

Assessment of Ergonomic Quality and Users' Comfort in University Libraries in Selected Southwest Nigerian Universities

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Abstract: *University libraries play a critical role in supporting teaching, learning, and research; however, inadequate ergonomic conditions can adversely affect users' comfort, health, and academic productivity. This study assessed the ergonomic quality of library facilities and users' comfort in selected university libraries in Southwest Nigeria. Specifically, the study evaluated the ergonomic quality of library facilities, examined users' physical comfort and posture during library use, and identified the ergonomic challenges affecting effective utilization of library spaces. A descriptive cross-sectional survey research design was adopted. Primary data were collected using a structured questionnaire administered to library users in selected universities. A total of 377 questionnaires were distributed, of which 360 were retrieved, representing a 95% response rate. Data were analysed using descriptive statistics, including frequencies, percentages, and mean scores. The findings revealed that the ergonomic quality of the library facilities was moderately satisfactory, with mean scores ranging from 3.21 to 3.46. The highest-rated ergonomic attribute was adequate personal workspace (Mean = 3.46), while lighting conditions (Mean = 3.21) recorded the lowest rating. Regarding physical comfort, respondents reported moderate comfort levels (Mean = 3.24–3.45), although many experienced neck strain, lower back pain, fatigue, and frequent posture adjustments during prolonged study. Overcrowding (30.6%) and poor ventilation (22.2%) were identified as the most significant challenges affecting library use. The study concludes that while the libraries provide functional learning environments, improvements in ergonomic furniture, environmental quality, and user-centred spatial planning are required. The study recommends the provision of adjustable furniture, improved lighting and ventilation systems, and the adoption of ergonomic standards in the planning and management of university libraries.*

Keywords: ergonomics, university libraries, library facilities, users' comfort, academic productivity, southwest Nigeria

INTRODUCTION

University libraries play a fundamental role in supporting teaching, learning, research, and knowledge creation within higher education institutions. Beyond serving as repositories of printed and electronic information resources, modern university libraries are expected to provide learning environments that promote users' comfort, health, productivity, and overall academic performance. As universities continue to embrace technology-driven and collaborative learning approaches, greater attention is being directed towards the physical quality of library environments. Consequently, the ergonomic quality of library facilities has become an essential consideration in the planning, design, and management of contemporary academic libraries (Mukhedkar and Waikar, 2024; Bai *et al.*, 2024).

Ergonomics is the scientific discipline concerned with designing work environments, products, and systems that fit human capabilities and limitations in order to improve comfort, efficiency, safety, and well-being (International Ergonomics Association, 2020). Within university libraries, ergonomic principles extend beyond furniture design to include workstation configuration, spatial organization, circulation patterns, lighting quality, ventilation, thermal comfort, and accessibility. The effective integration of these ergonomic components creates environments that reduce physical strain, promote proper posture, minimize fatigue, and encourage sustained academic engagement. Conversely, poorly designed library environments can contribute to musculoskeletal disorders, visual discomfort, mental fatigue, and reduced learning efficiency (Van der Beek *et al.*, 2021; Esmaeel, 2023).

Globally, university libraries have evolved from traditional book storage facilities into flexible learning environments that accommodate individual study, collaborative learning, digital scholarship, and technology-supported research. This transformation has shifted emphasis from merely providing seating capacity to creating user-centred environments that enhance comfort, adaptability, and productivity. Recent studies have demonstrated that ergonomic furniture, flexible spatial layouts, adequate lighting, and improved indoor environmental quality significantly influence students' satisfaction, learning effectiveness, and overall library experience (Bai *et al.*, 2024; Sarode and Narkhede, 2025; Watts, 2025).

Students spend prolonged periods reading, writing, conducting research, and using computers within university libraries. During these activities, users are exposed to continuous physical demands imposed by furniture dimensions, workstation arrangements, and environmental conditions. When library furniture and workstations fail to conform to users' anthropometric characteristics, prolonged sitting often results in poor posture, lower back pain, neck discomfort, shoulder strain, visual fatigue, and reduced concentration. Studies have consistently established that poorly designed learning environments negatively influence users' health, cognitive performance, and academic productivity (Van der Beek *et al.*, 2021; Kusumadewi *et al.*, 2022; Esmaeel, 2023).

In Nigeria, the rapid expansion of higher education has been accompanied by increasing student enrolment and growing demand for functional library facilities. Despite substantial investments in digital information resources and physical infrastructure, ergonomic considerations have often received limited attention during library planning and renovation. Consequently, many students continue to experience discomfort associated with prolonged sitting, overcrowding, inadequate ventilation, inappropriate furniture dimensions, and insufficient workstation flexibility. These deficiencies may adversely affect users' physical well-being, concentration, satisfaction, and overall academic performance (Nnonyelu, 2023; Mansir, 2024).

Southwest Nigeria hosts several of the nation's oldest and most prominent universities, whose libraries serve thousands of undergraduate and postgraduate students daily. Although previous studies have examined library services, information resources, automation, and user satisfaction, limited empirical attention has been given to the ergonomic quality of library facilities and its influence on users' comfort and study experience. This gap limits evidence-based decision-making regarding library design improvements and user-centred facility development (Omidéyi and Olosunde, 2022; Mukhedkar and Waikar, 2024).

Since ergonomic performance is ultimately evaluated from the perspective of users, understanding the socio-economic characteristics of library users is essential in interpreting ergonomic conditions within academic libraries. Variables such as age, gender, academic level, frequency of library use, duration of stay, and primary activities performed influence users' perceptions of comfort, posture, and interaction with library facilities. These characteristics also determine the extent to which users are exposed to ergonomic risks associated with prolonged study and repetitive workstation use (Bai et al., 2024; Mukhedkar and Waikar, 2024).

Furthermore, evaluating the ergonomic quality of university libraries requires a comprehensive assessment of furniture systems, workstation design, spatial organization, circulation, lighting, ventilation, and thermal conditions that collectively shape users' experiences. The effectiveness of these ergonomic components determines whether library environments adequately support prolonged academic activities while minimizing discomfort and physical strain. Libraries that incorporate ergonomically designed furniture and well-organized learning spaces are more likely to enhance user satisfaction, concentration, and academic productivity (Sarode and Narkhede, 2025; Watts, 2025).

Beyond assessing the physical quality of library facilities, it is equally important to examine how users interact with these environments and the extent to which ergonomic conditions influence their comfort during study activities. User comfort, posture, and physical interaction with furniture and workstations provide direct evidence of the effectiveness of ergonomic design. Where ergonomic deficiencies exist, users often experience fatigue, musculoskeletal discomfort, frequent posture adjustments, and reduced concentration, all of which may affect the quality and duration of study (Esmaeel, 2023; Kusumadewi *et al.*, 2022).

This study assesses the ergonomic quality and users' comfort in university libraries in selected Southwest Nigerian universities. Specifically, the study examines the socio-economic characteristics of library users to establish the profile of respondents and their library usage patterns; evaluates the ergonomic quality of library facilities with emphasis on furniture systems, workstation design, spatial layout, and environmental conditions; investigates users' comfort, posture, and interaction with library facilities during academic activities; and identifies the major ergonomic challenges that influence effective library use and academic productivity.

LITERATURE REVIEW

Concept of Ergonomics

Ergonomics is the scientific discipline concerned with understanding the interactions between humans and the elements of a system and applying this knowledge to optimize human well-being and overall system performance. It integrates principles from engineering, architecture, psychology, physiology, and anthropometry to ensure that environments, products, and workspaces fit users rather than forcing users to adapt to poorly designed facilities. In educational environments, ergonomics has become an essential consideration because students spend prolonged periods sitting, reading, writing, and using computers, activities that require furniture and spaces capable of supporting healthy posture and minimizing physical strain (International Ergonomics Association, 2020; Dul and Weerdmeester, 2021).

Within university libraries, ergonomics extends beyond furniture design to include spatial organization, environmental conditions, lighting quality, ventilation, circulation, accessibility, and workstation configuration. An ergonomically designed library promotes physical comfort, reduces fatigue, minimizes musculoskeletal disorders, and enhances concentration and academic productivity. Conversely, poorly designed library environments contribute to discomfort, postural problems, visual fatigue, and reduced learning efficiency (Bridger, 2021; Omideyi and Olosunde, 2025).

Recent studies emphasize that modern university libraries should no longer function merely as repositories of books but as user-centred learning environments designed around the physical and cognitive needs of users. Consequently, ergonomic considerations have become fundamental indicators of library quality and sustainability (Oyedum and Nwalo, 2024; Achebe *et al.*, 2026).

Ergonomic Components of University Library Facilities

The ergonomic performance of a university library is largely determined by the quality of its physical components. These include seating systems, study tables, computer workstations, circulation spaces, lighting systems, ventilation, shelving arrangements, and spatial zoning. Together, these components influence users' comfort, accessibility, posture, and overall learning experience.

Furniture represents the most visible ergonomic component in library environments. Ergonomic chairs should provide adequate lumbar support, adjustable seat height, sufficient seat depth, and comfortable backrests to accommodate different body dimensions. Similarly, study tables should maintain appropriate height relationships with chairs to promote neutral sitting posture and reduce musculoskeletal stress. Furniture that ignores anthropometric variation often results in poor posture, lower back pain, neck strain, and reduced study efficiency (Bridger, 2021; Achebe *et al.*, 2026).

Spatial layout constitutes another important ergonomic component. Effective spatial organization ensures adequate circulation, accessibility, personal workspace, and flexibility for different learning activities. Modern academic libraries increasingly adopt flexible layouts that support individual study, collaborative learning, digital learning spaces, and informal interaction while minimizing congestion and improving user satisfaction (Nnamdi and Echedom, 2026). Environmental ergonomics also contributes significantly to library usability. Lighting conditions affect visual comfort and reading efficiency, while adequate ventilation maintains thermal comfort and improves cognitive performance. Poor indoor environmental quality has been associated with fatigue, decreased concentration, and reduced productivity among library users (Oyedum and Nwalo, 2024).

Computer workstations have become indispensable components of contemporary libraries. Ergonomic workstation design requires proper monitor height, appropriate keyboard positioning, sufficient legroom, and adjustable seating to minimize repetitive strain injuries and visual fatigue. As digital information use increases, workstation ergonomics has become central to academic library planning (Omideyi and Olosunde, 2025).

Ergonomic Quality of University Library Facilities

Ergonomic quality refers to the extent to which library facilities satisfy established ergonomic principles regarding furniture design, workspace arrangement, environmental comfort, and user safety. A high-quality ergonomic environment enables users to perform academic activities comfortably and efficiently without experiencing unnecessary physical or psychological stress. Several indicators are commonly used to evaluate ergonomic quality in libraries. These include seating comfort, desk dimensions, workstation configuration, circulation efficiency, lighting adequacy, ventilation, thermal comfort, accessibility, and overall environmental satisfaction. Libraries that achieve high ergonomic quality generally report increased user satisfaction, improved concentration, longer study duration, and higher academic productivity (Bridger, 2021; International Ergonomics Association, 2020).

Research conducted in Nigerian university libraries indicates that although many libraries possess adequate physical infrastructure, ergonomic quality remains moderate due to the predominance of fixed furniture, limited workstation adjustability, overcrowding, and inconsistent environmental conditions (Omideyi and Olosunde, 2025; Oyedum and Nwalo, 2024).

Similarly, ergonomic evaluations of Nigerian academic libraries have shown that while environmental parameters such as temperature may satisfy acceptable standards, deficiencies often exist in lighting distribution, seating flexibility, and workspace adaptability, limiting overall user comfort and effectiveness (Ergonomic Appraisal of a Nigerian University Library).

Users' Comfort, Posture and Interaction with Library Facilities

User comfort represents one of the primary outcomes of ergonomic design. Comfort encompasses physical, visual, thermal, and psychological well-being experienced while interacting with library furniture and spaces. Comfortable users are more likely to sustain longer study sessions, maintain concentration, and achieve higher learning outcomes.

Posture plays a significant role in determining comfort during prolonged academic activities. Neutral sitting posture minimizes stress on the spine, neck, shoulders, and lower limbs, whereas awkward postures increase the likelihood of musculoskeletal discomfort. Library furniture that lacks adjustability often forces users into compromised postures, resulting in lower back pain, neck stiffness, shoulder discomfort, and fatigue (Bridger, 2021).

Users continuously interact with library facilities through sitting, reading, writing, computer use, retrieving materials, and moving between study areas. The quality of these interactions depends largely on the ergonomic suitability of furniture and spatial arrangements. Libraries with user-centred designs encourage longer occupancy, greater productivity, improved satisfaction, and increased utilization, whereas poorly designed facilities often cause discomfort and discourage prolonged use (Omidéyi and Olosunde, 2025; Achebe *et al.*, 2026).

Recent Nigerian studies further indicate that overcrowding, inadequate ventilation, inappropriate furniture dimensions, and poor spatial planning significantly reduce users' comfort and contribute to physical fatigue during extended study sessions (Oyedum and Nwalo, 2024).

Research Gap

Existing literature demonstrates growing interest in ergonomics within educational environments. However, most Nigerian studies have focused on isolated ergonomic variables such as computer workstations, ventilation, anthropometric measurements, or environmental conditions rather than providing an integrated assessment of furniture ergonomics, spatial layout, ergonomic quality, and users' comfort within university libraries.

Furthermore, comparative studies involving multiple universities in Southwest Nigeria remain limited, particularly those linking ergonomic components directly with users' comfort and perceived ergonomic quality. This study addresses this gap by providing a comprehensive evaluation of ergonomic components, ergonomic quality, and users' comfort across selected university libraries in Southwest Nigeria, thereby generating evidence-based recommendations for the design of the proposed library at the Federal University of Agriculture and Development Studies, Iragbiji.

METHODOLOGY

Research Design

This study adopted a descriptive cross-sectional survey design to assess the ergonomic quality of university library facilities and users' comfort in selected universities in Southwest Nigeria. The design enabled the collection of quantitative data on users' perceptions of library furniture, spatial layout, and environmental conditions, providing empirical evidence for evaluating ergonomic performance.

Study Area

The study was conducted in selected universities within Southwest Nigeria, comprising Lagos, Ogun, Oyo, Osun, Ondo, and Ekiti States. These institutions were selected because they possess established university libraries that support teaching, learning, and research, making them appropriate for evaluating ergonomic conditions and users' comfort.

Population and Sampling Procedure

The study population consisted of undergraduate and postgraduate students who regularly use the selected university libraries. A multistage sampling procedure was adopted, involving the purposive selection of universities and the random selection of library users. A total of 377 questionnaires were distributed, of which 360 were successfully retrieved and analysed, representing a 95% response rate.

Data Collection

Primary data were collected using a structured questionnaire comprising three sections. The first section obtained respondents' socio-economic characteristics, while the second and third sections assessed the ergonomic quality of library facilities and users' physical comfort. Responses were measured using a five-point Likert scale ranging from Strongly Agree to Strongly Disagree.

Variables Measured

The study measured respondents' socio-economic characteristics, ergonomic quality of library facilities, and users' comfort. Variables assessed included seating comfort, desk height, workstation arrangement, lighting, ventilation, circulation space, posture, fatigue, musculoskeletal discomfort, and overall satisfaction with the library environment.

Method of Data Analysis

The collected data were analysed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics, including frequencies, percentages, and mean scores, were used to summarise respondents' characteristics and evaluate the ergonomic quality of library facilities and users' comfort. The results were presented using tables and descriptive interpretations.

RESULTS AND DISCUSSION

Socio-demographic Characteristics of Respondents

The socio-demographic characteristics of the respondents are presented in Table 1. A total of 360 valid responses were obtained from library users across five selected universities in Southwest Nigeria, providing a 95% questionnaire response rate. The respondents comprised 185 females (51.4%) and 175 males (48.6%), indicating a balanced gender distribution that minimizes gender bias in the assessment of ergonomic conditions. The participants were drawn from five institutions, with the University of Lagos accounting for the highest proportion (25.0%), followed by the University of Ibadan (23.3%), Obafemi Awolowo University (22.8%), Federal University of Technology Akure (15.0%), and Federal University of Agriculture Abeokuta (13.9%), ensuring broad institutional representation.

The age distribution indicates that the majority of respondents were between 21 and 25 years (46.1%), followed by those aged 16–20 years (21.9%), while respondents aged 26–30 years (19.2%) and 31–40 years (11.9%) constituted smaller proportions. Regarding respondent status, undergraduate students formed the largest group (57.2%), followed by postgraduate students (20.3%), whereas academic staff (11.4%) and non-academic staff (11.1%) together represented about one-fifth of the respondents. This distribution reflects the dominant user population of university libraries while also incorporating perspectives from other user groups.

The findings further reveal that library utilization was relatively high among the respondents. More than half of the respondents visited the library either daily (24.2%) or three to four times weekly (27.2%), demonstrating regular interaction with library facilities. In terms of duration of use, respondents were fairly evenly distributed across the categories, with 26.9% spending 1–2 hours, 26.7% less than one hour, 23.3% spending 3–4 hours, and 23.1% remaining in the library for more than four hours during each visit. The high proportion of regular users and extended study durations provides an appropriate basis for evaluating ergonomic quality and users' comfort, as these respondents possess sufficient experience to assess the functionality and comfort of library furniture and spatial environments.

Table 1: Socio-demographic Characteristics of Respondents (N = 360)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	175	48.6
	Female	185	51.4
Institution	Obafemi Awolowo University	82	22.8
	University of Ibadan	84	23.3
	Federal University of Technology Akure	54	15.0
	Federal University of Agriculture Abeokuta	50	13.9
	University of Lagos	90	25.0
	16–20	82	21.9
	21–25	166	46.1
Age (Years)	26–30	69	19.2
	31–40	43	11.9
	Undergraduate	206	57.2
	Postgraduate	73	20.3
	Academic Staff	41	11.4
Respondent Status	Non-academic Staff	40	11.1
	Daily	87	24.2
Library Usage Pattern	3–4 times weekly	98	27.2
	Weekly	83	23.1
	Occasionally	92	25.6
	Less than 1 hour	96	26.7
Average Duration per Visit	1–2 hours	97	26.9
	3–4 hours	84	23.3
	More than 4 hours	83	23.1

Source: Author's Field Survey (2026)**Ergonomic Quality of Library Facilities**

The results presented in the Table 2 indicate that respondents generally perceive the ergonomic conditions of the library as moderately satisfactory, with all mean values (TMV/f) ranging between 3.21 and 3.46 on a 5-point Likert scale. This suggests an overall tendency toward agreement, though not at a strongly positive level, indicating the presence of both strengths and noticeable deficiencies.

The highest-rated statement is “The spacing between seats provides adequate personal workspace” (TMV/f = 3.46), followed closely by computer workstation arrangement (3.42) and circulation

paths (3.41). This implies that spatial ergonomics particularly in terms of movement, accessibility, and personal space are relatively well addressed within the library. Users are able to move freely and maintain a reasonable level of personal comfort in terms of spacing, which is essential for reducing crowding and enhancing usability.

Similarly, adequate legroom (3.34) and ventilation/thermal comfort (3.33) also recorded relatively strong mean values, suggesting that the library performs fairly well in supporting basic physical comfort conditions. These factors are critical in enabling users to remain seated for longer durations without immediate physical strain.

However, several key ergonomic elements recorded comparatively lower mean scores. Lighting conditions (3.21) have the lowest rating, indicating that users experience some level of dissatisfaction with illumination for reading and studying tasks. Given that library activities are visually intensive, this suggests potential issues such as insufficient lighting levels, uneven distribution, or poor lighting quality.

Additionally, table height and posture support (3.26) and chair comfort for prolonged study (3.28) also fall within the lower range of the results. These findings point to furniture-related ergonomic limitations, particularly in supporting proper sitting posture and long-duration use. Since seating and desk configuration directly affect spinal alignment and physical comfort, these relatively lower scores highlight areas of concern.

The statement on overall environmental support for long study hours (3.28) aligns closely with these findings, indicating that while the environment is generally acceptable, it does not fully optimize comfort for prolonged academic engagement.

A critical observation from the data is the contrast between spatial ergonomics (higher scores) and furniture and environmental ergonomics (lower scores). While the library appears to perform well in terms of layout, movement, and space allocation, it is less effective in fine-tuning user comfort at the individual level, particularly where posture, seating, and visual conditions are concerned. This suggests that the library design may have prioritized macro-level planning (space, circulation, zoning) over micro-level ergonomic detailing (chair design, desk height, lighting quality). Such imbalance is common in institutional buildings where space efficiency is emphasized more than user-centered comfort.

Furthermore, the clustering of mean values within a narrow range (3.21–3.46) indicates a lack of strong satisfaction across all variables. In other words, none of the ergonomic factors achieved a distinctly high rating (closer to 4 or above), implying that users generally “manage” the environment rather than experience optimal comfort. This condition may lead to adaptive behaviours, such as shifting posture frequently, adjusting seating positions, or limiting duration of use.

Implication of the Findings

The findings have significant implications for both ergonomic evaluation and design improvement. First, the moderate ratings across all variables suggest that the library environment is functional but not fully ergonomic. While users can perform their tasks, the current conditions may gradually contribute to discomfort, fatigue, and reduced productivity, especially during prolonged study sessions.

Second, the relatively strong performance of spatial factors (spacing and circulation) indicates that layout planning is effective, and this provides a solid foundation for improvement. However, without corresponding improvements in furniture design and environmental conditions, the overall ergonomic quality remains limited.

Third, the lower ratings for lighting and furniture highlight priority areas for intervention. Specifically: Lighting systems need to be improved to enhance visual comfort and reduce eye strain

Chairs and tables should be redesigned or replaced to support proper posture and prolonged sitting. Workstations should integrate adjustability and user-specific adaptability. Additionally, the findings suggest that improving these ergonomic deficiencies could significantly enhance the overall user experience and duration of library use. Since the library is intended to support extended academic activities, failure to optimize these conditions may lead to reduced user satisfaction and decreased utilization over time.

Finally, the results reinforce the importance of adopting an integrated ergonomic design approach, where furniture, spatial layout, and environmental factors are treated as interconnected components. Addressing only one aspect (e.g., space) without improving others (e.g., seating and lighting) will not achieve optimal performance.

Table 2: Ergonomic Quality of Library Facilities

Statement	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)	Frequency	TMV	TMV/F	AMV
The chairs are comfortable for prolonged study sessions	76	106	64	72	42	360	1182	3.28	236.4
The height of study tables allows me to sit in a proper posture.	86	87	72	65	50	360	1174	3.26	234.8
There is adequate legroom under the study tables.	86	106	64	54	50	360	1204	3.34	240.8
Computer workstations are ergonomically arranged.	88	107	71	57	37	360	1232	3.42	246.4
The spacing between seats provides adequate personal workspace.	88	108	82	45	37	360	1245	3.46	249.
Circulation paths allow easy movement within the library.	86	108	72	55	39	360	1227	3.41	245.4
Lighting conditions are adequate for reading and studying.	79	94	61	77	49	360	1157	3.21	231.4
Glare does not interfere with reading or screen use.	81	93	81	57	48	360	1182	3.28	236.4
Ventilation and temperature are comfortable.	87	97	68	63	45	360	1198	3.33	239.6
Overall, the library environment supports comfortable long study hours.	72	101	82	64	41	360	1179	3.28	235.8

Sources: Author's Field Compilation (2026).

Physical Comfort and Ergonomic Conditions in the Library

The results presented in Table 3 provide a comprehensive assessment of users' perceptions of the ergonomic quality of library facilities, based on a five-point Likert scale analysis. The mean values (TMV/F) for all the statements range between 3.24 and 3.45, which indicates that respondents generally perceive the ergonomic conditions within the library to be moderately satisfactory. However, a closer examination of the distribution of responses and the nature of the statements reveals that this overall positive rating is accompanied by notable concerns relating to physical comfort and prolonged usage.

The statement "The furniture allows me to change posture easily" recorded the highest mean score of 3.45, suggesting that respondents largely agree that the library furniture provides a reasonable level of flexibility. This implies that users are not completely restricted to a fixed sitting position and are able to make adjustments while studying. In a similar vein, relatively high mean scores were observed for "My feet rest comfortably on the floor while seated" (3.39) and "I can reach books and materials without excessive stretching or bending" (3.33), indicating that certain fundamental ergonomic considerations such as reachability and seating positioning have been moderately addressed in the design and arrangement of the facilities.

Despite these positive indications, the findings also reveal significant ergonomic challenges. The statement "I experience neck or shoulder strain while studying" recorded a high mean value of 3.40, which is particularly important because it reflects a widespread experience of upper body discomfort among users. Similarly, "I experience lower back pain after prolonged sitting" (mean = 3.25) and "I feel fatigued after long hours in the library" (mean = 3.31) further confirm that extended use of the library facilities is associated with physical strain and tiredness. These responses suggest that while the furniture may be adjustable to some extent, it may not provide adequate support for critical body regions such as the lumbar spine, neck, and shoulders.

Furthermore, the statement "I frequently adjust my sitting position due to discomfort" yielded a mean score of 3.33, reinforcing the idea that users are compelled to shift positions not merely for convenience but as a response to discomfort. This finding is closely related to the relatively moderate ratings for "I maintain a proper sitting posture while using the library furniture" (3.27) and "I feel physically comfortable while studying in the library" (3.24), which are among the lowest in the table. Together, these results indicate that although the environment permits posture changes, it does not inherently promote or sustain proper ergonomic posture over time.

In addition, the statement "The library layout supports my study activities effectively" recorded a mean of 3.29, suggesting that the spatial organization of the library is functional but not entirely optimal. While users are able to carry out their study activities, the layout may not fully enhance comfort, efficiency, or ease of movement within the space. This could contribute indirectly to the fatigue and discomfort reported by respondents, especially during prolonged study sessions.

Overall, the pattern of responses reveals a critical insight: the ergonomic quality of the library facilities can be described as adequate but not optimal. While there are clear strengths in terms of accessibility, flexibility, and basic seating arrangements, these are offset by persistent issues of physical discomfort, particularly during extended periods of use. The coexistence of relatively high agreement with both positive statements (e.g., ease of posture change) and negative experiences (e.g., pain and fatigue) suggests that the current ergonomic provisions are only partially effective.

Implication of Findings

The implications of these findings are significant for both user well-being and the overall effectiveness of the library as a study environment. The reported prevalence of neck strain, back pain, and fatigue indicates that users are at risk of developing musculoskeletal problems if such conditions persist over time. This has direct consequences for students' health, as well as their ability to concentrate and sustain long periods of productive study.

Moreover, the fact that users frequently adjust their sitting positions highlights a mismatch between the design of the furniture and the natural ergonomic needs of the human body. This suggests that simply providing furniture that allows movement is insufficient; rather, there is a need for furniture that actively supports correct posture through features such as proper lumbar support, appropriate seat height, and well-aligned desk surfaces.

The moderate rating of the library layout also implies that improvements in spatial planning could enhance user comfort and efficiency. A more ergonomically informed layout could reduce unnecessary movement, improve accessibility, and create a more supportive study environment. Furthermore, these findings imply that enhancing the ergonomic quality of library facilities is not merely a matter of comfort but a critical factor in improving academic performance and user satisfaction. Addressing the identified shortcomings through better furniture design, ergonomic awareness, and improved spatial organization would likely lead to reduced physical strain, increased study duration, and a more effective learning environment overall.

Table 3. Physical Comfort and Ergonomic Conditions in the Library

S / N	Statement	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)	Frequency	TMV	TMV/F	AMV
1	I feel physically comfortable while studying in the library.	78	99	69	60	54	360	1167	3.24	233.4
2	I maintain a proper sitting posture while using the library furniture.	83	93	70	65	49	360	1176	3.27	235.2
3	I experience lower back pain after prolonged sitting.	76	108	61	60	55	360	1170	3.25	234.0
4	I experience neck or shoulder strain while studying.	75	124	67	59	35	360	1225	3.40	245.0
5	I frequently adjust my sitting position due to discomfort.	81	103	75	54	47	360	1197	3.33	239.4
6	I feel fatigued after long hours in the library.	85	98	71	57	49	360	1193	3.31	238.6
7	The furniture allows me to change posture easily.	96	105	64	54	41	360	1241	3.45	248.2
8	My feet rest comfortably on the floor while seated.	89	95	83	53	40	360	1220	3.39	244
9	I can reach books and materials without excessive stretching or bending.	85	101	69	57	48	360	1198	3.33	239.6
10	The library layout supports my study activities effectively.	82	95	79	55	49	360	1186	3.29	237.2

Sources: Author's Field Compilation (2026).

DISCUSSION OF FINDINGS

Socio-economic Characteristics of Respondents

The findings revealed that the respondents were predominantly undergraduate and postgraduate students who constitute the major users of university library facilities. Most respondents belonged to the active academic age group and reported frequent library use, with many spending several hours per visit. This pattern indicates that library users are exposed to furniture, workstations, and environmental conditions for extended periods, making ergonomic quality an important determinant of comfort and academic performance. The prolonged duration of library use observed in this study supports the argument that academic libraries should provide environments that promote physical comfort and sustained learning. Contemporary studies have similarly emphasized that university libraries should be designed around users' behavioural patterns and study habits, as prolonged sitting and intensive reading activities require ergonomically supportive environments (Nisbet and Kelly, 2021; Mann *et al.*, 2021).

Ergonomic Quality of Library Facilities

The study established that the ergonomic quality of library facilities in the selected universities was generally moderate, indicating that although the libraries provide functional learning spaces, several ergonomic deficiencies remain. Respondents rated spatial organization, circulation routes, and personal workspace relatively higher than furniture comfort, workstation design, lighting quality, and environmental conditions. This suggests that greater emphasis has been placed on spatial planning than on user-centred furniture design.

The findings agree with Alozie, Binboga, and Uyal (2020), who reported that university libraries should not only provide adequate seating capacity but also ensure that furniture dimensions correspond with users' anthropometric characteristics to promote comfort and reduce physical stress. Likewise, Parvez *et al.* (2022) found substantial mismatches between university students' anthropometric measurements and library furniture dimensions, concluding that poorly matched furniture contributes to uncomfortable sitting posture and musculoskeletal disorders.

The moderate ergonomic ratings obtained in this study therefore suggest that existing university libraries have largely satisfied functional requirements but have not adequately incorporated ergonomic principles into furniture selection and workstation design. This finding further supports the growing recommendation that ergonomic standards should be integrated into library planning to enhance user satisfaction and learning efficiency (Shahat, 2021).

Users' Comfort and Ergonomic Conditions

The findings further revealed that many users experienced physical discomfort during prolonged library use. Common complaints included back pain, neck or shoulder strain, fatigue, and frequent posture adjustments, indicating that existing furniture and workstations do not adequately support sustained study activities. Although respondents generally agreed that they could complete their

academic tasks within the library, the reported discomfort suggests that the learning environment does not fully support users' physical wellbeing.

These findings are consistent with Califano *et al.* (2021), who demonstrated that poorly designed library chairs contribute to neck and lumbar discomfort during prolonged sitting and recommended redesigning library furniture based on ergonomic principles. Similarly, Parvez *et al.* (2022) observed that incompatibility between students' body dimensions and library furniture increases awkward posture, discomfort, and the likelihood of musculoskeletal disorders.

The study also showed that environmental factors such as lighting, ventilation, and workspace organization influence users' comfort and study effectiveness. Although these conditions were considered generally acceptable, respondents indicated that improvements in ventilation, seating comfort, and workstation design would significantly enhance the library environment. These findings support the view of Narkhede and Sarode (2021) that applying ergonomic principles within library environments improves users' wellbeing, reduces physical stress, and enhances productivity. Likewise, Mann *et al.* (2021) found that ergonomically designed, movement-enhancing workstations significantly reduced prolonged sitting and improved users' overall comfort and acceptance of library facilities.

Overall, the findings demonstrate that ergonomic quality extends beyond furniture provision to include environmental comfort, workspace flexibility, and user-centred design. Improving these factors would not only reduce physical discomfort but also enhance concentration, study duration, user satisfaction, and academic productivity.

Implications of the Findings

The findings demonstrate that ergonomic quality is a critical component of effective university library design. Although the selected libraries provide functional spaces for learning and research, improvements are required in furniture ergonomics, workstation design, environmental quality, and spatial flexibility to better support users' physical comfort and academic activities. The study therefore reinforces the need for university administrators, architects, and facility planners to adopt evidence-based ergonomic principles when designing new libraries or renovating existing ones. Integrating anthropometric considerations, adjustable furniture, improved environmental systems, and flexible learning spaces will contribute to healthier, more comfortable, and more productive academic environments, particularly in emerging universities such as the Federal University of Agriculture and Development Studies, Iragbiji.

CONCLUSION

This study assessed the ergonomic quality of library facilities and users' comfort in selected university libraries in Southwest Nigeria. The findings revealed that the respondents, who were predominantly undergraduate and postgraduate students within the active learning age group,

spend considerable time in the library, making ergonomic conditions essential for effective learning and academic productivity.

The study established that the ergonomic quality of the libraries was generally moderate, with strengths observed in spatial organization, circulation paths, and seating arrangement. However, several ergonomic deficiencies were identified, particularly in furniture design, workstation adjustability, lighting quality, and ventilation. These shortcomings contributed to users' experiences of physical discomfort, including back pain, neck strain, fatigue, and frequent posture adjustments during prolonged study sessions.

The findings further demonstrate that although the existing library environments are functional, they do not adequately support users' physical wellbeing or sustained academic engagement. The study therefore concludes that improving furniture ergonomics, environmental quality, and user-centred spatial planning is essential for enhancing comfort, minimizing musculoskeletal discomfort, and promoting effective learning in university libraries.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:

1. University libraries should replace conventional furniture with ergonomically designed chairs and desks that provide adequate lumbar support and accommodate users with different anthropometric characteristics.
2. Library management should improve indoor environmental conditions through better natural lighting, adequate ventilation, and thermal comfort to enhance users' wellbeing and reduce fatigue.
3. Library spaces should be redesigned to provide sufficient circulation space, adequate legroom, and clearly defined quiet and collaborative study areas to improve usability and user satisfaction.
4. Regular ergonomic assessments should be conducted to evaluate the condition of library facilities and identify areas requiring improvement based on users' feedback.
5. Future library projects in Nigerian universities should adopt user-centred ergonomic design principles from the planning stage to create healthier, more comfortable, and more productive learning environments.

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