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Ergonomic Challenges and their Impact on Student Well-being: A Qualitative Study in a Nigerian University

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Abstract *Ergonomic challenges within university learning environments are increasingly recognized as important determinants of student health and academic performance. However, most studies in low- and middle-income countries focus on quantitative assessments, with limited attention to students' lived experiences. This study employed a qualitative descriptive design using open-ended responses collected via an online survey administered to 352 undergraduate students at the University of Calabar, Nigeria. Data were analyzed using inductive thematic analysis to explore students' experiences, perceived impacts, and coping mechanisms related to ergonomic challenges in their learning environments. Three major themes emerged: (1) Physical strain and bodily discomfort, characterized by musculoskeletal pain and visual strain due to non-adjustable furniture and poor environmental conditions; (2) Cognitive exhaustion and academic disruption, where discomfort impaired concentration, reduced engagement, and contributed to absenteeism; and (3) Institutional neglect and adaptive coping, highlighting the absence of supportive infrastructure and students' reliance on improvised strategies. These findings demonstrate that poor ergonomic conditions extend beyond physical discomfort to significantly affect mental well-being and academic outcomes. Ergonomic deficiencies in university settings represent a critical but under-addressed public health issue. Interventions should prioritize human-centered classroom design, inclusive infrastructure, and institutional policies that support student well-being.*

Keywords *Ergonomics, Learning Environment, Nigeria, Qualitative research, Student Well-being, University students.*

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Introduction

The built environment of a higher education institution serves as an active, continuous background against which a student's daily academic and physiological life unfolds. Tertiary education places exceptional cognitive and physical demands on students, requiring them to spend long hours interacting with fixed architectural features, rigid lecture theater seats, traditional laboratory benches, and highly unpredictable micro-climatic conditions [1, 2]. Within the field of contemporary educational ergonomics, the physical lecture space is recognized not merely as a container for learning, but as a critical mediator of physiological health, student engagement, and long-term cognitive stamina [3, 4].

However, in many developing nations, institutional infrastructure design and campus furniture procurement frequently bypass user-centered parameters. When these physical structures fail to accommodate the natural body measurements and anthropometric variations of the student population, a profound anthropometric mismatch occurs [5, 6]. This structural misalignment forces students to continuously adopt awkward, non-neutral, and fatiguing postures. The immediate physiological consequence is sustained muscle strain, localized circulatory restriction, and early-onset musculoskeletal disorders (MSDs) that predominantly affect the lumbar region, neck, and shoulders [7]. Over time, what begins as transient physical discomfort during a morning lecture crystallizes into chronic somatic distress, directly undermining a student's capacity for sustained concentration, information processing, and overall academic success [8, 9].

While quantitative research remains indispensable for mapping the statistical prevalence of musculoskeletal pain and documenting macro-level infrastructure failures, it naturally simplifies the rich, multifaceted spectrum of human discomfort into clinical numbers and percentages [10]. Quantitative metrics are inherently limited; they cannot fully capture the visceral reality of chronic somatic pain experienced by a student during a high-stakes, multi-hour examination [11]. They fail to articulate the deep emotional frustration and psychological alienation born from sitting at a desk that actively rejects one's physical dimensions, nor can they measure the profound, cumulative exhaustion that comes from navigating overcrowded, acoustically hostile, and poorly ventilated lecture halls [12, 13].

By reducing systemic ergonomic deficiencies to isolated, sterile data points, traditional empirical approaches risk obscuring the true human cost of poor institutional design. To fully understand these dynamics, researchers must explore the qualitative, subjective experiences of the students themselves [14]. Investigating how individuals personally perceive their physical surroundings, negotiate bodily pain within competitive academic environments, and experience emotional fatigue provides a holistic view of the learning ecosystem [15, 16]. This study addresses this exact imperative, shifting the analytical focus from macro-statistics to the authentic voices, lived realities, and personal frustrations of the student body.

Furthermore, student populations in developing West African socio-economic landscapes face a distinct, compounded layer of infrastructural vulnerabilities. In Nigeria, contemporary public higher education is characterized by a severe structural paradox: an unprecedented explosion in student enrollment that has completely outpaced state funding, regular maintenance cycles, and institutional capital development [17, 18]. Consequently, historic public institutions are forced to stretch pre-existing, frequently outdated infrastructure to accommodate populations several times their original design capacity. This structural deficit manifests as intensely congested lecture theaters, an absence of adjustable or

ergonomically sound learning workstations, compromised indoor air quality, and elevated thermal stress that exacerbates physical discomfort in tropical climates [19, 20].

Faced with these harsh realities, university students are not passive observers; they act as resilient agents who must continuously invent, deploy, and modify spontaneous coping mechanisms simply to navigate their academic schedules [21]. These informal adaptations range from physical workarounds—such as standing for hours along crowded corridors, leaning against hot walls, or sharing highly compressed seating spaces—to psychological suppression of physical pain in pursuit of academic survival [22, 23].

Despite the severity of these conditions, there remains a critical gap in contemporary empirical literature regarding how West African tertiary students qualitatively experience, interpret, and bodily adapt to daily ergonomic stressors [24, 25]. Uncovering these personal perceptions and localized micromanagement strategies is vital for designing empathetic, context-specific institutional policies, targeted infrastructural upgrades, and functional student welfare frameworks [26, 27].

This study directly addresses this gap in the literature. Utilizing qualitative survey data collected via an online platform, this research explores the authentic lived experiences, personal perceptions, structural frustrations, and spontaneous coping mechanisms of students at the University of Calabar, Nigeria, as they navigate and resist systemic ergonomic challenges.

Methods and Study Design

Study Design

This study adopted a qualitative descriptive design to explore students' experiences and perceptions of ergonomic challenges within university learning environments [28]. The qualitative descriptive approach was selected because it enabled the researchers to obtain direct and relatively unembellished descriptions of students' experiences, perceived effects of ergonomic conditions, and coping strategies in their own words. The study was qualitative in design and analysis. Although the online survey also contained structured demographic questions, these items were used only to characterize the participants and provide contextual information for interpreting the qualitative findings; they did not constitute a separate quantitative component and were not subjected to inferential statistical analysis.

Participant Recruitment, Sampling Strategy, and Response Rate

The recruitment of participants for this qualitative descriptive study was conducted between April and June 2026. A non-probability convenience sampling technique, supplemented by snowball sampling, was employed to recruit undergraduate students from the University of Calabar, Nigeria. Initial recruitment messages containing the study description, data privacy assurance, and an electronic link to the Google Forms survey were distributed across official and departmental student WhatsApp groups, campus mailing lists, and social media platforms commonly utilized by the student body. To enhance the reach and diversity of the sample across various faculties, respondents were actively encouraged to share the survey link with their peers (snowball sampling). Out of approximately 380 initially targeted students, a total of 352 valid responses were successfully received. These 352 valid responses constituted the qualitative survey dataset used for analysis, while the structured demographic items were used only to characterize the study participants.

Inclusion and Exclusion Criteria

To ensure the integrity and relevance of the data collected, strict inclusion and exclusion criteria were applied:

- **Inclusion Criteria:** Registered full-time undergraduate students of the University of Calabar across all academic years (first to sixth year) who had access to the online survey platform and voluntarily provided informed consent were included.
- **Exclusion Criteria:** Part-time students, weekend program students, sandwich students, university staff members, and students who were concurrently employed full-time were excluded from the study. These groups were excluded because their daily campus routines, lecture schedules, and environmental exposures differ substantially from those of full-time undergraduate students.

Demographic Characteristics

A total of 352 students participated in the study. The demographic profile of the respondents revealed a balanced gender distribution comprising 185 males (52.56%) and 167 females (47.44%). The majority of the participants (89.49%, n = 315) fell within the 21–25 age bracket, with an overall mean age of 23 years. Regarding academic progression, representation spanned across all levels, with third-year students constituting the highest proportion (48.01%, n = 169). In terms of residential status, 71.88% (n = 253) resided in off-campus private hostels, 23.01% (n = 81) lived in school hostels, and 5.11% (n = 18) lived at home. Furthermore, 98.01% (n = 348) reported having no pre-existing physical disabilities, while 1.99% (n = 7) reported living with a disability.

These demographic data were used descriptively to provide contextual information about the participants and were not treated as a separate quantitative analytical component.

Survey Development and Piloting

The data collection instrument was a self-structured, multi-sectional questionnaire developed following an extensive review of existing literature on educational ergonomics, the Modified Nordic Musculoskeletal Questionnaire (NMQ), and literature concerning cognitive and physical well-being. The instrument contained structured demographic questions and open-ended questions designed to elicit detailed descriptions of students' experiences of classroom infrastructure, physical discomfort, perceived academic impacts, and coping strategies.

Prior to full-scale deployment, the questionnaire was pilot-tested using a convenience sample of 30 undergraduate students from a neighboring tertiary institution (Cross River University of Technology) who shared similar demographic and infrastructural characteristics with the target population. The pilot exercise focused on assessing the clarity, readability, relevance, comprehensibility, sequencing, and approximate completion time of the survey questions. Feedback from the pilot participants was used to refine ambiguous wording and improve the clarity and organization of the instrument before the final online survey was administered. The pilot responses were not included in the final qualitative dataset.

Qualitative Data Collection and Data Saturation

Qualitative data were collected through open-ended, free-text questions embedded within the online survey. These questions invited students to provide narrative descriptions of their experiences regarding classroom furniture mismatch, visual strain, environmental discomfort, perceived effects on learning, coping strategies, and psychological frustrations. The open-ended responses constituted the primary qualitative dataset for the study.

Because the survey was administered online and responses were submitted asynchronously, saturation was assessed iteratively rather than on the basis of a predetermined numerical threshold. During data collection and

preliminary analysis, successive groups of responses were reviewed and compared with previously identified codes and developing categories. The researchers monitored whether incoming responses generated substantively new codes, concepts, properties, or thematic dimensions relevant to the study objectives. Particular attention was given to whether later responses added new information to the developing thematic structure or primarily reinforced concepts that had already been identified.

Thematic saturation was considered to have been reached when successive responses no longer contributed substantively new codes, concepts, or thematic dimensions and instead provided further examples, elaborations, or variations of concepts already represented in the developing coding framework. The final qualitative dataset comprised 352 valid responses. Thus, saturation was treated as an analytical judgment based on the informational content and recurrence of concepts within the responses rather than simply as a function of the number of completed questionnaires.

Researcher Positionality and Reflexivity

As an academic researcher and clinical anatomy lecturer, the principal investigator maintained active reflexivity throughout the research process. Recognizing that personal familiarity with university structural deficits could potentially introduce interpretive bias during qualitative coding, the researcher maintained a reflexive journal. This practice documented preconceptions regarding institutional neglect and ensured that the thematic analysis remained grounded strictly in the authentic voices and lived experiences of the student participants rather than preconceived notions.

Coding Procedures and Number of Coders

Qualitative textual data extracted from the open-ended survey responses were exported into NVivo software for systematic thematic analysis following Braun and Clarke's reflexive thematic analysis framework. To ensure analytical rigor and minimize individual subjectivity, coding was independently performed by two trained qualitative coders (the principal investigator and an independent research assistant). The two coders initially reviewed a subset of transcripts to generate an initial codebook, independently coded the entire dataset, and subsequently met to compare codes, resolve discrepancies through consensus, and finalize the core overarching themes and sub-themes.

Methods Used to Establish Credibility and Trustworthiness

To establish trustworthiness and methodological rigor, the study adhered to Lincoln and Guba's evaluative criteria for qualitative research:

1. Credibility: Credibility was achieved through investigator triangulation, where two independent coders analyzed the qualitative dataset, and through member checking with a small subset of student representatives who confirmed that the synthesized themes accurately reflected their lived realities.
2. Transferability: Thick, detailed descriptions of the study setting, participant demographics, and contextual infrastructural challenges at the University of Calabar were provided to enable other researchers to assess the applicability of findings to similar low- and middle-income educational settings.
3. Dependability: An explicit, transparent audit trail documenting every stage of data collection, coding decisions, and thematic development was maintained throughout the research process.
4. Confirmability: Analytical neutrality was maintained by ensuring that all research findings, themes, and interpretations were

directly supported by verbatim participant quotations rather than researcher assumptions.

Selection of Quotations

Verbatim quotations included in the results chapter were selected using a purposive selection strategy. Quotations were chosen based on their vividness, conceptual clarity, and capacity to powerfully encapsulate the core essence of each identified theme or sub-theme. Care was taken to select representative statements from a diverse range of participants across different genders and academic levels while ensuring complete participant anonymity.

Data Collection

The survey included structured demographic questions and open-ended items that invited participants to describe their experiences with classroom infrastructure, physical discomfort, academic impacts, and coping strategies. The demographic questions were used only to provide contextual information about the participants, whereas the open-ended responses constituted the primary qualitative dataset for analysis. Participation was voluntary and anonymous.

Data Analysis

Qualitative data from the open-ended responses were analyzed using inductive thematic analysis following the approach described by Braun and Clarke [29]. Responses were read repeatedly to ensure familiarity, coded systematically, and grouped into themes and sub-themes. The analysis focused on identifying recurring patterns related to ergonomic challenges and their perceived impacts. No inferential statistical analysis was conducted because the study was designed as a qualitative descriptive inquiry.

Results

The thematic analysis of the open-ended text dataset revealed three primary themes that define the ergonomic realities of the student body at the University of Calabar.

Theme 1: Physical Strain and Systematic Bodily Discomfort

The first theme captures the direct physiological toll of the university's built environment. Students described their day-to-day existence as a constant struggle against physical exhaustion, with non-adjustable furniture and poor environmental controls causing widespread pain.

Sub-theme 1: Spinal and Musculoskeletal Fatigue

Students detailed how sitting on long, metallic benches for consecutive multi-hour lectures forces them into constant slouching. This awkward posture triggers intense pain in the lower back, neck, and shoulders.

> *"By the second hour of sitting on those flat wooden benches, my entire lower back goes numb, and a sharp pain shoots up to my shoulders. You can't lean back, you can't adjust the seat, you just have to endure the stiffness."*

Sub-theme 2: Ocular Strain and Thermal Discomfort

Beyond bad chairs, the lack of sun control—for example, the absence of window blinds in some lecture halls—allows harsh tropical light into lecture halls, making it incredibly difficult to see screens or whiteboards. This glare causes chronic headaches and severe eye strain.

> *"The sun pours directly into the lecture hall because there are no blinds. You are constantly squinting to see the notes, and within an hour, a splitting headache sets in. Combined with the heat, it makes the room feel unbearable."*

Theme 2: Cognitive Exhaustion and Academic Deterioration

The second theme highlights how physical discomfort directly compromises students' mental performance and academic focus.

Rather than focusing on course material, students find their attention consumed by managing pain.

Sub-theme 1: Attentional Depletion and Classroom Fatigue

Students reported that trying to balance on uncomfortable furniture rapidly drains their concentration, forcing them to mentally disengage from the lecture.

"I want to focus on what the lecturer is saying, but my body hurts so much that I end up just shifting around trying to find comfort. My brain stops processing the information because it's completely focused on the pain."

Sub-theme 2: Absenteeism and Disengagement

Chronic physical fatigue from poorly designed classrooms leads directly to regular absenteeism, with students choosing to stay in their rooms rather than face the physical strain of certain lecture halls.

"There are specific classrooms I completely avoid because I know how painful my body will feel afterward. Missing lectures hurts my grades, but going there feels like a punishment for my health."

Theme 3: Institutional Neglect and Adaptive Resourcefulness

The final theme explores the total absence of university support or specialized accommodations, forcing students to navigate these infrastructural gaps entirely on their own.

Sub-theme 1: Marginalization of Unique Profiles

Students with physical disabilities or unique body types highlighted a complete lack of adaptive or customized seating, leaving them feeling excluded by the campus infrastructure.

"The university designs classrooms as if every student has the exact same body. If you are exceptionally tall, have a physical challenge, or need back support, there is nothing for you. You are completely on your own."

Sub-theme 2: Improvised Coping Mechanisms

To survive the academic calendar, students resort to creative, personal modifications, such as building makeshift stands to keep their laptops at eye level.

"Many of us carry textbooks on flat desks to raise our laptops so we don't ruin our necks."

Discussion

This qualitative inquiry provides a vital, human-centered baseline for understanding how physical spaces directly shape the daily realities of student life, adding necessary depth to prior quantitative metrics of classroom ergonomics [1, 18]. The vivid student descriptions of cervical, lumbar, and ocular fatigue highlighted throughout this study expose the systemic nature of institutional infrastructural failures. When a university provides rigid, unyielding furniture that lacks options for individual physical adjustment, it places an exhausting physical burden directly onto the student body [19, 20].

Crucially, the empirical evidence demonstrates a clear connection between physical space and cognitive capacity, supporting the core tenets of Cognitive Load Theory [30]. In an ergonomically sound environment, a student's cognitive energy is entirely available for learning, synthesizing, and retaining complex academic content. However, when a classroom induces constant physical discomfort, the brain must dedicate continuous attentional and neurological resources simply to manage pain and environmental stressors [31]. This background cognitive load depletes working memory, causing rapid mental exhaustion, disengagement, and increased absenteeism, which ultimately damages academic productivity and performance.

Finally, these findings expose a critical equity issue within public higher education. The lack of adaptive furniture effectively marginalizes students with diverse body types or physical challenges, forcing them to rely on improvised personal fixes to survive lectures [19]. This absence of supportive infrastructure, coupled with a total lack of formal institutional training on ergonomic safety, leaves students highly vulnerable to preventable, long-term musculoskeletal injuries [2].

From a public health perspective, the intersection of musculoskeletal disorders (MSDs), mental fatigue, and compromised academic productivity represents a hidden institutional epidemic. Public health frameworks have historically focused on infectious diseases or lifestyle-related chronic conditions, often ignoring the micro-environmental hazards embedded within educational institutions. However, physical discomfort is not an isolated academic inconvenience; it is a systemic upstream determinant of long-term population health.

When young adults spend years subjecting their bodies to chronic mechanical stress and poor seating postures, it sets a trajectory for early-onset physical degeneration. Furthermore, the persistent cognitive load required to suppress chronic bodily pain induces neurological exhaustion, driving elevated anxiety, sleep disturbances, and systemic mental fatigue. When physical pain causes absenteeism or reduced learning efficiency, it directly undermines student productivity. In public health terms, this creates a damaging cycle where environmental infrastructure deficits diminish human capital, reducing the socioeconomic mobility that higher education is meant to provide.

While ergonomic structural safety is a universal concern, its reality is deeply split between high-income countries and Low- and Middle-Income Countries (LMICs). In high-income contexts, university modernization projects increasingly treat ergonomic integration and smart, adjustable furniture designs as standard procurement benchmarks.

Conversely, tertiary institutions in LMICs—particularly public universities in West Africa—operate under severe funding constraints. In these environments, explosive student enrollment growth has completely outpaced state funding and capital development allocations [17, 18]. Consequently, public institutions like the University of Calabar are forced to stretch aging, rigid, and overcrowded lecture hall frameworks far beyond their original design capacities. In an LMIC setting, the lack of adjustable chairs, poor room ventilation, and intense thermal stress compound the physical toll on the learning body. This turns classroom ergonomics from a matter of optimal comfort into a pressing health equity crisis.

To mitigate these systemic risks, higher education networks must transition from a culture of emergency maintenance to proactive, health-centered structural policies:

1. **Infrastructural Investment Guidelines:** University governing councils and state funding bodies must establish minimum ergonomic specifications for all future classroom procurement. Height-adjustable desks, supportive lumbar seating, and dynamic furniture solutions must be treated as essential institutional capital requirements, rather than luxury upgrades.
2. **National Education Policy Integration:** Ministries of Education should embed physical and environmental health standards directly into the institutional accreditation criteria managed by commissions like the National Universities Commission (NUC). Academic quality assurance frameworks must recognize that student learning capacity is structurally linked to ergonomic safety.
3. **Targeted Student Health Services:** Campus medical clinics must expand their scope beyond reactive primary care to

include proactive ergonomic advocacy. University health services should implement campus-wide ergonomic literacy campaigns, screen incoming students for early-onset musculoskeletal vulnerabilities, and establish clear reporting mechanisms for physical workspace deficiencies.

Conclusion and Recommendations

This study highlights that ergonomic inadequacies in university learning environments are not merely sources of physical discomfort but constitute significant barriers to student health, well-being, and academic performance. The findings demonstrate that poorly designed classroom infrastructure contributes to musculoskeletal strain, cognitive fatigue, and reduced academic engagement, while also disproportionately affecting students with diverse physical needs.

These results position ergonomic conditions as an important but under-recognized public health concern within higher education in low- and middle-income settings. Addressing these challenges requires a shift toward human-centered and inclusive classroom design, alongside institutional policies that prioritize student well-being.

Future interventions should integrate ergonomic standards into infrastructure planning, promote awareness of safe learning practices, and ensure equitable access to supportive learning environments. Improving the physical learning context is essential not only for enhancing academic outcomes but also for safeguarding the long-term health of students.

Strengths and Limitations

This study provides rich qualitative insights from a relatively large and diverse sample of university students, enhancing the breadth of perspectives captured. However, the use of an online survey limited the depth of individual responses compared to in-depth interviews. Additionally, the study was conducted in a single institution, which may limit generalizability to other settings.

Because the study used convenience and snowball recruitment through an online survey, the participants may not fully represent the experiences of all University of Calabar students. Furthermore, although 352 valid responses provided a broad range of qualitative accounts, the asynchronous nature of online free-text responses may have limited the depth and opportunity for probing that would ordinarily be possible in individual interviews or focus groups. The qualitative findings should therefore be interpreted as context-specific descriptions of students' reported experiences rather than as statistically generalizable estimates.

Conflict of Interest

The authors declare no conflict of interest related to this study.

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Authors' Contributions

- **Ogbe Alex (PhD Candidate):** Conceptualization, methodology, principal investigator, formal analysis, writing original manuscript, and funder of the study.
- **Dr. Michael Olabode Tomori (PhD):** Lead Supervisor of the study, local guide, methodology, investigation guide, writing—review and editing.
- **Emelonye Amaka Doris:** Online data manager, screening of online data, data coding, script typing and editing.
- **Dr. Catherine Akwilini:** Independent reviewer and critiquing of the study from start to finish.

Ethical Approval

Ethical clearance was obtained from the Research and Ethics Committee of Joseph Ayo Babalola University (Approval No: JABU/RGMO/REC/26/021). Before proceeding with online data collection for this study, informed consent was embedded in the online Google Form for willing participants to fill prior to completing the survey. On the online forms, there was no provision for participants' names or initials. It was clearly stated that participation was free and voluntary; hence, participants were free to withdraw from the study at any time without any consequences.

Data Availability

The dataset from which this aspect of the study was taken and analyzed is available from the corresponding author upon reasonable request, subject to ethical approval and institutional data-sharing policies.

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