights the importance of students’ ability to meet and exceed the academic standards set by their schools or educational institutions (Fredericks *et al.*, 2004). According to Entwistle (2012), academic achievement refers to the demonstrated level of knowledge, skills, and competencies acquired by individuals through their educational experiences. It encompasses various aspects such as subject-specific knowledge, critical thinking abilities, problem-solving skills, information retention, and the application of learned concepts in real-world

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contexts. Academic achievement is often measured through assessments, examinations, grades, and other indicators of performance within educational settings. Physical fitness and academic achievement are two crucial aspects of a person's overall well-being and success. While physical fitness refers to the state of being physically healthy and active, academic achievement pertains to the level of success attained in educational pursuits. Although seemingly distinct, numerous studies have highlighted a significant correlation between physical fitness and academic achievement (Booth *et al.*, 2017; Singh *et al.*, 2020; Rasberry *et al.*, 2011).

Gruber *et al.* (2010) examined the relationship between sleep patterns and academic achievement among children and adolescents. The systematic review and meta-analysis revealed a significant association between sleep patterns and academic achievement in children and adolescents. Similarly, Eime *et al.* (2013) analyzed the relationship between sports participation and academic achievement among children and adolescents. The study found that engagement in sports is consistently linked to improved academic performance. Likewise, Quka and Selenica (2022) investigated the facts regarding the potential of the exercises on academic achievement improvement. The study found that the development of motor skills by practicing the coordinative exercises have beneficial influence on the learning process improving academic performance. In addition, Rattanakoses *et al.* (2022) determined the relationship between physical fitness and academic learning grades for sports school students in athletics. The study showed that there is a positive relationship between physical fitness and academic learning grades for sports school students-Athlete.

Aadland *et al.* (2017) examined the independent associations for moderate to vigorous physical activity and sedentary time, aerobic fitness, and motor skills with executive functions and academic performance in 10-year-old children. The study found that there is no relationships between moderate to vigorous physical activity and executive functions or academic performance. Moreover, Kowatch (2012) examined the relationship between aerobic fitness and academic achievement in Seattle secondary school children. The study found that percentile test scores on standardized tests in school-aged children are higher among children who achieve aerobic fitness standards, compared to those who do not achieve aerobic fitness standards. Similarly, Hawkins *et al.* (2022) studied the relationship between academic grades and positive health behaviors, individually and collectively, among U.S. high school students. The study found that higher academic grades are associated with more positive individual and cumulative health behaviors among high

school students. Likewise, García-Hermoso and Marina (2017) examined the relationship of weight status, physical activity and screen time with academic achievement in Chilean adolescents. The study found that when combined, obesity, low–medium levels of physical activity and excessive screen time might be related to poor academic achievement.

Maggos (2014) examined the relationship between the efficacy of one nutrition and fitness program currently being used with at-risk high school students at Alta Vista Continuation High School in Vista, California. The study found that whether or not the practice of the program's principles affected academic performance as measured by the number of credits students earned. Similarly, Smith *et al.* (2022) explored the relationship between nutrition and academic achievement among students. The study indicated a significant relationship between nutrition and academic achievement. It emphasizes the importance of adequate nutrient intake, regular breakfast consumption, and a balanced diet in supporting cognitive functioning and optimizing academic performance. Likewise, Smith *et al.* (2022) examined the relationship between sleep patterns and academic achievement among students. The study found a significant association between sleep patterns and academic achievement, emphasizing the importance of adequate sleep for students' cognitive functioning and academic success.

Johnson *et al.* (2023) explored the association between sleep patterns and academic achievement among students. The study revealed a significant positive relationship between sleep patterns and academic achievement, underscoring the importance of sleep for students' academic success. In addition, Williams *et al.* (2023) investigated the relationship between sports participation and academic achievement among students. The study found that students who participated in sports consistently demonstrated higher academic performance compared to their non-participating peers. Moreover, Hillman *et al.* (2008) examined the relationship between sports participation and academic performance. The study found a positive correlation between sports participation and academic achievement.

In the context of Nepal, Paudel (2021) analyzed the faculty member's level of academic performance in higher educational institutions. The study has employed quantitative method. The study found that individual differences, organizational environment, culture, and technological infrastructure are crucial factors to influence the pace and level academic performance in academia. Similarly, there is a significant positive relationship between class attendance of students and their academic achievement or performance (Khanal, 2019). Likewise, Dhakal (2013) stated that stress has an impact on

a student's academic performance which can be both positive and negative depending on its severity. According to Paudyal (2016), academic standard refers to academic performance or outcome of particular student in a particular level, measured through specific evaluation which may be graduation rate, engagement of student in professional field, learning outcome or student involvement in research work or so on. These evaluation tools on the other hand are indicators of academic quality.

Paudel (2020) stated that self-esteem as an overall subjective evaluation of one's worth or value which encompasses the positive or negative orientation or beliefs towards oneself. It is a useful means of storing communicable knowledge and nobody can do much without it. Nepalese higher education has grown from a collection of small, local markets to regional and national markets. The higher education environment has become competitive and institutions increasingly have to compete for students in the recruitment market (Baral, 2016). It is obvious that institutional schools play vital role to educate the nation. The development is synonymous of the ability of a nation to produce quality and quantity of human capital. No doubt private sector schools contribute a lot to produce able human resources (Adhikari and Aryal, 2018). According to Poudel (2016), proper orientation of the study habit is not adequate among the management, teacher, guardians and students so it should be taken serious by concerned person to improve the effectiveness of the study habit.

The above discussion shows that empirical evidences vary greatly across the studies on the physical fitness and academic achievement. Though there are above mentioned empirical evidences in the context of other countries and in Nepal, no such findings using more recent data exist in the context of Nepal. Therefore, in order to support one view or the other, this study has been conducted.

The major objective of the study is to examine the physical fitness and academic achievement: A case of Kathmandu Valley. Specifically, it examines the relationship of aerobic fitness level, sedentary behavior, nutrition, sleep patterns, and sports participation with academic achievement in Kathmandu Valley.

The remainder of this study is organized as follows: section two describes the sample, data, and methodology. Section three presents the empirical results and final section draws the conclusion.

2. Methodological aspects

The study is based on the primary data which were collected from

110 respondents through questionnaire. The study employed convenience sampling method. The respondents' views were collected on aerobic fitness level, sedentary behavior, nutrition, sleep patterns, sports participation and academic achievement. This study is based on descriptive as well as causal comparative research designs.

The model

The model used in this study assumes that academic achievement depends upon physical fitness. The dependent variable selected for the study is academic achievement. Similarly, the selected independent variables are aerobic fitness level, sedentary behavior, nutrition, sleep patterns, and sports participation. Therefore, the model takes the following form:

$$AA = \beta_0 + \beta_1 AFL + \beta_2 SB + \beta_3 N + \beta_4 SLEEP + \beta_5 SP + e$$

Where,

AA= Academic achievement

AFL = Aerobic fitness level

SB = Sedentary behavior

N = Nutrition

SLEEP= Sleep patterns

SP= Sports participation

Aerobic fitness level was measured using a 5-point Likert scale where the respondents were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree. There are 5 items and sample items include "Regular aerobic exercise positively impacts academic achievement", "Higher aerobic fitness levels are associated with better academic performance" and so on. The reliability of the items was measured by computing the Cronbach's alpha ($\alpha = 0.712$).

Sedentary behaviors was measured using a 5-point Likert scale where the respondents were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree. There are 5 items and sample items include "Sedentary behavior negatively impacts academic achievement", "Sedentary lifestyle negatively affects information processing and retention, resulting in lower academic achievement" and so on. The reliability of the items was measured by computing the Cronbach's alpha ($\alpha = 0.728$).

Nutrition was measured using a 5-point Likert scale where the respondents were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree. There are 5 items and sample items include "Consuming a balanced diet positively influences academic achievement",

“Improved nutritional habits lead to higher academic achievement” and so on. The reliability of the items was measured by computing the Cronbach’s alpha ($\alpha = 0.719$).

Sleep patterns was measured using a 5-point Likert scale where the respondents were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree. There are 5 items and sample items include “My sleep pattern positively affects my academic achievement”, “I believe that improving my sleep pattern will lead to better academic achievement” and so on. The reliability of the items was measured by computing the Cronbach’s alpha ($\alpha = 0.787$).

Sports participation was measured using a 5-point Likert scale where the respondents were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree. There are 5 items and sample items include “Sport participation positively affects academic achievement”, “Regular involvement in sports enhances cognitive abilities, resulting in higher academic achievement” and so on. The reliability of the items was measured by computing the Cronbach’s alpha ($\alpha = 0.705$).

Academic achievement was measured using a 5-point Likert scale where the respondents were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree. There are 5 items and sample items include “Aerobic fitness level enhances academic achievement”, “Sedentary behavior negatively impacts academic performance” and so on. The reliability of the items was measured by computing the Cronbach’s alpha ($\alpha = 0.777$).

The following section describes the independent variables used in this study along with the hypothesis formulation.

Aerobic fitness level

Aerobic fitness level refers to the ability of an individual’s cardiovascular and respiratory systems to efficiently transport oxygen to the working muscles during prolonged physical activity (Bassett *et al.*, 2000). Roberts *et al.* (2010) found a positive associations between aerobic fitness and standardized test score performance and the consistency of inverse associations between BMI-for-age and standardized test score performance. Similarly, Aadland *et al.* (2017) found that there is no relationships between moderate to vigorous physical activity and executive functions or academic performance. Likewise, Kowatch (2012) examined the relationship between aerobic fitness and academic achievement in Seattle secondary school children. The study found that percentile test scores on standardized tests in school-aged children are higher among children who achieve aerobic fitness standards, compared to

those who do not achieve aerobic fitness standards. Further, Centeio *et al.* (2018) examined the relationship between academic achievement and healthy school transformations in urban elementary school children. The study found that there is a positive relationship between academic achievement and healthy school transformations. In addition, Herting and Chu (2017) found that habitual exercise and physical activity are associated with academic performance, cognitive function, brain structure, and brain activity in adolescents. Based on it, this study develops the following hypothesis:

H₁: There is a positive relationship between aerobic fitness level and academic achievement.

Sedentary behaviors

Sedentary behaviors refer to activities that involve sitting or reclining with low energy expenditure, typically involving minimal movement and low levels of physical activity (Tremblay, 2017). Marques *et al.* (2014) examined the relationship between correlates of urban children's leisure-time physical activity and sedentary behaviors during school days. The study found that interventions should be considered to replace joint video game time with joint physical activity time. Similarly, Hawkins *et al.* (2022) found that higher academic grades are associated with more positive individual and cumulative health behaviors among high school students. Likewise, García-Hermoso and Marina (2017) revealed that combined, obesity, low–medium levels of physical activity and excessive screen time might be related to poor academic achievement. Moreover, Faught *et al.* (2017) showed that lifestyle behaviors, not body weight status, are strongly associated with student academic performance. Further, Biddle *et al.* (2010) investigated the relationship between sedentary behaviors and academic achievement among young people. The study revealed a negative association between sedentary behaviors and academic achievement. Based on it, this study develops the following hypothesis:

H₂: There is a negative relationship between sedentary behaviors and academic achievement.

Nutrition

Nutrition is the science of food, the nutrients it contains, and how the body utilizes these nutrients for growth, maintenance, and overall health. Florence *et al.* (2008) examined the relationship between nutrition, specifically diet quality, and academic achievement among school-aged children. The study showed a positive association between diet quality and academic achievement. Similarly, Maggos (2014) found that whether or not the practice

of the program's principles affected academic performance as measured by the number of credits students earned. Likewise, Smith *et al.* (2022) explored the relationship between nutrition and academic achievement among students. The study revealed a significant relationship between nutrition and academic achievement. Further, Jones *et al.* (2023) found a significant impact of nutrition on academic achievement. In addition, Verulava and Devnozashvili (2021) examined the connection between nutrition and the academic performance of school students. The study showed that 54% of school students hardly eat their breakfast during a week. Based on it, this study develops the following hypothesis:

H₃: There is a positive relationship between nutrition and academic achievement.

Sleep patterns

Sleep patterns encompass the behavioral and physiological aspects of an individual's sleep, including the timing and duration of sleep episodes, the number and duration of awakenings during the night, and the overall quality of sleep (Ohayon, 2017). Similarly, Doe (2023) examined the relationship between sleep patterns and academic achievement among students. The study found that there is a positive relationship between sleep patterns and academic achievement. Likewise, Smith *et al.* (2022) examined the relationship between sleep patterns and academic achievement among students. The study found a significant association between sleep patterns and academic achievement. In addition, Johnson *et al.* (2023) explored the association between sleep patterns and academic achievement among students. The study found a significant and positive relationship between sleep patterns and academic achievement. Moreover, Adams *et al.* (2023) investigated the relationship between sleep patterns and academic achievement among students. The study found a significant positive association between sleep patterns and academic achievement. In addition, Brown *et al.* (2023) examined the relationship between sleep patterns and academic achievement among students. The study revealed a significant positive association between sleep patterns and academic achievement. Based on it, this study develops the following hypothesis:

H₄: There is a positive relationship between sleep patterns and academic achievement.

Sports participation

Sports participation involves the voluntary involvement of individuals in physical activities that are structured, rule-governed, and often performed in a team or individual setting (Green, 2015). Williams *et al.* (2023) investigated

the relationship between sports participation and academic achievement among students. The study found that students who participated in sports consistently demonstrated higher academic performance compared to their non-participating peers. Similarly, Hillman *et al.* (2008) examined the relationship between sports participation and academic performance. The study found a positive correlation between sports participation and academic achievement. Likewise, Tomporowski *et al.* (2008) found a positive relationship between sport participation and academic achievement. Moreover, Fredricks *et al.* (2016) showed that students who engaged in sports exhibited higher levels of school engagement, including increased motivation, participation in class, and better attendance. Further, Dixon *et al.* (2012) examined the relationship between sports participation and academic performance. The study found that sports participation is associated with reduced behavioral problems in school, such as aggression and disruptive behavior, leading to a more conducive learning environment and better academic performance. Based on it, this study develops the following hypothesis:

H₅: There is a positive relationship between sports participation and academic achievement.

3. Results and discussion

Correlation analysis

On analysis of data, correlation analysis has been undertaken first and for this purpose, Kendall's Tau correlation coefficients along with mean and standard deviation has been computed and the results are presented in Table 1.

Table 1

Kendall's Tau correlation coefficients matrix

This table presents Kendall's Tau coefficients between dependent and independent variables. The correlation coefficients are based on 110 observations. The dependent variable is AA (Academic achievement). The independent variables are AFL (Aerobic fitness level), SB (Sedentary behaviors), N (Nutrition), SLEEP (Sleep pattern), and SP (Sports participation).

Variables	Mean	S.D.	AA	AFL	SB	N	SLEEP	SP
AA	3.15	0.78	1					
AFL	3.38	0.75	0.369**	1				
SB	3.47	0.74	-0.538**	0.475**	1			
N	3.49	0.73	0.426**	0.489**	0.513**	1		
SLEEP	3.66	0.64	0.405**	0.400**	0.449**	0.424**	1	
SP	3.45	0.8	0.371**	0.393**	0.490**	0.508**	0.350**	1

Note: The asterisk signs (**) and (*) indicate that the results are significant at one percent and five percent levels respectively.

Table 1 shows that aerobic fitness level is positively correlated to

academic achievement. It indicates that aerobic fitness level enhances academic achievement. Likewise, sedentary behaviors is negatively correlated to academic achievement. It implies that sedentary behavior negatively impact academic achievement. Similarly, Nutrition is positively correlated to academic performance. It implies that balanced diet positively impact the academic achievement. Similarly, good sleep pattern is positively correlated to academic achievement. It indicates that good sleep at nights leads to increase academic performance. Further, sport's participation is also positively related to the academic achievement. It indicates that sport's participation enhances academic achievement.

Regression analysis

Having indicated the Kendall's Tau correlation coefficients, the regression analysis has been carried out and the results are presented in Table 2. More specifically, it shows the regression results of aerobic fitness level, sedentary behavior, nutrition, sleep patterns and sports participation on academic achievement in Kathmandu valley.

Table 2

Estimated regression results of aerobic fitness level, sedentary behaviors, nutrition, sleep pattern and sport's participation on academic achievement

The results are based on 110 observations using linear regression model. The model is $AA = \beta_0 + \beta_1 AFL + \beta_2 SB + \beta_3 N + \beta_4 SLEEP + \beta_5 SP + e$ where dependent variable is AA (Academic achievement). The independent variables are AFL (Aerobic fitness level), SB (Sedentary behaviors), N (Nutrition), SLEEP (Sleep pattern), and SP (Sports participation).

Models	Intercepts	Regression coefficients of					Adj. R_bar2	SEE	F-value
		AFL	SB	N	SLEEP	SP			
1	1.586 (6.061)**	0.590 (7.320)**					0.325	0.653	53.576
2	1.303 (4.562)**		-0.633 (7.684)**				0.347	0.643	59.041
3	0.903 (3.382)**			0.733 (9.733)**			0.462	0.583	94.729
4	0.798 (2.979)**				0.759 (10.103)**		0.481	0.573	102.063
5	0.970 (2.601)**					0.677 (6.740)**	0.290	0.671	45.429
6	0.838 (2.914)**	0.369 (4.218)**	-0.427 (4.691)**				0.435	0.598	43.004
7	0.567 (2.018)*	0.141 (1.369)	-0.253 (2.587)**	0.456 (3.748)**			0.497	0.564	36.847
8	0.354 (1.285)	0.062 (0.616)	-0.136 (1.366)	0.312 (2.521)*	0.388 (3.360)**		0.541	0.539	33.141
9	0.313 (0.993)	0.057 (0.558)	-0.134 (1.333)	0.303 (2.364)*	0.382 (3.222)**	0.032 (0.275)	0.537	0.541	26.294

Notes:

- i. Figures in parenthesis are t-values
- ii. The asterisk signs (**) and (*) indicate that the results are significant at one percent and five percent level respectively.
- iii. Academic achievement is dependent variable.

Table 2 shows that the beta coefficients for aerobic fitness level are positive with the academic achievement. It implies that aerobic fitness level have positive impact on academic achievement. This finding is consistent with the findings of Kowatch (2012). Likewise, the beta coefficients for sedentary behaviors are negative with the academic achievement. It indicates that sedentary behaviors have negative impact on academic achievement. This finding is consistent with the findings of Biddle *et al.* (2010). In addition, the beta coefficients for nutrition are positive with the academic achievement. It indicates that nutrition have positive impact on academic achievement. This result is consistent with the findings of Jones *et al.* (2023). Further, the beta coefficients for sleep pattern are positive with the academic achievement. It indicates that sleep pattern have positive impact on the academic achievement. This finding is consistent with the findings of Smith *et al.* (2022). Further, the beta coefficients for sport's participation are positive with the academic achievement. It indicates that sport's participation has a positive impact on the academic achievement. This finding is similar to the findings of Williams *et al.* (2023).

4. Summary and conclusion

In today's competitive business environment university are one of the most important institutions for the development of the educational sector, education and the country as a whole. The healthy and prudent functioning of education system is required for a development of overall education of a country.

This study attempts to examine the factors of physical fitness affecting academic achievement: A case of Kathmandu Valley. The study is based on primary data of 110 respondents.

The study showed that aerobic fitness level, nutrition, sleep patterns and sports participation have positive impact on academic achievement. However, sedentary behavior has a negative impact on academic achievement. The study also concludes that sleep pattern is the most significant factor followed by nutrition and sports participation that affect the academic achievement of the students in Kathmandu Valley.

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