

RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND MENTAL HEALTH OF UNDERGRADUATE HEALTH SCIENCE UNIVERSITY STUDENTS

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ABSTRACT

University life presents new environments and challenges leading to depression, stress, and anxiety even with physical activity participation. There have been reported restrictions in recreational activities in some hostels and attempted suicide among undergraduate university students with little attention on the relationship between these phenomena. This study aims to determine the relationship between physical activity (PA) levels and the mental health (MH) status of undergraduate health science students. A cross-sectional quantitative study was employed. 581 undergraduate students (21.04±2.83 years. Males, 235(40.4%) and females 346(59.6%) were recruited for the study. International PA; and depression, anxiety, and stress scale questionnaires were administered. 42.0% had moderate, 38.9% vigorous, and 19.1% low levels of PA. 59.4% reported anxiety, 43% depression, and 24.3% stress symptoms. PA had a significant relationship with MH status. Participants with high PA levels have reduced depression, anxiety, and stress levels. It is strongly recommended that stakeholders should put in place pragmatic PA interventions to reduce anxiety, depression, and stress levels prevalent among undergraduate students.

Keywords: Physical activity, Mental health, Depression, Stress, Anxiety, University students

INTRODUCTION

Physical inactivity has recently been implicated as a major contributing factor to the world's non-communicable diseases and premature deaths. Martínez-Bello et al., (2023) emphasized these findings. Numerous studies have identified physical activity as an important public health tool used in treating and preventing various physical diseases and treating mental disorders such as depression and anxiety disorders (Marques et al., 2018). Systematic reviews also state that engaging in physical activity (PA) is linked to better mental health and lowers the risk of mental disorders, particularly depression and anxiety (Biddle and Asare, 2011). PA can occur during work or school hours, leisure time when performing home chores, and as a mode of transportation (Biddle, Gorely, Marshall, and Cameron, 2009). The most popularly cited and broad definition of physical activity was published by Caspersen in 1985, he defined physical activity as any bodily movements produced by the skeletal muscles that result from expending energy.

In recent times, mental health problems are on the rise among the youth in Ghana (Lund et al, 2023). Previous study has also shown higher risk of mental health, particularly among children and young, which may lead to, anxiety, stress, depression, loneliness, suicidal thoughts, addiction, relationship disorder, grief, learning difficulties, and other mental diseases of varied severity (Shamsuddin et al., 2013). Bint-e-hafeez et al., (2019), stated in the article to determine the role of physical activity on the mental well-being of medical students that, medical students would have to manage their education in addition to patients in hospitals, exams, tests, and other obligations which in turn affect their mental health.

Additionally, some research also has it that depression and anxiety are at a high peak when students are worried about their studies (Hope and Henderson, 2014).

According to the results of an epidemiological study conducted in Africa, 20% of youth suffer from depression and disorders brought on by stress each year (Asare and Danquah, 2015). Nearly two million preventable deaths globally have been attributed to insufficient physical activity each year (Armstrong et al., 2006). Research conducted by Ballester et al. (2019), with Spanish university students from five universities, exposes that approximately 10% of Spanish students report having had suicidal thoughts in the previous year.

Despite the World Health Organization, (2010) recommendation of adults between 18-64 years engage in a minimum of at least 150min per week of moderate-intensity aerobic PA or 75 min per week of vigorous-intensity aerobic PA, and the benefits of regular physical activity on well-being, the level of physical activity among university students is low and is rapidly decreasing during the period of adolescence to young adulthood, thereby affecting their mental health.

Taking into account the evidence to suggest that physical activity has the potential to be of benefit to those suffering from mental health problems and that university students are at elevated risk of such problems, this study sought to investigate the association between physical activity and mental health status (depression, anxiety, and stress) among undergraduate health science students of a university.

MATERIALS AND METHODS

This study employed a cross-sectional quantitative design. This design involves looking at data from a population (undergraduate health science students) at a given point in time. A two-phase sampling method was used in this study. The first phase was the quota sampling technique which was used to calculate the sample size (10%) of the study's target population. The convenience sampling technique was employed in the second phase to recruit participants in each of the Departments. The total population of students in the College of Health Sciences is 7472. Using the quota sampling method, ten (10) percent of the total population was recruited for the study (10% of 7472) = 747.2. Hence the sample size was 747.2. However, after reviewing the questionnaires received (eliminating contradictory answers and empty or incomplete questionnaires) as well as due to challenges beyond the control of the researcher, the final sample size comprised 581 (77.8%) students.

Two structured questionnaires were used to collect data about each study participant's physical activity and mental health after obtaining his/ her written consent. These structured questionnaires were; the International Physical Activity Questionnaire (IPAQ) and the Depression, anxiety, and Stress Scale (DASS). Some studies conducted have proven that the IPAQ is both a valid and reliable tool for determining physical activity levels in individuals (Cleland et al., 2018).

The IPAQ was used to collect information about the kinds of physical activity that people perform as part of their everyday lives. The total physical activity level of the respondent was calculated by the sum of METs (Metabolic

Equivalent of Tasks) thus minutes per week of walking, moderate and vigorous physical activity.

The Depression, anxiety, and Stress Scale (DASS) is made up of three scales designed to measure the emotional states of depression, anxiety, and stress. DASS is a 21-item questionnaire with a 4 Likert type of scale from zero (0) that didn't apply to me at all to three (3) that applied to me more or mostly. Each of the three items has 7 questions each based on factors such as dysphoria, and autonomic arousal. The DASS -21 scale has been validated by Lavelle, B. (2022) with a Cronbach's alpha of 0.79 for anxiety, 0.91 for stress, and 0.93 for depression. The scores on the DASS-21 determine the severity levels of depression, Anxiety, and stress (thus, normal, moderate, and severe. Written informed consent was obtained from participants after due explanation before the data collection with all ethical considerations were strictly adhered to. A copy of the questionnaire was distributed to participants face to face and digitally after a thorough explanation of the concept of the study. Follow-ups were made by calling, text messaging, and visiting those who were unable to complete at the time of retrieval. Data gathered with IPAQ was coded and inputted into an automatic spreadsheet used in the scoring of the international physical activity questionnaire generated by Dr. Hoi Lun Cheng (2016). Data gathered with the DASS 21 was also coded and inputted into Excel spreadsheet 20.0 where error was checked and data cleaned. Results obtained were exported to Statistical Package for Social Services (SPSS) version 26.0 for statistical analysis. Frequencies, mean, percentages, and standard deviation were used as descriptive statistics.

Crosstabs, Chi-square test, and multinomial logistic regression analysis were used with significance set at 0.05 alpha.

RESULTS

From Table 1 a total of 581 participants were recruited in the study. The mean age and standard deviation of the participants were 21.04 ± 2.83 years. Males accounted for 235(40.4%) and females 346(59.6%). The majority of 288(49.6%) of the respondents were between the ages of 17-20 years followed by the 21- 24 age group with 254(43.7%) while age groups above 33 had the least respondents 6(1%). The distribution of respondents among the respective departments showed the largest representation of Pharmacy with 113 (19.4%) respondents while Medical Laboratory Sciences had the least number of respondents 25(4.3%).

Regarding the levels of physical activity participation, the majority of the respondents (42%) engaged in the category of “moderate” physical activity. This was followed by (38.9%) of the respondents who met the criteria of “high” physical activity category”. Lastly, only 19.1% of the respondents were engaged in the category of “low” physical activity. **Figure 2** shows that 40.6% of the respondents had normal anxiety levels, followed by 27.2%, 11.5%, 10.8%, and 9.8% who had moderate, mild, severe, and extremely severe anxiety levels respectively.

Figure 3 indicates that 75.7% of students had normal stress levels, 12.7% showed mild stress levels, followed by 7.2% of respondents who reported moderate stress levels. 3.4% of the participants reported severe stress levels with only 0.9% who reported as extremely severe stress levels. **Figure 4** indicates that 57.0% of

students reported normal depression levels. 19.6% showed mild levels of depression followed by 15.8% who reported moderate levels of depression. The least number of respondents 3.3% reported extremely severe levels of depression. **Table 2** indicates that there was a significant relationship between stress levels and both age and department of affiliation. Where age and department of affiliation are ($p=0.005$ and $p=0.008$). **Table 3** indicates that there is no statistically significant association between depression and gender; depression and marital status, and lastly depression and age group ($p=0.059$, $p=0.676$, and $p=0.098$, respectively). However, only departments of affiliation exhibit a significant relationship with depression ($p < 0.001$). **Table 4** demonstrates that all demographic characteristics, with the exception of their department of affiliation, have a significant link with anxiety (p -value of 0.011).

Considering **Table 5** there was a relationship between PA and mental status (PA & anxiety $M=0.021$ and $G=0.560$; PA & Depression $M=0.004$ and $G=0.662$; PA & stress $M=0.026$ and $G=0.210$).

In **Table 6**, there was a negative correlation between physical activity levels (low (-0.474), moderate (-0.546), and high (-0.546) and mild levels of anxiety with p values of 0.216, 0.079 and 0.079. Whereas with extremely severe levels of anxiety, there was a negative correlation with physical activity levels (low (-0.258), moderate (-0.368), and high (-0.368) with p -values 0.376, 0.429, and 0.429. there was a negative correlation between physical activity levels (low (-0.125), moderate (-0.369), and high (-0.369) and mild levels of depression with p -values of 0.244, 0.125, and 0.125. Whereas with extremely severe levels of

depression, there was a negative correlation with physical activity levels (low (-0.031), moderate (-0.034), and high (-0.034 with a p-value of 0.961, 0.950, and 0.961. Moreover, there was a negative correlation between physical activity levels (low (-0.007), moderate (-0.537), high (-0.537), and mild levels of anxiety with p-values of 0.099, 0.982, and 0.064. With extremely severe levels of depression, there was a negative correlation with physical activity levels (low (-0.299), moderate (-9.064), and high (-9.064) with p-values of 0.640, 0.735, and 0.745.

Table 1: Socio-demographic characteristics of participants

Demographics	Frequency (F)	Percentage (%)
Age Group		
Mean ± Standard Deviation		21.04±2.83
17-20	288	49.6
21-24	254	43.7
25-28	21	3.6
29-32	12	2.1
33+	6	1.0
Gender		
Male	235	40.4
Female	346	59.6
Marital Status		
Single	552	95.0
Married	17	2.9
Others	12	2.1
Department		
Physiotherapy and Sports Science	33	5.7
Nursing and Midwifery	83	14.3
Medicine and Dentistry	100	17.2
Physician Assistant	50	8.6
Health Promotion and Disability Studies	40	6.9
Herbal Medicine	36	6.2
Veterinary Medicine	45	7.7
Medical Laboratory Sciences	25	4.3

Diagnostic Imaging	Medical	56	9.6
Pharmacy		113	19.4

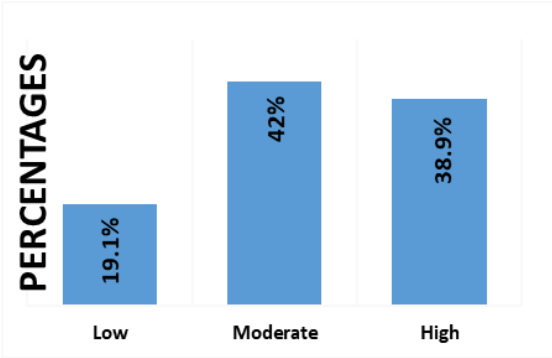


Figure 1: Levels of physical activity among participants

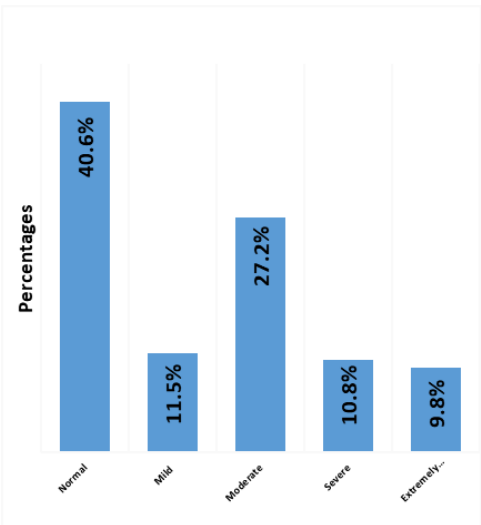


Figure 2: Levels of anxiety among participants.

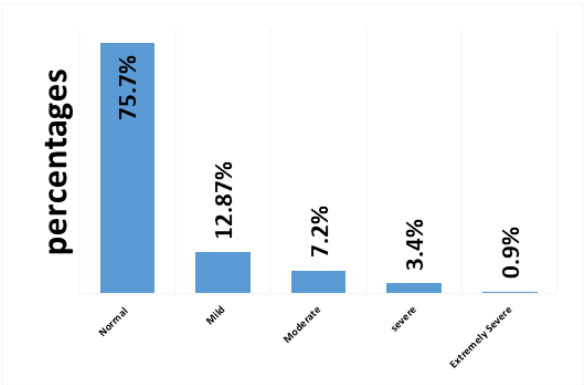


Figure 3: Percentages of stress levels among participants

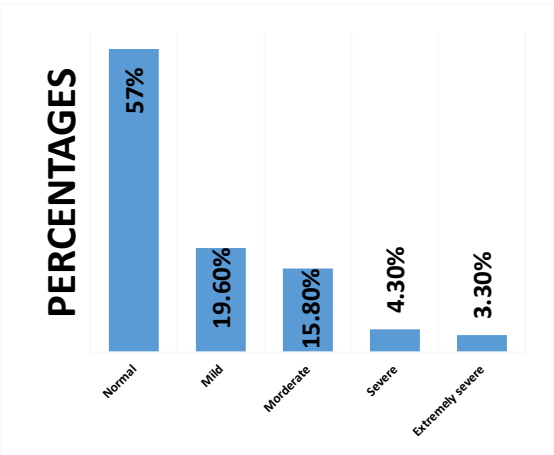


Figure 4: Levels of depression among participant

Table 2: Relationship between stress and socio-demographic factors.

Variable	Category	Level of Stress					Chi - Square	P - value
		Normal	Mild	Moderate	Severe	Extremely severe		
Gender	Female	265	37	24	15	4	5.902	0.207
	Male	174	37	18	5	1		
Age Groups	17-20	217	37	24	7	1	22.128	0.005*
	21-24	194	31	12	13	2		
	25-28	11	3	3	0	2		
	29-32	11	2	2	0	0		
	33+	4	1	1	0	0		
Marital Status	Single	418	70	39	2	5	2.699	0.997
	Married	12	3	2	0	0		
	Others	10	1	1	0	0		
Department	Physiotherapy and Sport Science	20	9	2	2	0	59.443	0.008*
	Nursing and Midwifery	69	5	7	2	0		
	Medicine and Dentistry	78	7	9	4	2		
	Physician Assistant	38	6	3	2	1		
	Health promotion and disability studies	23	7	3	6	1		
	Herbal Medicine	32	1	2	1	0		
	Veterinary Medicine	26	7	0	1	1		
	Medical Laboratory Sciences	21	2	2	0	0		
	Diagnostic medical imaging	37	13	4	2	0		
	Pharmacy	86	17	10	0	5		

Table 3: Relationship between depression and socio-demographic factors.

Variable	Category	Level of Depression					Chi - Square	P - value
		Normal	Mild	Moderate	Severe	Extremely severe		
Gender	Male	120	55	44	11	5	9.080	0.059
	Female	210	59	48	14	14		
Age Groups	17-20	167	44	51	14	10	13.426	0.098
	21-24	147	59	32	7	7		
	25-28	6	5	6	0	2		
	29-32	7	4	1	3	0		
	33+	2	1	2	0	0		
Marital Status	Single	316	108	86	23	19	9.311	0.676
	Married	8	5	2	2	0		
	Others	1	0	0	0	0		
Department	Physiotherapy and Sport Science	20	4	7	0	2	84.352	0.001*
	Nursing and Midwifery	55	15	8	3	2		
	Medicine and Dentistry	70	9	12	5	4		
	Physician Assistant	30	8	8	1	3		
	Health promotion and disability studies	21	7	5	4	3		
	Herbal Medicine	29	4	1	1	1		
	Veterinary Medicine	32	8	2	2	1		
	Medical Laboratory Sciences	8	11	6	0	0		
	Diagnostic medical imaging	24	12	14	4	2		
	Pharmacy	42	36	29	5	1		

Table 4: Relationship between anxiety and socio-demographic variables.

Variable	Category	Anxiety Normal	Mild	Moderate	Severe	Extremely severe	Chi - Square	P - value
Gender	Male	93	29	71	22	20	3.130	0.536
	Female	142	38	87	41	37		
Age Groups	17-20	121	33	76	32	24	5.546	0.698
	21-24	97	31	72	25	27		
	25-28	8	0	5	3	3		
	29-32	8	1	3	1	2		
	33+	0	2	2	1	0		
Marital Status	Single	224	61	154	59	54	13.331	0.345
	Married	6	4	4	3	0		
	Others	1	0	0	0	0		
Department	Physiotherapy and Sport Science	11	6	7	6	3	58.009	0.011*
	Nursing and Midwifery	37	12	18	7	9		
	Medicine and Dentistry	52	9	20	6	13		
	Physician Assistant	22	4	14	6	4		
	Health promotion and disability studies	7	6	16	5	6		
	Herbal Medicine	17	6	10	1	2		
	Veterinary Medicine	27	6	4	3	5		
	Medical Laboratory Sciences	5	5	9	4	2		
	Diagnostic medical imaging	21	5	18	7	5		
	Pharmacy	37	8	42	18	8		

Table 5: Multinomial logistic regression; relationship between the mental health status and physical activity

	PA ANXIETY	& PA DEPRESSION	& PA STRESS
Model of fit information	P=0.021	P=0.004	P=0.026
Goodness of fit	P=0.560	P=0.662	P=0.210

Table 6: Correlation Coefficient between Mental Health Status and Physical Activity Levels

Mental Health Status	Physical Activity Level	Coefficient(b)	P value
Level of Anxiety	Mild	Low	-0.474 0.216
		Moderate	-0.546 0.079
		High	-0.546 0.079
	Moderate	Low	-0.045 0.099
		Moderate	-0.096 0.672
		High	-0.096 0.126
	Severe	Low	-0.037 0.922
		Moderate	-0.210 0.505
		High	-0.216 0.505
	Extremely severe	Low	-0.258 0.376
		Moderate	-0.368 0.429
		High	-0.368 0.429
	Mild	Low	-0.125 0.244
		Moderate	-0.369 0.599
		High	-0.369 0.510
	Moderate	Low	-0.051 0.872
		Moderate	-0.278 0.296

Level of depression	Severe	High	-0.278 0.296
		Low	-0.281 0.098
		Moderate	-0.429 0.327
	Extremely severe	High	-0.429 0.327
		Low	-0.031 0.961
		Moderate	-0.034 0.950
	Mild	High	-0.034 0.950
		Low	-0.007 0.099
		Moderate	-0.537 0.982
	Moderate	High	-0.537 0.064
		Low	-0.186 0.061
		Moderate	-1.158 0.242
	Severe	High	-1.158 0.735
		Low	-0.205 0.745
		Moderate	-0.617 0.242
	Extremely severe	High	-0.617 0.735
		Low	-0.299 0.640
		Moderate	-9.064 0.735
		High	-9.064 0.745

DISCUSSION

This study aimed to establish the relationship between physical activity levels and mental health status of undergraduate health science students. Participants of the study had a mean age and standard deviation of 21.04±2.83 years respectively. This finding was similar to a study by Tyson et al. (2010), where the participants had an average age of 21.04 ±2.01 years. The majority of the respondents fell within the age group 17-20 years (288, 49.6%) followed by the 21- 24 age group (254, 43.7%) with 1% above age 33. This finding suggests that the

majority of the undergraduate health science students in this study were in their adolescence and early adulthood stages respectively, dealing with life's stressors, forming intimate relationships with the opposite sex as well as enjoying the company of peers (Fegert, Vitiello, Plener, & Clemens, 2020). Fegert et al. (2020) was of the opinion that a person's mental health may be impacted by a variety of stressors that can be brought on by all these changes. This was in line with research by Scott et al., (2019), numerous mental health issues, such as anxiety disorders, mood disorders, and psychotic illnesses, frequently start in adolescence or the early stages of adulthood. From the study, (235, 40.4%) of the participants were males and (346, 59.6%) were females. Similarly to this, Tyson et al. (2010) recruited 100 students for their study to establish the physical activity level and mental health of the student population, of which 20 were male and 80 were females inferring that most of the participants are females.

Out of 581 responses, 59.4% reported having symptoms of anxiety, 43% had symptoms of depression, and 24.3% had symptoms of stress, with females having a higher incidence of stress, anxiety, and depression than males. These findings indicate that among undergraduate health science students in this study, anxiety was more prevalent compared to depression and stress and that females are more impacted than males. This discovery was in line with earlier research which examined the mental health of college students (Tyson et al., 2010; Faravelli et al., 2013). These findings may be explained by the different ways that men and women self-report, as women are more likely to define any situation as problematic and become stressed much earlier

than males. Also, their innate propensity for anxiety and their inability to resolve all of their problems productively (Bint-e-hafeez et al., 2019).

Additionally, there was no significant relationship between the mental health status and the socio-demographic variables except for the department of affiliation and age. However, age showed a significant relationship with only stress. The findings of this study were concordant with a study by Stallman (2010) who suggested that the academic setting and unique features of various departments might have an effect on students' mental health. The type of coursework, departmental culture, and academic workload, frequently faced restlessness due to surprise tests, level of competitiveness, and faculty-student relations are a few examples of possible contributing elements as reported (Asare and Danquah 2015). Apart from the department of affiliation, age of the students also showed a significant link with stress ($p=0.005$), which was in line with other studies demonstrating that various age groups or stages of life are related to various stresses (Roxas et al 2023; Riboldi et al., 2023). Younger students may be dealing with the stress of living away from home for the first time or adjusting to a new academic and social environment, whereas older students may be dealing with the stress of adjusting to a new academic and social environment, juggling work, family, and study obligations, dealing with rising academic expectations, or having to make significant career decisions (Arnett, 2000; Zuhriyah, Winta, & Pratiwi, 2023).

According to this current study, again, 244 (42%) engage in moderate physical activity, 226 (38.9%) engage in vigorous physical activity, and 111 (19%) engage in low physical

activity indicating that the majority of the respondent at least engage in moderate physical activity.

According to the findings of the multinomial logistic regression analysis, there appears to be a link between physical activity (PA) and mental health parameters such as anxiety, depression, and stress. The model fit information indicates a strong association between PA and anxiety, stress, and depression. The good fit of the data further supports this finding, confirming the credibility of the model of fit information. This means that physical activity can help reduce anxiety, depression, and stress levels. This result was in line with that of Kandola et al. (2018), who found a strong correlation between PA and stress, anxiety, and depression. In the same vein, Binte-hafeez et al. (2019) also supported this conclusion in their study. Moreover, Majeed (2022) also stated in his research that PA can be utilized as a supplement to treat alcoholism and drug addiction, enhance one's sense of self, enhance cognitive performance, and lessen the effects of anxiety and depression.

The study revealed an inverse relationship between physical activity levels and the severity of anxiety, depression, and stress. As physical activity levels increase, the likelihood of experiencing these mental health conditions tends to decrease. Furthermore, students who engaged in high and moderate levels of physical activity showed lower levels of anxiety, depression, and stress than low physical activity groups. However, these findings were not statistically significant. These variations could be due to different confounding factors that might influence these associations. Similarly, Stults-Kolehmainen & Sinha, (2014) suggested that while physical activity can help

to reduce anxiety, depression, and stress, the effects are influenced by numerous factors. These could include individual differences such as genetic predispositions, gender, and age. Herring, O'Connor, & Dishman (2010) also suggested that physical activity can help reduce symptoms of anxiety, depression, and stress however, the type, duration, and intensity of the PA, as well as the person's physical health and past exercise experiences, can all affect how much PA reduces anxiety, depression, and stress.

Previous research conducted by Rodríguez-Romo et al., (2023) among university students showed that moderate and high levels of PA are inversely related to anxiety and depression. These findings are also supported by Gerber et al., (2015), who discovered that regular PA among university students was inversely connected with stress, anxiety, and depressive symptoms and positively correlated with quality of life.

CONCLUSION

The study indicates that participants had good physical activity levels, good depression, and stress levels, but greater anxiety levels. Females reported higher levels of anxiety, depression, and stress, while young participants had the highest levels. Participants with higher PA levels have improved MH status (reduced depression, anxiety, and stress levels). Therefore, it is vital that stakeholders put in place more PA interventions to reduce anxiety, depression, and stress levels prevalent among the undergraduate students. Instituting and re-enforcing policies on guidance and counselling services, peer support programmes, mental health education, and flexible learning environments across educational institutions

in the country as a whole. Stakeholders should collaborate with health agencies, university administration and management, student leadership, and professionals in Physiotherapy, Exercise and Sports Therapy to create a physical activity module or programme tailored to suit and accommodate each programme, and address mental health issues in students. Appointment of Physical Activity and Wellness Ambassador (PAWA) may also go a long way to encourage students to participate, engage, and embrace active living among themselves. Further studies should be conducted on stress, depression, and anxiety coping mechanisms among university students.

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