



The Impact of Classroom Heat on Behaviour and Mental Health among Post-Primary School Students in Delta State

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Abstract

Much recently, owing to global warming, poor ventilation or inadequate power supply, or even in cases where there is power supply, inability of schools to afford electricity due to high tariff, our classrooms have been thrust into severe heat. This study seeks the impact of classroom heat on behaviour and mental- health among post primary school students in delta state. The study was guided with five research questions. The study adopted casual-comparative and correlational design. The population comprised of 46,759 SS students in both public and approved private schools with a sample of 1080 (540 public and 540 private) students. The study adopted the multi-stage sampling technique. The instruments that was used for data collection is Questionnaire titled classroom heat on Behaviour and mental-health questionnaire (CHBMHQ). The data were analysed using descriptive and inferential statistics using mean, standard deviation and coefficient of determination. The findings showed among others a high level of impact of classroom heat on behaviour among post primary school students in delta state. It was therefore recommended amongst others that Delta State Post Primary Schools, Environmental personnel should take more leadership role in advising people on effective adjustment to heat and proactive in improving messaging about adaptation before hot weather to reduce long term health costs and sustain societal function as the climate warms in schools.

Keywords: Classroom; Heat; Behaviour; Mental-Health



Introduction

Post primary Schooling is an intrinsically social enterprise. Post primary schools are institutions with multiple goals like enhancing academic performance, encouraging holistic and mentally balanced students. It includes multiple settings like classrooms, corridors, common areas, laboratories, lunch room, and playground (Deepa et al, 2017). Student behaviour is shaped by and exhibited and interpreted in a social context that involves extreme heat. The rate at which heat has increased in the past few years is alarming and demand serious attention by environmental stakeholders. Heat is the hotness of a body or place. Heat contributes negative or positively to the mental and behaviour of learner within the classroom situation. Severe heat is an approach aimed at disorganizing school and classroom environments, including increasing the negative effects of disruptive or distracting behaviours, reducing the enhancement of effective teaching and learning. Deepa et al (2017) opined that an estimated one-third of students fail to learn because of psychosocial problems that interfere with their ability to fully attend to and engage in instructional activities, prompting a call for new directions for addressing barriers to learning. This has caused students to face the problem of unusual behaviour, increased academic pressure that has changed the mind set of post primary students. Favourable learning environments are crucial, especially in light of the cascading impact that educational outcomes have on people's future earning potential (Lala et al, 2022).

Since the classroom is the anchor of students' daily lives, it is crucial to comprehend and utilize it in order to achieve a stable mental health. Park et al (2022) stated that unfavourable classroom conditions in schools, such as higher temperatures (heat) and a higher occupant density in classrooms can have a poor impact on students' health issues. The basic importance that study hall plays in post elementary schools' homerooms cannot be overemphasized. Zeroing in on the intensity solace of understudies in a homeroom, Jiang et al (2018) noticed that intensity solace on understudies' test execution as well as the effect on their wellbeing ought to be inside the temperature brought from 25⁰ C down to 20⁰C. The investigation of Xu et al, (2012); Randell and Dark (2019) showed that understudies' (students) wellbeing is harmed by unnecessary intensity, which unavoidably influences their learning results. The punishment of this exorbitant intensity on mental advancement is expected to be more extreme in nations, for example, Nigeria where temperatures and levels of neediness are both high. Further, as accounted by Randell (2019), prologue to severe intensity of heat make it harder for understudies (students) in auxiliary (post primary school) to finish their schooling in tropical areas of the globe.

The post primary students most especially the junior students do not acclimate to the heat as adults do they are more prone to heat-related ailments. Because of their less significant bodies and higher exterior area to body mass ratio, tend to absorb more heat and not sweat as much as adults do (WHO, 2019). Along with unhelpful ramifications on classroom behaviour and mental capacity, delayed disclosure to hot atmosphere like extreme heat can also bring about health symptoms of tiredness and lack of retentions. Many of post primary education in Nigeria particularly Delta State rely on natural ventilation when heats are far above the ground. Windows and doors are kept open for cross-ventilation. However, due to vandalization of school buildings by students and community member, with limited roads and rail network and financial constraints, constructing mechanical systems or providing air conditioners becomes a possibility. Furthermore, due to power outages and load shedding, the use of electric fans in classrooms is frequently limited.



Pawel et al (2019) evidence the effects of heat in school classrooms on children's performance in school. Three research hypotheses were raised and tested using correlational design method. Data was from 18 studies to seek heat conditions in classrooms and children's performance in school. A questionnaire titled "Psychological measuring abilities and skills" including end-of-year grades and the assessment results were used. A regression analysis was use in the study to test the hypotheses. The study revealed that change in learning outcome changed significantly with heat. For other learning outcomes, no relationship was created because the data were insufficient. The relationship determined in the examination shows that the presentation of mental tests and school assignments can be anticipated to increment on normal by 20% assuming study hall temperatures are brought from 30°C down to 20°C and that the temperature for ideal execution is lower than 22°C. The relationship is substantial just for calm environments. It requires check for different environments and augmentations to temperatures lower than 20°C and higher than 30°C.

Laura et al. (2024) examine the effects of extreme heat and heat waves on the health of kids. Expo-facto was the research design employed in the study. The study's population included 1719 patients and students aged to 18 from 2013 to 2023. 113 people answered to the study's sample. According to the study, patients who are exposed to high temperatures are more likely to experience a number of negative health effects, including low birth weight and preterm birth. Increased asthma flare-ups, heat sickness, and poor academic performance in children have all been connected to extreme heat exposure.

Shalin et al. (2016) examined subjective health symptoms and the effects of heat on students in public schools. A heat-health symptom diary was filled out by 252 students (n = 252) from eight high schools over the course of five days. Data recorders were used to capture the temperature within the classroom. For at least an hour on any given day, many students were tired (97.2%), had trouble focusing (96.8%), or felt sleepy (94.1%). The association between interior temperatures and children experiencing fatigue and breathing difficulties was statistically significant, even after adjusting for the school cluster effect and the time of day. Indoor temperatures were consistently higher in classrooms constructed using prefabricated asbestos sheets, a converted shipping container, and a corrugated iron roof than in classrooms built of masonry.

The challenge of classroom heat posed by the rising temperatures have negatively influence the classroom instruction. It is possible to attribute this poor classroom instruction in schools to the atmosphere surrounding the classroom, which seriously disrupts the wellbeing of post-secondary students. These kinds of disrupts in wellbeing could lead to severe impairments in cognitive, social, or even mental capacities. The majority of state-funded institutions, especially those in the local areas, lack dedicated training study classrooms, and instruction is frequently disrupted. In a classrooms like this, students are unable to perceive and truly connect with their mentor. Assuming the classrooms is warm and bereft of intensity, students comprehend the educational exercises, they can proactively foster class wide and individual understudy systems. The progress of a decent classroom conduct relies on recognizing the particular circumstances that brief and support a decent and positive psychological wellness of students. A classroom of roughly 30 to 40 students in an extremely little classrooms, which can sporadically bring about congestion, as well as extraordinary surrounding heat, causing a study classrooms in a school to appear to be undesirable and really hot. Hence, to assist with limiting the difficulties of outrageous classroom heat and empower students to adapt to hot temperatures in hall or class rooms in schools and to assist

alleviate the hazards of high heat and enable youngsters to cope in classrooms necessitated this study

Research Questions

The following research questions were raised to guide the study

1. What is the level of impact of classroom heat on behaviour of students in post primary schools in Delta State?
2. What is the level of impact of classroom heat on mental health of students in post primary schools in Delta State?
3. What is the level of impact of classroom heat on behaviour of students in post primary schools in Delta State based on gender?
4. What is the level of impact of classroom heat on mental health of students in post primary schools in Delta State based on gender?
5. What is the relationship between classroom heat behaviour and mental health of students in Delta State Post Primary Schools?

Methods

The study adopted casual-comparative and correlational design. The casual-comparative was adopted because the study is retrospective. The descriptive and correlational research design was used in this investigation. The researchers considered the descriptive and correlational research design as appropriate because it enables the study to gather data with the aim of describing the already existing situations in which they could be compared in order to establish the relationship between the variables. The population used for the investigation is 46,759 SS students across 1099 public and private secondary schools in Delta state students. A total of approximately 46,759 populations which comprises of 38092 students in public schools and 8666 private schools SS3 students that was present according to Delta state ministry of Secondary Education (2024). The sample of this study consists of 1080 (540 public and 540 private) students drawn from both public and the government approved private secondary school. The study adopted the multi-stage sampling technique. The first stage was Statified Random Sampling Technique(SRST) to select six (6) Local Government Area in the three senatorial districts of Delta State. At the second stage, Simple Random Sampling Technique was used to select 9 public and 9 private senior secondary schools in each of the Senatorial Districts making a total of 108 senior secondary schools that was drawn for the study (Okagbare et al 2023). In the last stage, the researcher used simple Simple Random Sampling Technique(SRST) by balloting to select ten (10) students in each of the one hundred and eight (108) senior secondary schools drawn from Delta North, Delta Central and Delta South Senatorial District of Delta State making a total of 1080 students used for the study. The instruments that were used for data collection is questionnaire. The questionnaire is titled classroom heat on Behaviour and mental health (CHBMHQ) was used to collected data for the study. The questionnaire was divided into two sections: Section A contains demographic information about the respondents, such as their location, and Section B contains two scales: The Classroom heat on Behaviour Rating Scale (CHBRS) and the classroom heat on Mental Health Rating Scale (EHCMHRS). The classroom heat on Behaviour Rating Scale (CHBRS) consists of 10 items that describe how heat impact on their behaviour while Classroom heat on Mental-Health Rating Scale (CHMHRS) consists of 10 items that describe how heat impact on their mental. Participants were asked to rate the items on a four-point likert scale ranging from 1 to 4, with 1 indicating Strongly Disagree (SD), 2 indicating Disagree (D), 3 indicating Agree (A) and 4 indicating Strongly Agree (SA). The

researchers administered the questionnaire to the students directly. They required two research assistants who were trained on the goal of the study and helped in administration of the questionnaire. The data were analysed using descriptive and inferential statistics. To answer the research questions, mean, standard deviation and coefficient of determination was used.

Results

Research Question 1: What is the level of impact of classroom heat on behaviour of students in post primary schools in Delta State?

Table 1: Mean and Standard Deviation on the level of impact of severe heat of classroom on behaviour of students in post primary schools in Delta State

S/N	Items	N	Mean	SD	Decision
1	Heat related-illness makes me to stay outside the classroom environment	1080	3.74	0.46	High impact
2	The itching from heat rash makes me uncomfortable in class	1080	3.70	0.55	High impact
3	I like heat stroke from heat in classroom	1080	3.68	0.54	High impact
4	The smell from classroom heat makes me to avoid active learning	1080	3.64	0.55	High impact
5	Heat rises the temperature of my body that caused smell in class	1080	3.63	0.58	High impact
6	Heat cramps makes me to develop aggressive attitude	1080	3.62	0.61	High impact
7	I feel easily irritated during heat hours in classes	1080	3.62	0.63	High impact
8	I easily change my mood in the class due to heat problems	1080	3.58	0.58	High impact
9	I feel like isolating and marginalizing my classmates when the classroom is hot	1080	3.56	0.51	High impact
10	I open part of my body to receive air in my class	1080	3.49	0.57	High impact
Grand Mean			3.69	0.52	

Benchmark: 2.50

Table 1 clearly highlights the mean level of impact of severe heat of classroom on behaviour of students in post primary schools in Delta State. According to the data gather in Table 1 the average means of 3.69 is higher than the bench mark means of 2.50. This implies a high level of impact of severe heat of classroom on behaviour of students in post primary schools in Delta State.

Research Question 2: What is the level of impact of classroom heat on mental-health of students in post primary schools in Delta State?

Table 2: Mean and Standard Deviation on the level of impact of classroom heat on mental-health of students in post primary schools in Delta State

S/N	Items	N	Mean	SD	Decision
1	Heat results to poor sleep that reduced my cognitive disfunction in class	1080	3.49	0.57	High impact
2	I sweat heavily during hot times in classes	1080	3.43	0.59	High impact
3	I suffer health outcome due to heat in my class	1080	3.37	0.59	High impact
4	I feel like to take my life during hot time	1080	2.34	0.15	Low impact
5	I sleep more during hot weather in class	1080	3.34	0.85	High impact
6	My body react to fatigue in hot classroom	1080	3.23	0.75	High impact
7	The heat rise in my class sometimes makes me to vomit	1080	2.71	0.74	High impact
8	I dazed in class due to heat rise in classroom	1080	1.97	0.98	High impact
9	Extreme hot weather events have a more pronounced negative effect on my health	1080	3.19	0.27	High impact
10	My heart beat very fast when the classroom is hot	1080	3.03	0.19	High impact
Grand Mean			3.42	0.55	

Benchmark: 2.50

Table 2 clearly highlights the mean level of impact of classroom heat on mental-health of students in post primary schools in Delta State. According to the data gather in Table 1 the average means of 3.42 is higher than the bench mark means of 2.50. This implies a high level of impact of classroom heat on mental-health of students in post primary schools in Delta State.

Research Question 3: What is the level of impact of classroom heat on behaviour of students in post primary schools in Delta State based on gender?

Table 3: Mean and Standard Deviation to determine the level of impact of classroom heat on behaviour of male and female students in post primary schools in Delta State

Statement	Male Students (N=482)			Female Students (N=598)		
	Mean	SD	Remark	Mean	SD	Remark
Heat related-illness makes me to stay outside the classroom environment	2.61	0.53	High impact	2.70	.89	High impact
The inching from heat rash makes me uncomfortable in class	2.57	0.61	High impact	2.91	.99	High impact
I like heat stroke from heat in classroom	2.94	0.71	High impact	2.82	.87	High impact
The smell from classroom heat makes me to avoid active learning	2.53	0.79	High impact	2.89	.92	High impact
Heat rises the temperature of my body that caused smell in class	2.74	0.53	High impact	2.65	.88	High impact
Heat cramps make me to develop aggressive attitude	2.50	.50 2	High impact	2.60	1.10	High impact
I feel easily irritated during heat hours in classes	3.50	.50	High impact	2.64	1.07	High impact
I easily change my mood in the class due to heat problems	2.50	.50	High impact	2.79	1.06	High impact
I feel like isolating and marginalizing my classmates when the classroom is hot	3.50	.50	High impact	2.80	1.07	High impact
I open part of my body to receive air in my class	2.60	1.1 0	High impact	3.50	.50	High impact
Grand Mean	2.63	0.53		2.79	.89	

Benchmark: 2.50

Table 3 clearly highlighted the mean and standard deviation of the impact of classroom heat on behaviour of male and female students in post primary schools in Delta State. Each variable has mean higher than the bench mark mean of 2.50. A care looks at Table 3 revealed that grand mean value for male students in post primary schools in Delta State is greater than bench mark mean of 2.50 while that of female students in post primary schools in Delta State are also greater than the bench mark mean of 2.50. This implies that there is a high level of impact of classroom heat on behaviour of male and female students in post primary schools in Delta State.

Research Question 4: What is the level of impact of classroom heat on mental health of students in post primary schools in Delta State based on gender?

Table 4: Mean and Standard Deviation to determine the level of impact of classroom heat on behaviour of male and female students in post primary schools in Delta State

Statement	Male Students (N=482)			Female Students (N=598)		
	Mean	SD	Remark	Mean	SD	Remark
Heat results to poor sleep that reduced my cognitive disfunction in class	3.01	0.87	High impact	2.70	.89	High impact
I sweat heavily during hot times in classes	2.84	0.78	High impact	2.91	.99	High impact
I suffer health outcome due to heat in my class	2.96	0.80	High impact	2.82	.87	High impact
I feel like to take my life during hot time	2.92	0.72	High impact	2.89	.92	High impact
I sleep more during hot weather in class	2.72	0.67	High impact	2.65	.88	High impact
My body react to fatigue in hot classroom	2.97	0.81	High impact	2.60	1.10	High impact
The heat rise in my class sometimes makes me to vomit	3.01	0.87	High impact	2.64	1.07	High impact
I dazed in class due to heat rise in classroom	2.84	0.78	High impact	2.79	1.06	High impact
Extreme hot weather events have a more pronounced negative effect on my health	2.96	0.80	High impact	2.80	1.07	High impact
My heart beat very fast when the classroom is hot	2.92	0.72	High impact	3.50	.50	High impact
Grand Mean	2.72	0.67		2.70	.89	

Benchmark: 2.50

Table 4 clearly highlighted the mean and standard deviation of the level of impact classroom heat on mental health of male and female students in post primary schools in Delta State. Each variable has mean higher than the bench mark mean of 2.50. A care looks at Table 4 revealed that grand mean value for male students in post primary schools in Delta State is greater than bench mark mean of 2.50 while that of female students in post primary schools in Delta State are also greater than the bench mark mean of 2.50. This implies that there is a high level of impact of classroom heat on mental health of male and female students in post primary schools in Delta State.

Research Question 5: What is the relationship between classroom heat behaviour and mental health of students in post primary schools in Delta State?

Table 5: Pearson Product Moment Correlation and Coefficient of Determination of classroom heat behaviour and mental health of students in post primary schools in Delta State

Variables	N	R	r^2	$r^2\%$	Remark
classroom heat behaviour					
Mental health of students	1080	0.944	0.891	89.1	Positive connection

Table 5 shows the result of a Pearson's correlation analysis, which was used to examine the classroom heat behaviour and mental health of students in post primary schools in Delta State. The result revealed that $r = 0.944$, $r^2 = 0.891$, and $r^2\% = 89.1$. The result showed a positive relationship between classroom heat behaviour and mental health of students in post primary schools in Delta State. It implied that classroom heat behaviour contributed 89.1% to the variability in mental health of students in post primary schools in Delta State.

Discussion

Data relating to first research question indicated a high level of impact classroom heat on behaviour of students in post primary schools in Delta State. This finding could be that the severe heat in the engulfed areas is a major public health challenge that exacerbates the risks linked to extreme heat-related mortality due to worldwide warming. This finding resembles the finding of Doane et al. (2016) and Tang et al. (2021) whose studies revealed that severe heat is the multidimensionality of risk perception that is dominated by risk severity, risk probability, concern about results and behavioural control in classrooms

Data relating to second research question indicated a high level of impact of classroom heat on mental health of students in post primary schools in Delta State. The body's heat narrow function enables students to cope with contact to high and low heat. Nevertheless, this adaptation increases the stress on many organs, and when the human body experiences excessive heat, health will be impaired. This finding resembles the finding of Laura, et al. (2024) who seek the impact of extreme heat and heat waves on children's health and found that severe heat contact leads to assortment of adverse health product in patients.

Data relating to third research question indicated a high level of impact of classroom heat on behaviour of male and female students in post primary schools in Delta State. This implied that Male and female maladaptation to severe heat could potentially be faced with an increasingly frequent and intense heat waves if not prevented by appropriate awareness raising and heat relief advice. This finding resembles the finding of Kerstin et al. (2024) who stated that self-rated heat stress and tolerance among male and female students were significantly high with all behaviours except soft drink consumption common to female.

Data relating to fourth research question indicated a high level of impact of classroom heat on mental health of male and female students in post primary schools in Delta State. This implied that extreme heat was most likely to make male and female students to sleep in classes as the result of the pronounced negative effect of tiredness and stress the heat may come with. This finding resembles the finding of Qu and Xiao (2019) who stated that for physical health, heat exhaustion and heat stroke among gender (male and female) are the most serious illnesses caused directly by extreme heat. They further revealed in their findings that male and female body may overheat, leading to prostration, dizziness, and muscle cramps.

Data relating to fifth research question indicated a positive relationship between classroom heat behaviour and mental health of students in post primary schools in Delta State. This association is as a result of exposure to extreme heat that has been associated with higher mortality. The study also implied that exposure to severe heat can compromise general wellbeing and social life of students. This finding is in line with the study of Shalin et al. (2016) investigated Heat-related health consequences and subjective health symptoms in public schools and observed positive associations, after controlling for school cluster effect



and time of day, between interior temperatures and children felt weary and found it difficult to breathe.

Conclusion

Based on the findings, it was concluded that a high level of impact of severe heat of classroom on behaviour of students existed, a high level of impact of severe heat of classroom on mental health of students existed, an impact of severe heat of classroom on behaviour of male and female students existed, an impact of severe heat of classroom on mental health of male and female students existed and a positive connection of severe heat of classroom behaviour and mental health of students in post primary schools in Delta State existed.

Recommendations

The study recommended that:

1. To curb the problem of severe heat in Delta State Post Primary Schools, Environmental personnel should follow up policy-makers to effectively adopt and implement intervention strategies like tree planting within the school premises.
2. Communities, local governments where the Delta State Post Primary schools are situated should take more leadership role in advising people on effective adaptation to heat.
3. We should be practical in improving messaging about adaptation before hot weather to reduce long term health costs and sustain societal function as the climate warms in schools.



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