

# A Study on Exercise and Sleep Patterns in Preclinical Medical Students in The University of Maiduguri

Martha Orendu Oche Attah<sup>1,3</sup>, Tamunotonye Watson Jacks<sup>2</sup>, Sani Hyedima Garba<sup>1</sup>

<sup>1</sup>Department of Human Anatomy, College of Basic Medical Sciences, University of Maiduguri, Maiduguri, Borno State, Nigeria

<sup>2</sup>Department of Medicine, Faculty of Medicine, Cyprus International University, Nicosia

<sup>3</sup>Department of Human Anatomy, Rivers State University, Port-Harcourt, Rivers State, Nigeria

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## ABSTRACT

**Introduction:** sleep is a biological process that is essential for physical and psychological restoration. Medical and paramedical school students experience a significant amount of psychological stress during their training owing to their hectic schedules. Medical students are known to have an irregular sleep pattern and suffer from sleep disturbances, fatigue and mood changes which often continues throughout training and career.

**Aim:** to observe the sleep pattern in preclinical Medical students and observe if exercise affected sleep patterns.

**Methods:** questionnaires were developed for data collection on personal data, general concept of sleep, sleeping patterns and the effect of physical activity on sleep. The data was then compiled and analyzed.

**Results:** The highest age range was 21-31 years (62.8%), 70% of the respondents were male and 77.8% were single and spent an average of 3 to 4 hours (44.4%) studying nightly. 52.6% of the students did not have a regular bedtime but wakeup time was generally between 5am (36%) and 6am (35.6%). About 54% of the respondents fell asleep in 20 minutes or less after settling in; 57.1% took siestas in the afternoon. Many of the students understood the basic concept of sleep, dreaming and sleep pattern. 56.1% of the respondents engaged in physical exercise and found it beneficial.

**Conclusion:** exercise is an inexpensive practice that reduces stress and promotes sleep patterns. Although, less than half of the respondents did not participate in exercise in spite of its documented beneficial effects.

**Keywords:** Exercise; Medical Students; Paramedical Students; Physical Activity, Sleep Pattern.

## Introduction

Sleeping is a natural repetitive state of rest for the mind and body which is essential to life. While the body rests, the brain oversees a wide variety of biological maintenance that keeps the body functional<sup>1</sup>. Sleep is crucial for memory consolidation, learning, decision making, and critical thinking which are necessary for proper functionality in the academic environment. Sleep is an optimal operation for key cognitive functions related to academic, mental and social success in institutions of higher education. University students are reported to have a significantly worse quality of sleep which may be caused by inconsistent sleep schedules and sleep deprivation when compared with the general population. They also suffer from a greater amount of daytime sleepiness compared to the general population as many students are busy in the daytime attending lectures<sup>2</sup>. When students resume at College/Universities, their sleep habits are often one of their first daily routines to change and not usually for the better. College/University students typically shift to an irregular sleep-wake cycle characterized by short sleep length on weekdays and phase delays (later wake-up time) on weekends, this general pattern

is influenced by an individual's study, social and work schedules. Sleep deprivation and poor sleep quality are particularly prominent in young adult and college student populations<sup>3</sup>. Students tend to sacrifice sleep to participate in social and academic commitments contributing to constantly changing sleep routines and poor sleeping habits. Medical students are known to have an irregular sleep pattern and suffer from sleep disturbances, fatigue and mood changes which often continues throughout training and career. Research shows that a good night's rest is essential for helping maintain mood, motivation, memory and cognitive performance. While asleep, the brain integrates new knowledge and forms new associations therefore, sleep is critical for maintaining a healthy life. An adult typically needs 7 to 8 hours of sleep per day<sup>4</sup>. Though many health organizations recommend 7 to 8 hours of sleep for the average adult, there is no standardized number of hours for sleep. The amount of sleep needed varies per individual.

The quality of sleep that one receives depends on two factors, basal sleep and sleep debt. Basal sleep is the amount of sleep a body needs on a regular basis for optimum sleep<sup>5</sup>. Sleep debt is the accumulated

sleep that is lost to poor sleep behaviors, illness, environmental factors, or other causes. Sleep debt results in lowered sleep quality. It is just as important as sleep quantity, but the two work concurrently. Sleep quality does not necessarily reflect on the quantity of sleep obtained. Although some people may feel rested with a few hours of sleep per night, studies show that reduced hours of sleep is associated with low performance on complex mental tasks<sup>4,5</sup>.

An intriguing occurrence during sleep is dreaming. Although reports of dreaming are most frequent and vivid when an individual is aroused from rapid eye movement (REM) sleep<sup>7</sup>. Dreams are highly influenced by emotion. The limbic areas, in particularly the amygdala, is highly active during the REM dream state leading some researchers believe that emotion does not simply arise from the dream, but rather emotion orchestrates the dream activity<sup>8</sup>. Dreams can be viewed as unique psychological products of our minds that are full of personal meanings<sup>9</sup>. Dreams and the concept of dreaming are poorly understood by many students and the present study seeks to shed light on the perception of sleep amongst students.

No other daytime behavior has been associated with better night-time sleep than exercise. Regular physical activity has consistently been associated with better sleep in survey studies<sup>10,11</sup>. Acute exercise and regular exercise participation are typically recommended for better sleep in the lay literature, as well as by sleep experts. In the current study, there is an attempt to relate exercise and sleep in Medical and Paramedical students from the College of Medical Sciences of the University of Maiduguri.

## Material and Method

### Study setting and sample

This cross-sectional study was conducted at College of Medical Sciences, University of Maiduguri. Second and third year Pre-clinical medical students and second, third and fourth year human anatomy students were administered a questionnaire. The questionnaire was developed for data collection on personal data, societal/general concept of sleep, and the concept of dreaming. The non-responses were excluded from the analysis. All answers were kept confidential and completed questionnaires were anonymous, and no personal identifiers were collected. All study procedures were approved by the Institutional Ethical Board of the University of Maiduguri The data was then compiled and analyzed using Microsoft Excel.

### Recruitment

Interested students were invited to participate in the study after their lectures Students who expressed

an interest in participating were asked to meet in a large classroom or an auditorium where they were informed about the purpose of the study. Students consenting to participate were asked to complete a self-administered individual survey in form of a questionnaire. A structured and open questionnaire was administered to students after consent was obtained from the participating students. These students filled the questionnaires as required and submitted them to the researchers. Vision-impaired students and those who could not read the consent and questionnaire forms were not eligible to participate. Those enrolled in correspondence, extension, or night school programs were not included as well since their experience might be different from regular-time students. A total of 300 questionnaires were administered to the undergraduate students that participated in the study. The questionnaires were prepared to represent 620 students. The students that filled the questionnaires were chosen by random sampling method. Physical activities carried out by students are varied therefore, the researchers attempted to classify the exercises as light, heavy or both taking into consideration the time and energy exerted in the course of the exercise. The results and analysis excluded missing/uncompleted questionnaires.

## Results

Table 1 provided results concerning the general characteristics of respondents which included the age, gender, marital status, residential area and hours spent studying every night. The most common age range was between 21-30 years (62.8%). The next highest age ranges were 11-20 (19.6%) and 31-40 (13.5%). The other age ranges showed low values. Males were more common respondents (70%) whereas females comprised of (30%) among respondents. Majority of the respondents were single (77.8%) and the married students were 21.1%. Less than 1% were widowed and/or divorced. 20.5% stayed in the hostel which was the residential area provided by the Institution for students. The other respondents were situated in a built up part of town (50%), outer part of town (9.4%), reserved part of town (9.4%), the University Staff Quarters (8.3%) or in the nearby village (2.4%). Majority of the students studied for 3-4 hours nightly (44.4%) and 33.3% studied for 5-6 hours. The other respondents studied for 1-2 hours (22.1%), 7-8 hours (8.9%) and thirty minutes (0.4%).

Figures 1-9 captured the general perception of medical students to sleeping. 27.6% and 55.8% of the respondents strongly agreed and agreed that sleep was a passive process where all systems of the body were out of touch with the environment, compared

to 11.3% that did not agree whereas 5.1% didn't know (Figure 1). Majority of the respondents (35% and 31.4%) agreed that the brain was completely at rest during sleep and a surprisingly high 30.7% disagreed (Figure 2). An overwhelmingly high number of respondents agreed that sleep was necessary for both mental and physical development (Figure 3). Figure 4 showed that an equally high number (45.5% and 33.3%) agreed that the duration of sleep is most essential to achieve its function as against the minority of respondents that disagreed (11.88%) and didn't know (9.2%). The opinion was mixed when the respondents were asked if the depth of sleep was more important than its duration in achieving its function with 25.9% strongly in agreement, 36.4% agreed whereas 27.6% disagreed and 12.2% didn't know (Figure 5).

Table 1. Showing the General Characteristics of Respondents.

Characteristic		Frequency (n=296)
Age	11-20	58 (19.6%)
	21-30	186 (62.8%)
	31-40	40 (13.5%)
	41-50	08 (2.7%)
	51-60	04 (1.3%)
Gender	Male	207 (70%)
	Female	93 (30%)
Marital Status	Single	221 (77.8%)
	Married	60 (21.1%)
	Widowed	1 (0.3%)
	Divorced	2(0.7%)
Residential area	Built up part of town	142(50%)
	Outer part of town	27(9.4%)
	Village	07(2.4%)
	Reserved part of town	28(9.4%)
	University quarters Hostel	24(8.3%) 59(20.5%)
Hours spent reading at Night	30mins	01(0.4%)
	1-2	26(22.1%)
	3-4	100(44.4%)
	5-6	75(33.3%)
	7-8	20(8.9%)

Sleep is a passive process when all the systems of the body are out of touch with the physical environment

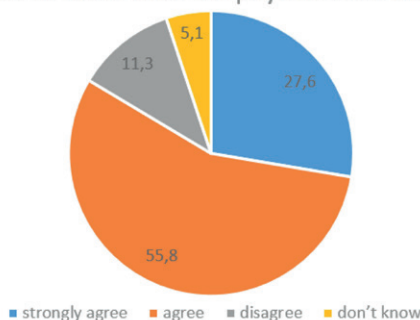


Figure 1. Pie-chart showing students' perception of the definition of sleep.

The brain is completely at rest during sleep

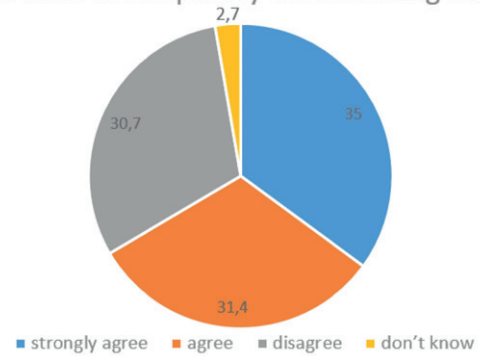


Figure 2. Pie-chart showing students' perception of the brain during sleep.

Sleep is necessary for physical and mental development

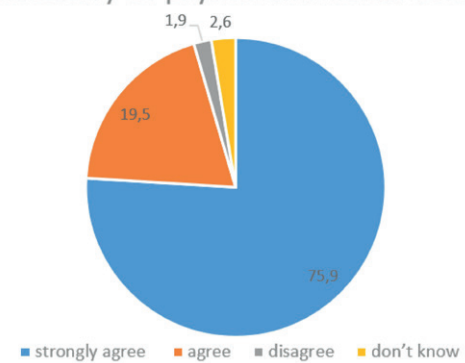


Figure 3. Pie-chart showing students' perception of the necessity of sleep.

The duration of sleep is most essential for it to achieve its function

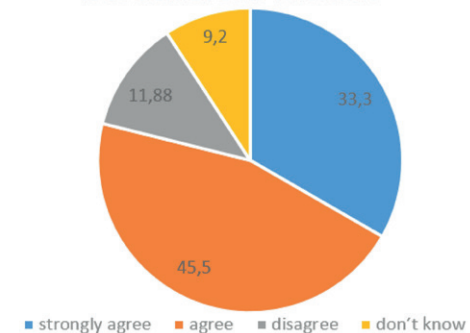


Figure 4. Pie-chart showing students' opinion of the importance of sleep.

The depth of sleep is more important than its duration in achieving its function

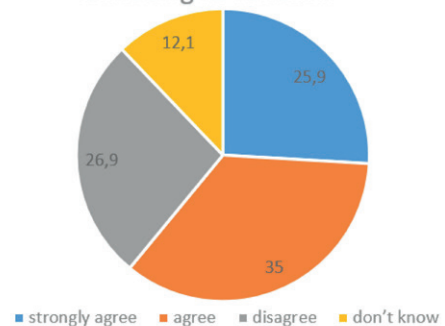


Figure 5. Pie-chart showing students' view on the depth of sleep.

Duration and depth of sleep are of equal important importance in the achievement of the function of sleep

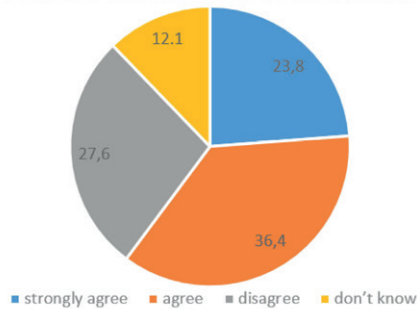


Figure 6. Pie-chart showing students' perception of duration versus depth of sleep.

Dream is an indcation of poor quality of sleep

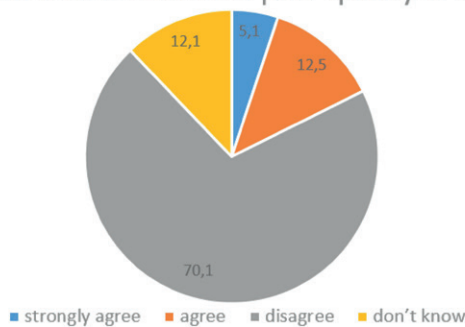


Figure 7. Pie-chart showing students' understanding of dreams in sleep.

Dreams are related to conscious thoughts, worries or activities prior to sleep

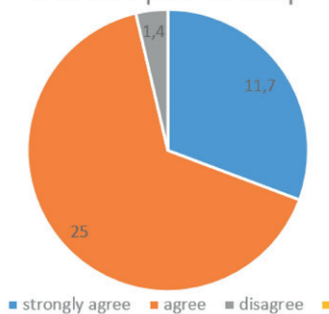


Figure 8. Pie-chart showing students' perception of dreams with relation to thoughts and activities.

My dreams come at the following periods

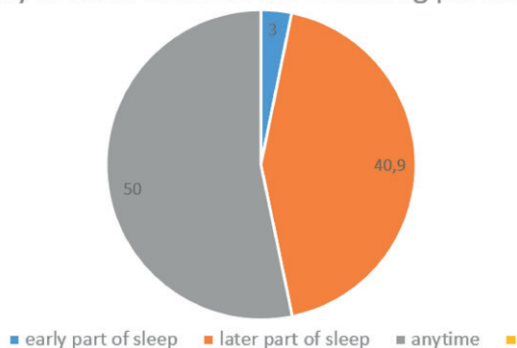


Figure 9. Pie-chart showing students' time of dreaming.

There was a mixed opinion in the belief that duration and depth of sleep were important in the achievement of the function of sleep with 36.4% in agreement and 27.6% also in agreement compared to 12.1% that did not know (Figure 6). Surprisingly, 70.1% of respondents thought that dreams were an indication of a poor quality of sleep against 5.1% that strongly agreed, 12.5% that agreed and 12.1% that didn't know (Figure 7). Figure 8 shows that a high percentage (57.8%) disagreed that dreams were related to conscious thoughts, worries or activities prior to sleep when compared to 11.7% that strongly agreed and 25% that agreed. When asked at what time dreams occurred, 50% of respondents answered that dreams came at any time at all while in 3.0% of the respondents, dreams came at the earlier part of sleep and for 40.9%, dreams came at the later part of sleep (Figure 9).

Table 2 considered sleep patterns in the respondents. The respondents had a close response when asked if they had a regular bedtime with 47.3% answering in the affirmative and 52.6% negating the question. The average bedtime of respondents was recorded at 10pm – 11pm (28.6% and 28.2% respectively) with 6pm and 1am being the least likely times to go to bed (1.2% for each time periods). Majority of the respondents reported that it took 10-20 minutes to fall asleep (40.1%) while 26.1% of the respondents fell asleep within 20-30 minutes. 17.8% too longer to fall asleep at a period of time greater than 30 minutes and 14.6% slept in less than 10 minutes.

80% of the respondents had a regular waking up time while 20% didn't have one. 5am and 6am were the most frequent wake up time (35% and 35.6% respectively) and the last times recorded for waking up was 3am, 9am and 11am which all recorded the same value (0.9%) from all respondents. 66% of the respondents felt sleepy in the afternoons and 10% and 15.3% hardly ever and never felt sleepy in the afternoons. 57.1% of the respondents took a nap during the course of the day compared to 13.3% and 16.7% that hardly ever or never did. The most common duration of the nap was 2hrs (40.2%). Others slept for 1hr (26.4%) and 1hr 30 minutes (14.8%).

Table 3 showed the effect of exercise on the sleep of respondents. 56.1% of respondents engaged in physical exercise compared to 43.9% that didn't. Out of the respondents that exercised, 81.2% exercised frequently while 18.8% did so regularly. Majority of the respondents (43.8%) worked out in the evenings only while 33.9% worked out in the mornings and 22.2% worked out both in the morning and evenings. An overwhelming 75.4% of respondents replied that exercised helped them sleep better at night as opposed to 4.8% that didn't think so and 19.7% that

hadn't noticed. Light workout was believed by 55.3% of respondents to help them sleep compared to 16.7% that thought strenuous exercise was more effective. 28% thought that both types of exercise promoted sleep. 59.3% of respondents usually woke up with signs of insufficient sleep while 11.8% never did and 6.3% always woke up showing signs of insufficient sleep.

**Table 2.** Showing Sleep Patterns in Respondents.

Question	Response	Frequency (n=296)
Do you have a regular time when you go to bed at night?	Yes No	62(47.3%) 69(52.6%)
If yes, what is the average time or common time?	6pm	1(1.2%)
	7pm	5(6%)
	8pm	3(3.8%)
	9pm	12(15.6%)
	10pm	22(28.6%)
	11pm	22(28.2%)
	12midnight 1am	11(14.2%) 1(1.2%)
After getting into bed each night, how long does it take to fall asleep?	<10mins	18(14.6%)
	10-20mins	50(40.1%)
	20-30mins	33(26.1%)
	>30mins	22(17.8%)
Do you keep a regular waking time in the mornings?	Yes No	103(80.0%) 26(20.0%)
If yes, what is the common waking up time?	3am	1(0.9%)
	4am	10(9.6%)
	5am	37(36%)
	6am	36(35.6%)
	7am	13(12.5%)
	8am	5(4.8%)
	9am 11am	1(0.9%) 1(0.9%)
Do you usually feel sleepy in the afternoons?	Always Often Sometimes Hardly ever Never	6(4%) 7(4.7%) 99(66.0%) 15(10%) 23(15.3%)
Do you take a nap or siesta in the afternoon?	Always Often Sometimes Hardly ever Never	8(6.0%) 12(9.4%) 69(57.1%) 16(13.3%) 25(16.7%)
If yes, how long is the siesta?	30mins	6(6.9%)
	1hour	23(26.4%)
	1hour 30mins	13(14.8%)
	2hours	35(40.2%)
	3hours >3hours	9(10.3%) 1(1%)

**Table 3.** Showing the Effect of Exercise on Sleep.

Question	Response	Frequency
Do you engage in physical exercise?	Yes	170(56.1%)
	No	130(43.9%)
If yes, how often	Regularly	27(18.8%)
	Occasionally	121(81.2%)
What time of the day do you exercise?	Morning only	58(33.9%)
	Evening only	75(43.8%)
	Morning and evening	38(22.2%)
Does exercise help you to sleep better at night?	Yes	141(75.4%)
	No	9(4.8%)
	Haven't noticed	37(19.7%)
If yes, what degree of exercise helps you?	Light	83(55.3%)
	Strenuous	25(16.7%)
	Both	42(28%)
Do you wake up with signs of insufficient sleep?	Always	17(6.3%)
	Often	14(5.2%)
	Sometimes	160(59.3%)
	Rarely	47(17.0%)
	Never	32(11.8%)

### Discussion

Historically, no daytime behavior has been closely associated with sleep better than exercise. Sleep serves as an energy conservation function, a body tissue restitution function, or temperature down-regulation function have all predicted a uniquely potent effect of exercise on sleep because no other stimulus elicits greater depletion of energy stores, tissue breakdown, or elevation of body temperature<sup>11</sup>. Exercise has been shown to serve as a potentially attractive alternative in improving sleep or as an alternative treatment for insomnia. Sleep deprivation can be harmful to students especially medical students who are occupied with academic activities for most of their study duration. The sleep-wake cycle of medical students is characterized by insufficient sleep duration, delayed sleep onset, and occurrence of napping episodes during the day<sup>1</sup>. This sleep pattern could lead to insomnia which is described as a sleep disorder characterized by symptoms of unrest and inability to sleep. Studies have also demonstrated that insomnia may cause psychiatric disorders, psychosocial stress, and dysfunctions such as decreased work efficiency and learning disabilities<sup>1,12,13</sup> which would be deleterious in medical students who were studied in the present study. Sleeping is clearly an important aspect of successful academic and personal life in college, yet very little attention has been given to finding an appropriate sleeping pattern and the knowledge and perception of dreams as well as the effect of exercise on sleep.

The average age of the respondents in the current study was between 21-30 years and this is consistent with the average age of medical students in their pre-clinical level in Nigeria. The majority of the students were also single which also consistent with the age range. Majority of the respondents however resided in the built-up part of town and this could be because these respondents lived in their residential quarters with their families. The hostels provided by the institution for students was the second highest residential area and the necessary residence for out of town students<sup>1</sup> also reported that majority (81%) of students stayed off campus and that the college campus lifestyle may influence sleep patterns<sup>14</sup> reported that majority of hostellers were in the habit of sleeping later than midnight and waking late in the morning. Also, that they rarely followed a regular sleep schedule which correlated with a high incidence of daytime sleepiness.

Majority of the students spent a bulk of the night hours studying as a large number of respondents reported that they studied for an average of 3-6 hours. This repeatedly would alter sleep pattern in the students as the average time required for a proper night rest is considered to be eight (8) hours.

Majority of student displayed the basic knowledge about many perceptions concerning sleep and dreaming as majority of the responses given were consistent with the basic knowledge of individuals who were yet to had studied the physiology of sleep as at the time that the research work took place.

Sleeping pattern observed in the current study consisted of delayed sleeping time as a result of time taken to study regularly in some of the students. A large number of the students however had an average bed time of 10pm-11pm which would allow sufficient time to rest before the activities of the next day commenced since waking time for majority of the respondents was 5am-6am as the wake-up time was highly consistent in a large number of respondents. The sleep pattern observed by Singh et al., 2009 showed "delayed sleep phase syndrome" which is normally seen in adolescents as the students delayed sleeping time during the week and 'caught up' on sleep during the weekends<sup>14,1</sup> also recorded longer sleep duration for medical students during the weekends compared to week days. Siestas/naps were also taken by 40% of the students to relieve the stress in the afternoon and a large number of students partook in this practice (40%) of students in the study by<sup>1</sup> also took siestas in the afternoon and only 19% of respondents did not.

Exercise is a healthy, safe, inexpensive and simple means of improving sleep. College students spend averagely more time in classroom and laboratories but several respondents made time out to utilize the facilities made available by the school authorities for exercise.

In the current study, more than 50% of the respondents (56.1%) indicated that they engaged in various forms of exercise, including jogging, playing tennis, football and other forms of physical activity and a fewer number of these respondents engaged in these physical exercises on a regular basis and they admitted that the physical exercises enabled sleep at night. This could be attributed to the effects of exercise reported by Youngstedt and Kline (2006) stated that better sleep is associated with willingness to exercise and better health and less stress are associated with better sleep and greater ability and willingness to exercise. Outdoor exercise could also be associated with better sleep because it increases daily bright light exposure which is associated with better sleep as it is known to release endorphins, lower stress levels apart from ensuring a good night sleep<sup>14</sup>.

Most of the respondents also reportedly engaged in light exercises as opposed to heavy or strenuous or doing both light and strenuous as allowed by the busy medical students in addition to personal commitments. Compared to the current study where a high number of students (56.1%), only 13% of students regularly exercised in the study conducted by<sup>14</sup>.

## Conclusion

Medical and paramedical students that participated in the current study were generally knowledgeable about the benefits of exercise and the relationship of exercise to managing stress. However, there has to be a sensitization of all students pursuing careers in medicine and the health professions such that they understand the positive effects of exercise on health, and the importance of sleep for optimal functioning. This would highlight the need for education to promote regular exercise regimens during typical weeks and also during exam weeks, in order to relieve stress and promote wellness. Students will benefit directly by learning healthy habits for a lifetime, as they pursue what are likely to be high stress careers. As future physicians who practice healthy habits are more likely to encourage these habits in their patients. Therefore, promoting student wellness by providing orientation for first year medical and paramedical students will promote healthy habits from the start. Ongoing vigilance for students who exhibit signs of stress must be maintained, and students must be aware of ways to seek help in confidential, non-judgmental settings.

## Ethical Considerations

The present research study was performed in accordance with the approval of the Institutional Ethics Committee.

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Corresponding author

Martha Orendu Och

E-mail: [marthaorendua@unimaid.edu.ng](mailto:marthaorendua@unimaid.edu.ng)