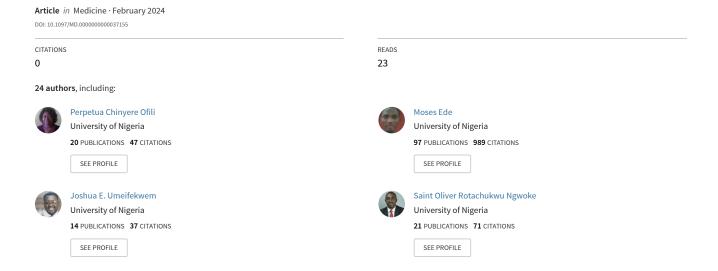# Physical activity and depressive symptoms during the fifth wave of COVID-19 pandemic Implication for public policy and administrators

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Physical activity and depressive symptoms during the fifth wave of COVID-19 pandemic
Implication for public policy and administrators

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Abstract

Depression is a public mental health problem that can progress to suicidal ideation, literature suggests regular physical activity may ameliorate it. The study assessed the link between physical activity and depression symptoms during the fifth wave of the COVID-19 pandemic and the Academic Staff Union (ASU) strike among undergraduates. Four hundred and eighteen undergraduates were recruited and participated in the study. Participants completed the International Physical Activity Questionnaire-Short Form (IPAQ-SF) and Patient Health Questionnaire-9 (PHQ-9) to measure depression severity. The result on PA showed that about one-third of the participants were inactive, above half were moderately active, while a few achieved high PA levels. Above one-fifth of the participants experienced minimal or no depression while a good percent had mild, moderate, moderately severe, and severe depression. Non-parametric tests between PA total score and depression total score with demographic variables were not significant. Spearman's correlation showed a strong negative relationship between PHQ-9 scores and IPAQ-SF scores. This suggests that a high PA level is associated with lower depression symptoms. The COVID-19 pandemic and the ASU strike experiences resulted in increased depression among undergraduates. The university administration needs to formulate an urgent policy to promote PA among undergraduates and provide treatment for the affected students.

Abbreviations: ASU = Academic Staff Union, COVID-19 = corona virus disease known as 2019, IPAQ-SF = International Physical Activity Questionnaire-Short Form, Mod. = moderate, PA = physical activity, PHQ-9 = Patient Health Questionnaire-9.

Keywords: ASU-strike, COVID-19, depression, physical activity, public administrators, public policy, undergraduates

1. Introduction

Depression is a mental health disorder and a global health problem. Depression is the third most common cause of disability worldwide. Depression could be referred to as a mood or emotional condition which may impact a person feelings, thoughts and behavior and may cause a number of emotional and physical health problems.[1] Prior to the pandemic, studies on undergraduate mental health condition showed that a range of depression severity was common and its incidence has been rising globally, especially in Nigeria.[2–7] Literature suggests, the corona virus disease known as 2019 (COVID-19) pandemic raised the prevalence of depression among Nigeria undergraduates

as is evidenced by 71.8%.[8] The prevalence pattern is a clear indication that the Academic Staff Union (ASU) post-COVID-pandemic industrial action in Nigeria may have contributed to an increase in proportion of undergraduates students who experience depression.

COVID-19 refers to a new beta COVID-19—novel coronavirus (SARS-Cov-2), that first appeared in Wuhan city, Hubei province, China in December 2019.[9] The disease which presents symptoms such as fever, respiratory symptoms (cough, sore throat, and nasal discharge), headache, and malaise was highly contagious and declared a public health emergency of international concern on 30th January, 2020 and a pandemic on March 11, 2020.[10,11] COVID-19 pandemic resulted in worldwide shot down of educational institutions, sparked stress, anxiety, and worry about getting infected which increased the rate of depression in undergraduate students.[12,13] The pandemic caused students to experience a lot of academic stress which exacerbated their depression level.[13] With the implementation of shot down policy, physical classes are replaced with online classes, which came with their own set of challenges and annoyances due to the low digital literacy levels and lack of smart phones among the majority of the students,[14] as well as Nigeria problematic internet connection issues.

Literature suggests undergraduate students are more prone to depression, perhaps as a result of the difficulties they face every day. Undergraduate students' depression is a major mental health issue that can negatively impact mood, thinking and feeling, studies and academic performance, eating patterns, relationships, behavior, or the body systems as a whole, substance abuse (alcohol, drugs) and suicidal thoughts.[1,5,15] Depression is the top cause of death for young people between the ages of 15 to 24 years old.[16] Both males and females have the same likelihood to attempt suicide while depressed but males have more tendencies to succeed in the suicide mission.[16]

University undergraduates are young people who transmit from secondary school (high school) into the university after passing the Joint Admission Matriculation Board standardized test. They are at a crucial transitional stage from adolescence to adulthood which subjects them to series of mental discomfort that can lead to depression. Earlier studies[17–19] highlighted risk factors of depression to include, feeling distant

from family members, adjusting to new challenges of trying to fit into the university system, such as securing accommodation, relationship issues, curiosity about their future careers which creates anxiety and stress to maintain excellent grades, financial difficulties resulting from the current economic crisis in Nigeria and other environmental factors. Symptoms of depression among undergraduates may manifest in a variety of ways, such as sadness, anxiety, low energy, fatigue, loss of interest or enjoyment in routine activities, changes in appetite and weight changes (either gain or loss), feelings of hopelessness, guilt, and unworthiness, attempts at suicide, difficulty concentrating, making decisions, or remembering things, low interest in social interaction and irritability or excessive crying.[20,21] Depression can be experienced in several degrees as mild, moderate (Mod.), moderately severe, and severe[21] which determine severity.

Age, gender, place of residence (hostel or off-campus), and year of study are a few socio-demographic factors that may have a substantial impact on undergraduates level of depression. Earlier studies[3,6] reported that gender play significant role in a person level of depression and females are known to experience depression more often than males.[22] Conflicting results exist in previous studies about the relationship between gender and depression.[23] Also, discrepancies exist in results of prior studies on association between academic level and level of depression experienced by undergraduates. Students in their lowest academic year were more depressed.[6] Regarding place of residence, no evidence of a connection has been observed between the kind of accommodation or residence and depression.[6,8] The rising incidence of depression among undergraduate students may subject them to a number of health challenges, if a suitable intervention approach is not put in place promptly to reduce their levels of depression.

Evidence from the literature indicates that regular physical activity (PA) can lower one depressive symptoms. A substantial amount of research indicates that PA is helpful in the prevention or treatment of depression.[24–28] Numerous researches found an inverse relation between PA and depression.[29–31] In line with above, PA of Mod. to vigorous intensity done for at least 30 minutes, 5 times (150 minutes) weekly serve as an adjunct in controlling mental health concerns like depression.[32] PA is any action involving the skeletal muscles that requires energy expenditure[32] such as working, playing, household chores, exercise and sports. These activities are classified into various non sleep categories including leisure-time, occupation, transportation and home based activity with a view to increase PA.[33] Although regular engagement in PA is associated with numerous mental health benefits, studies report a drop in undergraduates' PA levels.[34] It is therefore important to understand the PA levels of university undergraduates as it will aid in developing effective measures to encourage consistent PA participation in order to lower the prevalence of depression among them. Literature suggests that PA behavior that starts early in life may probably continue into old age and conversely inactive behavior cultivated early in life may transmit to adulthood.[35] Although there are earlier studies on undergraduate depression levels in Nigeria,[4–6,8] this present study is unique as no prior study has examined depression among undergraduates since the outbreak of COVID-19 pandemic and the recent ASU strike.

The study aimed to determine the link between PA and depression among university undergraduates in southeast Nigeria. The link between them may provide evidence based information on health promotion strategies to be adopted by the university administration to guide against new cases of depression and how to improve the health status of the students who are already victims of depression. Furthermore, the study hypothesized that there is no significant difference in PA levels and depression levels based on demographic variables of gender, location, age and academic levels.

2. Methods

2.1. Study design and participants

The study adhered to the STROBE statement for conduct and reporting for cross-sectional studies.[36] Eligible participants were 36,000 undergraduate students enrolled during the 2020/2021 academic session in the University of Nigeria.[37] The University of Nigeria has 4 main campuses, Nsukka, Enugu, Ituku-Ozara and Ababut Nsukka campus (University of Nigeria, Nsukka) were used for the study. University of Nigeria, Nsukka campus has 9 Faculties which include Biological Sciences, Education, Engineering, Arts, Agriculture, Pharmaceutical Sciences, Veterinary Medicine, Social Sciences, and Physical Sciences. Participants' ages range from 18 to 30 years. Students who enrolled in Diploma program, sub-degree program (Joint Universities Preliminary Examination Board), non Nigeria students and those who had completed first degree were not part of the study. We conducted the survey between May to August 2022.

2.2. Sample and sampling procedure

The sample was determined using a formula $Z^2_{\alpha/2}*P*(1-P)*D/E^2$ for sample size estimation for proportion in the survey type of study.[38] The prevalence of depression was 44.6% based on a previous study,[6] with a 5% margin of error and 95% confidence level. This gave an estimated sample size of 380 participants. To guard against non non-response rate a 10% (0.1), i.e., $(380 \times 0.1 = 38)$ of the minimum required sample size was added which gave the final sample for the study as 418 participants.[38,39]

A multistage sampling technique was used to select the participants. First simple random sampling was used to select 5 faculties out of 9 faculties in the Nsukka campus and then 2 departments from each of the faculties. Finally, convenience sampling was used to select 40 students from 8 departments and 49 students from the 2 departments in faculty of education which is the largest faculty.

2.3. Procedure for data collection

The research was carried out in line with the Declaration of Helsinki 1964 of the 18th World Medical Association, as updated by the 29th World Medical Assembly in Tokyo in 1975.[40] The Faculty of Education, University of Nigeria Ethics Committee authorized the study with permission number UNN/FE/REC22/053. Approval was sought from the Heads of the sampled Departments to distribute the Patient Health Questionnaire (PHQ-9) and International PA Questionnaire (IPAQ-SF) to the university undergraduate students. The purpose of the study was explained as a preamble in the questionnaire. Students were informed that they were not compelled to be part of the study, thus responding to the questionnaires was indicative of their consent to be part of the study.

2.4. Measures

Participants completed self-report questionnaires which included demographic information about their age, gender, course level, and residence (hostel or off-campus), the Patients Health Questionnaire-9 (PHQ-9), and the IPAQ-SF.

2.5. Socio-demographic characteristics

The study participants responded to questionnaire items on socio-demographic characteristics such as age, gender, class or year of study, and place of residence or type of accommodation. Participants' age in years was coded as a continuous and polytomous variable. These include young adults (18–22 years) coded as 1, intermediate young adults (23–26 years) coded as 2, and older adults (27–30 years) coded as 3. Gender was dichotomized to male coded as 1 and female coded as 2. Place of residence or accommodation type was categorized to hostel coded as 1 and off-campus coded as 2. The year of study/academic level was categorized to 5 groups. Year one (100 level coded as 1), year 2 (200 level coded as 2), year 3 (300 level coded as 3), year 4 (400 level coded as 4) and year 5 (500 level coded as 5).

2.6. Depression

Depression was measured using a brief PHQ-9[41] which measures depression severity. The instrument is on a 4-point scale ranging from "not at all" to "most of the days" the frequency with which participants experienced depression symptoms in the past 2 weeks. PHQ-9 is used in clinical and population-based studies. The total score is a simple summation of the 9-item scores with cut-points of 5, 10, 15, and 20 for mild, Mod., severe, and severe depressive symptoms, respectively. The present study established a reliability coefficient of PHQ-9 as .92 which suggested very good internal consistency reliability for the scale with the present sample.

2.7. Physical activity

Participant PA was measured using the IPAQ-SF.[42] The IPAQ-SF correlation was 0.80 for reliability and 0.30 for validity with a global acceptable reliability of 0.70 to 0.97.[43] Previous studies in Nigeria established the reliability of IPAQ-SF as 0.73[44] and 0.79.[45]

The IPAQ short form is a self-reported questionnaire that measures the duration of PA on 4 categories including vigorous, Mod. walking (low), and sitting. The sitting section (sedentary) was not used for the present study. Each category of PA is assigned Metabolic Equivalent Task (MET) such as 3.3 METs for walking or low PA, 4 METs for Mod. PA, and 8 METs for Vigorous PA. The estimation of energy expenditure for each category was calculated by multiplying the MET value for the category × duration/minutes × number of times such activity was performed in a week. The total METs value was the summation of walking/low-intensity, Mod.-intensity, and vigorous-intensity activities expected to at least 3000 MET-min/week which is considered the health-enhancing PA level.[42] Participants who achieved less than < 600 MET-min/week were classified as low PA (insufficiently active or inactive), ≥ 600 METs to < 3000 MET-min/week as Mod. or active and ≥ 3000 MET-min/week as high PA (health-enhancing PA level).[42]

2.8. Statistical analysis

A computer-based software; Statistical Package for Social Sciences (SPSS version 21) was used to analyze the data. Preliminary analysis was conducted to screen data for coding errors, missing value points, and outliers in the participants' coded responses to the questionnaire items.[46] The Kolmogorov–Smirnov statistic conducted to test the normality of the PHQ-9 and IPAQ-SF continuous data was significant (value < 0.05) which suggested a violation of the assumption of normality. The chi-square test was used to evaluate the statistical association between PA levels (i.e., low PA, Mod. PA, and high PA) and depression levels (i.e., minimal, mild, Mod., Mod.-severe, and severe) with demographic variables at 0.05 level of significance. Non-parametric statistical tests (Mann–Whitney test and Kruskal–Wallis test) were computed to examine the association between PA scores (i.e., total MET-min/week) and depression scores (i.e., total PHQ-9 scores) with the demographic variables. Spearman correlation was employed to determine the relationship between PHQ scores and PA scores.

3. Results

3.1. Descriptive statistics

Out of 418 questionnaires distributed, 383 have required information for all sections of the questionnaire. This gave a return rate of 91.63%. The sample consists of 43% male and 57% female. The average ages of the participants were 23.08 ± 3.71. The summary of demographic characteristics of participants is presented in Table 1.

The findings of descriptive statistics such as frequency, percentages, mean rank, median, and Spearman correlation for determining relationship between total depression score and total PA score and the sub-divisions of PA levels are presented in Tables 2–5.

Table 2 presents the results of PA level and depression level of participants. From the table 31.3%, 63.2%, and 5.5% of the participants had low, Mod., and high PA levels (health-enhancing) PA respectively. Table 2 also presents the frequencies and percentages of depression (PHQ-9 scores) among undergraduates, which indicate that 23.2%, 29.0%, 19.3%. 16.4% and 12% respectively had minimal or no depression, mild depression, Mod. depression, moderately severe depression, and severe depression.

Table 3 shows the results of the Pearson Chi-square test for independence conducted to determine the differences in PA levels of the participant demographic variables (gender, location of accommodation, age, and academic level). The result indicated no significant difference among the variables. Gender, X^2 (2, n = 383) = 0.26^a, P = .88, Cramer V = 0.03 (small effect Cohen et al); accommodation location, X^2 (2, n = 383) = 2.21^a, P = .33, Cramer V = .08 (small effect); age, X^2 (4, n = 383) = 0.85^a, P = .93, Cramer V = 0.07 (small effect).

Table 3 also presents the result of the Mann–Whitney U test and the Kruskal–Wallis test conducted to compare the demographic variables of gender, location of accommodation, age, and academic level respectively. For gender, males (Md = 1226.50, = 164) and female (Md = 1062.00, n = 219), U = 16,118.50, Z = –0.1716, P = .10, r = 0.09 (small effect). For location of accommodation, hostel (Md = 1154.50, n = 148) and off-campus (Md = 1116.00, n = 235), U = 17,384.50, Z = –0.01, P = .61, r = –0.00 (no effect). The Kruskal–Wallis test revealed no significant difference in age and academic level. For age across 3 groups (Grp1, n = 123; age 18–22, Grp2, n = 190; age 23–26, Grp3, n = 70; age 27–30), X^2 (2, 383) = 1.98, P = .37. For academic level across 5 groups (Grp1, n = 92; year1, Grp2, n = 91; year2, Grp3, n = 78; year3, Grp4, n = 88; year4 and Grp5, n = 34; year5 and above), X^2 (4383) = 5.49, P = .24.

Table 4 shows, the result of the Chi-square test for independence conducted to verify the differences in depression levels of participants based on the demographic variables (gender, location of accommodation, age and academic level). The Pearson Chi-square test for independence conducted indicated significance difference only on gender, but no significant difference was observed on accommodation location, age and academic level. Gender, X^2 (2, n = 383) = 13.40^a, P = .01, Cramer V = 0.19 (medium effect); accommodation location X^2 (4, n = 383) = 7.35^a, P = .12, Cramer V = 0.14 (medium effect and); age, X^2 (8, n = 383) = 9.29^a, P = .32, Cramer V = 0.08 (small effect).

Table 4 equally presents the Mann–Whitney U test and Kruskal–Wallis test conducted on the total PHQ-9 scores to compare gender, and location of accommodation, then, age and academic levels respectively. In gender, males (Md = 8, n = 164) and females (Md = 10, n = 219), U = 16,247.00, Z = –0.60, P = .11, R = 0.08 (small effect). For location of accommodation, hostel (Md = 8, n = 148) and off-campus (Md = 10, n = 235), U = 16,522.50, Z = –0.82, P = .41, R = 0.04 (small effect). Also, Kruskal–Wallis test on age and academic levels respectively showed no significant difference. For age across the 3 group (Grp1, n = 123: age 18–22, Grp2, n = 190: age 23–26, Grp3, n = 70: age 27–30), X^2 (2, 383) = 1.776, P = .41. For academic level across 5 groups (Grp1, n = 92: year1, Grp2, n = 91: year2, Grp3, n = 78; year3, Grp4, n = 88: year 4 and Grp5, n = 34: year 5 and above) X^2 (4, 383) = 3.173, P = .529.

The Spearman correlation analysis for determining the relationship between depression scale total (HPQT) with Total PA and levels of PA are presented in Table 5. Significant negative correlation exists between HPQT and IPAQ-SF TPA MET-min/wk (r = –0.90, P = .000); HPQT and IPAQ-SF LPA^a (low [–0.54, P = .000]); HPQT and IPAQ-SF MPA^b (Mod. [–0.55, P = .000; HPQT and IPAQ-SF HPA^c (high [–0.68, P = .000]).

4. Discussion

This study is the first in Southeast Nigeria Universities to use the IPAQ-SF and PHQ-9 to measure undergraduates' PA level and depression levels, investigate the relationship between PA and depression, and determine their association with demographic factors like gender, age, resident location, and academic level since COVID-19 pandemic and ASU strike. According to the study findings, one-third, the majority and a relatively small number of undergraduates had low, Mod., and high PA levels. This result backs up the findings of an earlier study[45] that most of the undergraduates were moderately active, although more proportion had lower PA levels while less proportion had higher PA levels than they claimed in their study. The result backs up the report of WHO[32] that more than a quarter of the world adult population is insufficiently active. The drop in high PA levels and the increase

Table 1

Demographic characteristics of the study participants (n = 383).

Characteristics	Category	Frequency	Percent
Gender	Male	164	42.8
	Female	219	57.2
Age	18–22	123	32.1
	23–26	190	49.6
	27–30	70	18.3
Residence	Hostel	148	38.6
	Off-campus	235	61.4
Course level	Yr 1	92	24.0
	Yr 2	91	23.8
	Yr 3	78	20.4
	Yr 4	88	23.0
	Yr 5	34	8.9

Table 2

PA levels and depression levels of participants (n = 383).

Variable	F	%
PA levels (IPAQ-SF scores)		
Low—PA level	120	31.3
Moderate—PA level	242	63.2
High—PA level	21	5.5
Depression (PHQ-9 scores)		
Total depression cases	295	77.0
Minimal or none depression	89	23.2
Mild depression	111	29.0
Moderate depression	74	19.3
Moderately severe depression	63	16.4
Severe depression	46	12.0

High PA = ≥3,000 MET-min/wk, IPAQ-SF = International Physical Activity Questionnaire-Short Form, Low PA = <600 MET-min/wk, Moderate PA = >600 to <3000 MET-min/wk, PA = physical activity, PHQ-9 = Patient Health Questionnaire-9.

Table 3

Total PA scores and PA levels with participants demographic characteristics (N = 383).

Variables	N	Total PA score (MET-min/wk)				Physical activity levels			
		Mean rank	Median	U, H(χ²)	Z, (df), P value, r	Low PA (n = 120) f (%)	Mod. PA (n = 242) f (%)	High PA (n = 21) f(%)	χ², (df) P val, phi/cv
Gender									
Male	164	203.22	1226.50	U (16,118.50)	Z (−1.72),	52 (31.7)	102 (62.2)	21 (5.5)	0.255, 2
Female	219	183.60	1062.00		0.09, −0.09	68 (31.1)	140 (63.9)	11 (5.0)	0.88, 0.03
Accommodation									
Hostel	148	192.04	1154.50	U (17,384.50)	Z (−0.01)	51 (34.5)	87 (58.8)	10 (6.8)	2.207, 2
Off-campus	235	191.98	1116.00		1.00, −0.00	69 (29.4)	155 (66.0)	11 (4.7)	0.33, 0.08
Age									
18–22	123	201.71	1182.00	H(X²) = 1.975	2.372	35 (28.5)	81 (65.9)	7 (5.7)	0.850, 4
23–26	190	184.23	1056.00			61 (32.3)	119 (62.6)	10 (5.3)	0.93, 0.03
27–30	70	196.04	1069.00			24 (34.3)	42 (60.0)	4 (5.7)	
Academic yr									
Yr 1	92	207.09	1302.00			29 (31.5)	58 (63.0)	5 (5.4)	
Yr 2	91	179.59	1036.00	H(X²) = 5.486	4.241	29 (31.9)	57 (62.6)	5 (5.5)	3.321
Yr 3	78	206.01	1292.00			19 (24.4)	54 (69.2)	5 (6.4)	8, 0.91, 0.07
Yr 4	88	178.43	951.00			32 (36.4)	51 (58.0)	5 (5.7)	
Yr 5	34	187.35	1069.00			11 (32.4)	22 (64.7)	1 (2.9)	

*P = .05, cv = Cramer's, df = Kruskal–Wallis degree of freedom, H(X²) = Kruskal–Wallis H test (chi-square), high PA = ≥3000 MET min/wk, low PA = <600 MET-min/wk, Mod.= moderate, moderate PA = 600–3000 MET-min/wk, P val = P value; P values from X² test indicated possible association between PA categories and socio-demographic variables, phi = effect size, r = Cohen (1988) effect size, U = Mann–Whitney U, V = effect size for tables larger than 2 by 2, X² (df) = Pearson X² degree of freedom, Z = Mann–Whitney Z.

in the percentage of low PAL when compared with the study conducted before the COVID-19 pandemic in Nigeria[45] could be a result of the sedentary lifestyle brought on by the sit-at-home policy. Due to the shutdown of public spaces during the lockdown, including fitness centers, previously active students were no longer able to use PA facilities. In addition, environmental issues and the impact of urbanization, as noted by,[47] decreased the amount of space available for PA in most homes, which had a negative impact on PA behavior. The 8-month strike that forced students to stay at home may also have contributed to the decline in PA. The outcome necessitates quick action plans from the university administration to promote the PA behavior of Students.

The results also revealed that 77.0% of individuals had depression, with mild depression accounting for 29.0%, Mod. depression for 19.3%, fairly severe depression for 16.4%, and severe depression for 12% of participants (Table 2). Although consistent with earlier studies, this result is rather overwhelming and paints a picture of an elevated prevalence of depression.[2] It is concerning since a quick glance at the findings of earlier studies indicates that the incidence of depression is rising as[3] estimated a prevalence of 33% among Iranian undergraduates. In Nigeria specifically, a prevalence of only 8.3% among university undergraduates was observed.[4] Another study reported a prevalence of 58%.[5] Furthermore[6] highlighted a prevalence of 44.6% while[8] reported a prevalence of 71.8% and this current study observed a prevalence of 77.0%. This may be related to feeling distant from their family members, having difficulty in school, having relationship problems, and struggling financially as a result of Nigeria current economic crisis, and other environmental circumstances.[17–19] The ASU strike and the COVID-19 Pandemic several waves are likely responsible for this trajectory increase in student depression.[13,14]

The results of the chi-square test between the PHQ-9 score and gender showed a significant difference, which confirms the findings that men experience depression at a rate of 28% compared to 23% for women.[3] Female students were reported to have more depression than male students.[23] However, no evidence of a connection was observed between depression and gender.[6] The inconsistent findings on the relationship between depression and gender may be due to certain socioeconomic characteristics, such as adequate support from close friends and family. This lends credence to the argument that depression may be brought on by a lack of traditional social support, such as meeting basic necessities.[5] The impact of inadequate social support may be greater on women than on men. Women, in contrast to men, often appear to be too emotional, making it harder for them to deal with marital problems and financial challenges. Males are more extroverted, have a desire to share issues and ideas, and can think of alternative ways to deal with the causes of sadness. Here, the straightforward analogy is that, if women receive enough social support, their levels of depression may not differ from those of men.

Examining the connection between PA and depression was another goal of research. The Spearman correlation (Table 5) shows a negative relationship between TPA (total PA) and the 3 PA dimensions and depression (rho = −0.90), LPA[a] or low (r = −0.54), MPA[b] or Mod. (r = −0.55), HPA[c] or high (r = −0.68) respectively. This result implies that when PA volume increases, depression level decreases, and when PA level decreases depression level increases. The result confirms earlier research studies showing an inverse link between PA and depression.[29–31] The results are also in line with other research, which indicates that those who are physically inactive are twice as likely to experience depressive symptoms as people who are physically active.[29] Lower symptoms of depression were also reported in physically active people.[30,31]

The study findings that there is a link between PA and depression are reasonable since they support claims made in other studies about the potential of PA to lessen depression.[24–28] PA offers numerous beneficial practical applications in the treatment and management of depression in the field of mental health. Regular PA has been shown to reduce overall stress levels by releasing tension and promoting relaxation. It provides a mental break from distressing negative thoughts and provides avenues for social interaction and social support. The new acquaintances can enhance feelings of belonging which may reduce feelings of loneliness or isolation often experienced with depression. More so, PA improves mood by enhancing the production of endorphins, dopamine, and serotonin in the brain which elevates mood and reduces symptoms of depression.

Table 4

Total PHQ-9 and PHQ-9 levels with participants demographic characteristics (N = 383).

Variables	N	Total depression (PHQ-9) score				Depression levels					
		Median	Mean rank	U, H(χ^2)	Z, (df) P value, r	Mini (n = 89) f (%)	Mild (n = 111) f (%)	Mod (n = 74) f (%)	Mod Sev (n = 63) f (%)	Sev (n = 46) f (%)	χ^2, (df) P val, phi/cv
Gender											
Male	164	8.00	181.57	U = 16,247.00	Z (−1.60) 0.11, −0.08	49 (55.1)	42 (37.8)	24 (32.4)	33 (52.4)	16 (34.8)	13.395 4, 0.01, 0.19
Female	219	10.00	199.81			40 (44.9)	69 (62.2)	50 (67.6)	30 (47.6)	30 (65.2)	
Accommodation											
Hostel	148	8.00	186.14	U = 16,522.50	Z (−0.82) 0.41, −0.04	38 (42.7)	46 (41.4)	20 (27.0)	29 (46.0)	15 (32.6)	7.352 4, 0.12, 0.14
Off-campus	235	10.00	195.69			51 (57.3)	65 (58.6)	54 (73.0)	34 (54.0)	31 (67.4)	
Age											
18–22	123	8.00	183.23	H(X²) = 1.776	(df = 2) 0.411	26 (29.2)	44 (39.6)	25 (33.8)	16 (25.4)	12 (26.1)	9.288 8, 0.32, 0.11
23–26	190	10.00	199.47			47 (52.8)	45 (40.5)	38 (51.4)	32 (50.8)	28 (60.9)	
27–30	70	8.00	187.14			16 (18.0)	22 (19.8)	11 (14.9)	15 (23.8)	6 (13.0)	
Academic yr											
Yr 1	92	8.00	180.18	H(X²) = 3.173	(df = 4) 0.529	23 (25.8)	29 (26.1)	17 (23.0)	15 (23.8)	8 (17.4)	19.300 16, 0.86, 0.08
Yr 2	91	10.00	204.62			19 (21.3)	25 (22.5)	14 (18.9)	19 (30.2)	14 (30.4)	
Yr 3	78	8.00	183.99			23 (25.8)	19 (17.1)	16 (21.6)	12 (19.0)	8 (17.4)	
Yr 4	88	10.00	200.10			18 (20.2)	25 (22.5)	19 (25.7)	13 (20.6)	13 (28.3)	
Yr 5	34	9.00	187.65			6 (6.7)	13 (11.7)	8 (10.8)	4 (6.3)	3 (6.5)	

*P = .05, cv = Cramer's, df = degree of freedom, H(X²) = Kruskal–Wallis degree of freedom, H(X²) = Kruskal–Wallis H test (chi-square), Mini = minimal, Mod Sev = moderate severe, Mod = moderate, phi = effect size, PHQ = Patient health questionnaire, r = Cohen (1988) effect size, Sev = severe, U = Mann–Whitney U;Z = Mann–Whitney Z, V = effect size for tables larger than 2 by 2, X² (df) = Pearson X² degree of freedom.

6

Table 5

Spearman correlation analysis on study variables and sub-dimensions'.

Variable	Mean	SD	1	2	3	4	5
PHQT	10.29	6.42	–				
IPAQ-SF TPA MET-min/wk	1221.08	777.03	−0.90	–			
IPAQ-SF LPA[a] (low)	529.00	347.97	−0.54	0.56	–		
IPAQ-SF MPA[b] (moderate)	277.43	325.51	−0.55	0.66	0.10	–	
IPAQ-SF HPA[c] (high)	408.76	435.37	−0.68	0.77	0.09	0.50	–

HPA = high physical activity, IPAQ-LF LPA[a] = <600 MET-min/wk, IPAQ-SF HPA[c] = ≥3000 MET min/wk, IPAQSF MPA[b] = >600 to 3,000 MET-min/wk, IPAQ-SF = International Physical Activity Questionnaire-Short Form, LPA = low physical activity, M = mean, MET = metabolic equivalent tasks, Min = minutes, MPA = moderate physical activity, PA = physical activity, PHQT = patient health questionnaire total score, SD = standard deviation, TPA = total PA MET-min/wk, wk = week.

4.1. Implications for public policy and administrators

The COVID-19 pandemic undoubtedly raised students' levels of depression, but the ASU strike also played a significant role. The impact of the ASU strike has not yet been felt because the successful applicants for the Unified Tertiary Matriculation Examination in 2022 and 2023 have not yet started their academic calendars. These student groups are already feeling some degree of worry due to academic uncertainty, which could eventually lead to depression. According to the research, regular PA could be used by university administrators as a successful intervention technique to lower the prevalence of depression among university undergraduates. The importance of such intervention cannot be overemphasized because it will be a tool in the hands of the university administration to prevent depression or lessen future sadness, particularly among the 2 disappointed and stagnant groups that have not yet begun their academic programs.

We suggest that health public administrators should monitor the distribution and administration of drugs related to COVID-19 to the community members who are eligible for the drug. They should not admit corrupt practices as it does not allow the COVID-19 vaccines and other related drugs to reach the target population. It is also the role of public administrators to ensure that the public is educated on issues related to vaccines sponsored by the government and other volunteers. Therefore, public administrators should liaise with health officials in teaching the public about specific COVID-19 strategies. This could be achieved faster as most of the Centers for Disease Control and Prevention are located at either local government areas or state levels.

Given that some developing countries experienced low turn-out due to misconceptions, it is the role of public administrators to make laws and modify laws and regulations to respond to the pandemic. Prior to the COVID-19 epidemic, elected and appointed public administration authorities had to decide how much money to spend on these public goods and how to balance these conflicting demands. We suggest that public administrators should continue these to the point of post-COVID-19 experience. This shows the importance of public health policies in ensuring equity in distributing public goods. They create policies that can enhance a citizen experience and guarantee the institution operates efficiently. They collaborate with healthcare administrators to ensure smooth delivery.

Public administrators and healthcare administrators are employed by educational institutions to assist students and staff with health-related cases. Traditionally, they create work schedules, increase productivity, keep an eye on spending and budgets, and make sure the facility conforms with all applicable policies pertaining to medicine. Depending on the facility size and location, a healthcare administrator responsibilities may alter over time as during the COVID-19 pandemic. As evidenced by how the COVID-19 pandemic altered the landscape of healthcare, flexibility within the role is advantageous.

As students became depressive due to the COVID-19 pandemic and ASU strike, university administrators should create public billboards and share websites that promote awareness of changing negative perceptions related to the COVID-19 and ASU strike. They should increase efforts that support research on COVID-19 cases in university communities in Nigeria. The awareness information would reduce misconceptions about it. It is not quite impressive that only educational institutions in high-income and upper-middle-income nations supplied current information about the COVID-19 pandemic, and these nations were more proactive in spreading messages about the COVID-19 pandemic. Unlike some universities in Nigeria, such a broad dissemination of knowledge was not in place and that could be the reason for increased depressive symptoms among Nigerian university students related to COVID-19 and ASU strike.

5. Conclusion

According to the study, the majority of undergraduates had Mod. PA levels; one-third was inactive, and only a few had high PA levels (health-enhancing). However, there was no statistically significant difference between PA Levels and the demographic factors. It was found that depression was highly prevalent, and a statistically significant relationship exists between gender and depression severity. Also, PA and depression have a negative association. In accordance with the results, it was advised that university management should start conducting routine mental health screenings to spot students who are depressed and get them immediate mental health care. Also, in order to improve students' mental health, counseling services and recommended PA days during the week should be implemented.

6. Limitations

The population of this study was limited to undergraduate students at the University of Nigeria in Nsukka, which is not large enough to generalize the findings to all university student populations. The IPAQ-SF was used to measure the PA level, and the PHQ-9 was used to measure the depression level. Since both were self-reporting instruments, there is a chance that responses were biased and that the PA level and depression scores were overstated or understated. Additional research utilizing an objective pedometer or accelerometer-based measurement of PA level is required. For hospital documentation, an accurate clinical evaluation of undergraduates' depression is also necessary. In the future, studies should also combine qualitative and quantitative measures. Also, future research may focus on the causes of the rising prevalence of depression among undergraduate students and assess the efficacy of incorporating Social Cognitive Theory into an intervention to initiate and maintain regular PA among undergraduates.

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