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Library Users' Perceptions of the Spatial Layout and Ergonomics of College Libraries in Pekanbaru

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ABSTRACT

College libraries not only function as information collection centers, but also as learning spaces and academic interactions that require physical comfort for users. This study aims to analyze user perceptions of library layout and ergonomics and examine the influence of both aspects on user comfort in universities in Pekanbaru City. The study used a quantitative approach with a descriptive-explanatory type. The survey method was employed by distributing structured questionnaires using a five-point Likert scale to 100 active users of the Library Units of Universitas Riau, Universitas Islam Negeri Sultan Syarif Kasim Riau, and Universitas Lancang Kuning. The collected data were analyzed using descriptive statistics and multiple linear regression using SPSS software. The results of the study indicate that in general, users have a positive perception of the library layout and ergonomics, although there are still critical notes on the aspects of acoustics, room zoning, and facility comfort for long-term use. The results of the regression test indicate that layout and ergonomics simultaneously have a significant effect on user comfort. Partially, both variables also have a positive effect, with layout as the most dominant factor. This research provides practical benefits as a basis for consideration for library managers in designing and improving the quality of the physical environment that is oriented towards user needs. Furthermore, this research contributes academically to enriching empirical studies on the spatial design and ergonomics of university libraries in Indonesia.

Keywords: *Ergonomics; User Comfort; College Libraries; Perception; Spatial Planning.*

1. INTRODUCTION

University libraries are undergoing significant transformations along with advances in information technology and changes in academic learning patterns (Oyedokun, 2025). Libraries are no longer positioned solely as storage for print collections, but are evolving into active learning centers that support discussion, collaboration, and research (Onunka, Onunka, Fawole, Adeleke, & Daraojimba, 2023).

Library as a third place positioning the library as an alternative space besides the home and classroom that can foster intellectual and social interaction (Wood, 2021). In this context, the quality of the physical environment is a strategic factor in increasing the attractiveness and effectiveness of library services (Gunarathna, 2024). The physical environment of the library plays a crucial role in shaping the experiences and perceptions of users while inside (Noh, 2022). Spatial layout, comfort of facilities, and a conducive atmosphere directly influence the duration of visits and user learning productivity (Peng, Wei, Fan, Jin, & Liu, 2022). Research shows that good spatial design can significantly increase user satisfaction and engagement (Applegate, 2009). Therefore, physical environmental management needs to be viewed as an integral part of a university library development strategy (Lin, Shen, & Silfvenius, 2024).

Library layout encompasses furniture arrangement, service zone division, user circulation flow, lighting, and noise control (Majidi, Saradj, & Khanmohammadi, 2023). Effective spatial planning can facilitate various learning styles, from individual study to group work. Beard and Dale (2010) emphasized that spatial flexibility is key to creating a library that adapts to the needs of modern users (Beard and Dale, 2010). Therefore, spatial layout is not only a matter of aesthetics, but also directly related to function and accessibility. Beyond spatial layout, ergonomics are crucial in ensuring user comfort and health (Azadi, Bai, & Nourian, 2024). Ergonomics focuses on the appropriateness of facility designs such as chairs, tables, shelves, and technological devices to the physical characteristics of users. A non-ergonomic learning environment has the potential to cause fatigue, musculoskeletal disorders, and reduce learning concentration (Robertson et al., 2013). Therefore, implementing ergonomic principles is a long-term investment in improving the quality of library services.

Pekanbaru, as an educational center in Riau Province, has a relatively high level of academic activity and public interest in reading. This is reflected in the high number of visits to libraries, such as the Soeman HS Library, which reaches tens of thousands of visitors. However, high visitation rates do not always translate to user comfort. This situation requires a more in-depth evaluation of the spatial quality and ergonomics of libraries in the region. The COVID-19 pandemic has had a significant impact on library management, including budget adjustments and service priorities. Some libraries have experienced limitations in facility maintenance and design updates. However, post-pandemic, there has been an increased need for comfortable and safe physical study spaces. The gap between user needs and available facilities has the potential to affect user perceptions of library quality.

Previous studies have highlighted the importance of ergonomic and spatial factors in supporting user comfort and learning activities. Aryadi and Susilowati (2021) found that learning facilities that do not adequately consider ergonomic principles may contribute to physical discomfort among students (Aryadi & Susilowati, 2021). Similarly, Yulianti (2013) demonstrated that improvements in the ergonomic conditions of library environments can enhance user comfort and support better performance (Yulianti, 2013). These findings suggest that both physical layout and ergonomic quality are important components in creating effective learning environments.

The contribution of this study lies in its integration of spatial layout and ergonomic factors within a single analytical framework to examine user comfort in university libraries in Pekanbaru. While previous studies have addressed these aspects separately, this study analyzes their combined influence from the perspective of library users. This perception-based approach aligns with the paradigm of user-centered library design, which has become increasingly important in contemporary library studies (Khoo, Rozaklis, & Hall, 2012). Thus, the study provides empirical evidence that contributes to a more comprehensive understanding of factors affecting user comfort in university libraries.

This article is original in its research focus, integrative approach, and emphasis on user perception as the primary indicator of library physical comfort. Unlike previous research, this study

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combines spatial and ergonomic analysis within a single conceptual framework. This research's scientific contribution is expected to enrich the study of higher education libraries in Indonesia, particularly in the Sumatra region. Thus, this article offers empirical and conceptual novelty in the study of library spatial and ergonomics.

2. RESEARCH METHOD

This study used a quantitative approach with a descriptive explanatory type. The quantitative approach was chosen because this study aims to objectively measure user perceptions and examine the relationships and influences between variables using numerical data and inferential statistical analysis (Creswell, 2014). Descriptive characteristics are used to describe the conditions of spatial layout, ergonomics, and user comfort levels, while explanatory characteristics aim to explain the influence of spatial layout and ergonomics on user comfort. Thus, this approach allows researchers to obtain an empirical picture while testing research hypotheses in a measurable manner. The method used was a survey, which is considered appropriate for collecting data on perceptions, attitudes, and assessments of a large number of respondents in a relatively short time (Groves et al., 2009). The survey was conducted using a structured questionnaire compiled based on research variable indicators and theories related to library spatial layout and ergonomics. The research instrument used a five-level Likert scale (1–5), ranging from strongly disagree to strongly agree, because this scale is effective in measuring respondents' attitudes and perceptions quantitatively (Likert, 1932).

The research locations included three university libraries in Pekanbaru City: the Library Units of Universitas Riau, Universitas Islam Negeri Sultan Syarif Kasim Riau, and Universitas Lancang Kuning. These locations were selected based on the consideration that these three institutions represent the main characteristics of state and private universities in Pekanbaru and have a relatively high level of user visits. Therefore, the research results are expected to provide a representative picture of user perceptions in the local university library environment. The population in this study was all active users who used library services at the three universities during the research period. Given that the population size is not known with certainty and tends to fluctuate, the sample size was determined using the Lemeshow formula, which is commonly used for infinite populations (Lemeshow et al., 1990). Based on this calculation, the sample size was set at 100 respondents. This number is considered to meet the minimum requirements for multiple linear regression analysis (Hair et al., 2019).

The respondent selection technique used quota sampling, a non-probability sampling technique by determining a certain number of respondents at each research location. This technique was chosen to ensure the representation of respondents from each library so that the sample distribution is more proportional (Etikan, Musa, & Alkassim, 2016). The selected respondents were library users who were currently or had used the reading room, study area, and computer station facilities in the library. The research variables consisted of two independent variables and one dependent variable. Spatial Layout (X1) was measured through indicators of room zoning, lighting, acoustics, and circulation, which refers to the concept of modern library space design (Beard & Dale, 2010). Ergonomics (X2) was measured through indicators of chair, table, and computer station comfort, in accordance with the principles of ergonomics of work and learning environments (Robertson et al., 2013). Meanwhile, Library User Comfort (Y) was measured based on respondents' perceptions of comfort, feeling at home, and ease of activity in the library space.

Data collection was conducted by distributing questionnaires directly to respondents at the research locations. Before being widely distributed, the research instruments were tested for validity and reliability to ensure that the questions were able to measure the intended constructs consistently and accurately (Sekaran & Bougie, 2016). Validity testing was conducted using the Pearson Product Moment correlation, while reliability testing used the coefficient of correlation.Cronbach'sAlpha. The collected data were analyzed using multiple linear regression analysis with the help of SPSS software. This analysis was used to determine the influence of spatial layout and ergonomics on user comfort, both partially and simultaneously. The t-test was used to test the partial influence of each independent variable on the dependent variable, while the F-test was used to test the influence of both independent variables

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together (Ghozali, 2018). All statistical tests were conducted at a significance level of 0.05.

3. RESULTS AND DISCUSSION

Analysis of User Perceptions and Factors Affecting Library Comfort

This section presents the results of the analysis of research data regarding user perceptions of the layout and ergonomics of university libraries in Pekanbaru and its discussion. The analysis was conducted to answer the research questions and test the hypothesis formulated in the introduction, namely whether layout and ergonomics affect user comfort. Data were obtained from 100 active user respondents at three university libraries and analyzed using descriptive and inferential statistical approaches.

Table 1. Library User Perceptions of Library Layout

No	Aspects/Indicators	Average Score	Assessment Categories
1	General layout of the library	3,85	Good
2	Arrangement furniture	3,9	Good
3	Space circulation	3,78	Good
4	Acoustics (noise control)	3,2	Enough
5	Clarity of spatial zoning	3,15	Enough
6	Suitability of space to the learning needs of library users	3,6	Good
Rate-rate		**3,58**	**Good**

Source: Data processing (2025)

The descriptive analysis results indicate that library users generally have a positive perception of the library's layout. The majority of respondents assessed the furniture arrangement and circulation as adequate to support learning and information-seeking activities. However, several aspects received relatively lower ratings, particularly in acoustics and clarity of zoning. This finding indicates that although the design of the space is generally well-received, there is still a need for users to control noise and separate areas based on activity function. This finding aligns with research by Beard and Dale (2010), which emphasized the importance of clear zoning in modern libraries, particularly the separation between quiet study areas and discussion spaces (Beard & Dale, 2010). Indefinite zoning can trigger concentration disruptions due to cross-activity noise. Furthermore, Applegate (2009) stated that positive perceptions of the layout are strongly influenced by users' ability to find a space that suits their learning needs (Applegate, 2009). Therefore, spatial layout aspects need to be designed flexibly yet structured.

Table 2. Library User Perceptions of Library Ergonomics

No	Ergonomic Indicators	Average Score	Assessment Categories
1	Functionality of chairs and tables	3,65	Good
2	Chair comfort for long study durations	3,1	Enough
3	Comfortable sitting position	3,05	Enough
4	Ergonomics of computer stations	2,95	Enough

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5	The impact of ergonomics on physical fatigue	3	Enough
6	Facility support for long-term learning activities	3,05	Enough
Rate-rate		**3,13**	**Enough**

Source: Data processing (2025)

Regarding the ergonomics variable, the analysis results showed that respondents considered the available chairs and tables to be functional enough to support short-term learning activities. However, perceived comfort decreased when activities were carried out for longer durations, particularly when using computer stations. This was evident from respondents' complaints regarding fatigue and uncomfortable sitting positions. These findings indicate that ergonomic aspects are not yet fully optimal in supporting intensive learning needs. These results are consistent with the findings of Robertson, Ciriello, and Garabet (2013), who stated that non-ergonomic furniture design can trigger physical discomfort and reduce user productivity (Robertson, Ciriello, & Garabet, 2013). In the library context, facilities that are only oriented towards basic functions are not sufficient to support long-term learning activities. Therefore, the application of ergonomic principles is important to improve the quality of the user experience. Ergonomics is not only related to comfort, but also to the long-term health of users.

To test the influence of spatial layout and ergonomics on user comfort, a multiple linear regression analysis was conducted. This regression model was used to determine the contribution of each independent variable, either partially or simultaneously, to the dependent variable. The results of the regression analysis are presented in Table 1, which contains the beta coefficient values and significance of each variable. This analysis serves as the basis for testing the research hypothesis. Based on the results of the F test, a significance value below 0.05 was obtained, indicating that spatial layout and ergonomics simultaneously have a significant effect on user comfort. This finding confirms that comfort in the library is not determined by a single factor, but rather is the result of the interaction of various aspects of the physical environment. Thus, the hypothesis stating that there is a joint influence between spatial layout and ergonomics on user comfort can be accepted. This result is in line with the approach*user-centered design*in library management (Khoo, Rozaklis, & Hall, 2012).

Table 3. Multiple Linear Regression Test Results

Variables	Beta Coefficient	Sig.	Information
Spatial Planning (X1)	0.452	0.000	Significant
Ergonomics (X2)	0.318	0.004	Significant

Source: Data processing (2025)

Partially, the t-test results show that spatial layout (X1) and ergonomics (X2) each have a positive and significant effect on user comfort, with a significance value <0.05. This indicates that improving the quality of spatial layout and ergonomics will be followed by an increase in the level of user comfort. This finding answers the research hypothesis which states that both independent variables have a significant influence on the dependent variable. Thus, each variable has a strategic role in creating a comfortable library environment. The beta coefficient value shows that spatial layout (β = 0.452) has

a more dominant influence than ergonomics (β = 0.318). This finding indicates that users in Pekanbaru are more sensitive to the overall arrangement of the space than the specific quality of individual furniture. Clear zoning, smooth circulation, and a conducive room atmosphere are the main factors in shaping the perception of comfort. This indicates that the macro design of the library space has a greater impact on the user experience.

The dominance of this spatial layout is in line with the concept*Learning Commons* which emphasizes the flexibility and diversity of spatial functions in academic libraries (Bennett, 2009). Users tend to feel more comfortable when they have a choice of spaces that suit their activities. The library's ability to provide individual, collaborative, and recreational study areas is key to increasing user comfort and engagement. Therefore, the results of this study strengthen the relevance of this theory in the context of university libraries in Indonesia. Although ergonomics has a smaller influence than spatial layout, the results show that this aspect remains significant and cannot be ignored. Suboptimal ergonomics still contribute to physical discomfort, especially during learning activities that require high concentration for long periods. This supports the findings of Helander (2006) who emphasized that ergonomic discomfort can affect users' cognitive performance (Helander, 2006). Therefore, improvements in spatial layout need to be accompanied by improvements in the quality of ergonomic furniture.

As a conceptual illustration, the relationship between spatial layout, ergonomics, and user comfort can be depicted in a model that shows the direct influence of both independent variables on comfort. This model emphasizes that spatial layout plays a dominant role, while ergonomics serves as a supporting factor that enhances user physical comfort. Overall, the results of this study not only answer the research questions but also enrich empirical studies on the physical environmental design of higher education libraries. These findings are expected to form the basis for policy-making in developing libraries that are oriented towards user needs.

Implications of Spatial Layout and Ergonomics for User Comfort

The findings of this study indicate that both spatial layout and ergonomics contribute significantly to user comfort in university libraries. However, the stronger influence of spatial layout suggests that users are more sensitive to the overall organization of library spaces than to the quality of individual furniture elements. This finding reflects the evolving role of academic libraries as learning environments that must accommodate diverse user activities, including individual study, collaborative learning, information seeking, and social interaction. In this context, factors such as clear zoning, effective circulation, noise control, and the availability of activity-specific spaces become critical determinants of user comfort and satisfaction.

At the same time, the results reveal several areas that require improvement. Although respondents generally perceived library furniture as functional, lower ratings on seating comfort, workstation ergonomics, and support for prolonged learning activities indicate that existing facilities may not fully meet the demands of intensive academic use. These findings suggest that functional adequacy alone is insufficient; libraries must also consider the physical well-being and long-term comfort of users when designing and selecting facilities.

More broadly, the study highlights a shift in user expectations regarding the role of university libraries. Libraries are no longer perceived merely as repositories of information but as integrated learning environments that support academic productivity, physical comfort, and positive user experiences. Therefore, efforts to improve library quality should adopt a holistic approach that combines effective spatial planning with ergonomic considerations. By addressing both aspects simultaneously,

university libraries can create more inclusive, adaptable, and user-centered environments that better support contemporary learning needs.

4. CONCLUSION

Based on the analysis and discussion, it can be concluded that spatial layout and ergonomics play a significant role in shaping user comfort in university libraries in Pekanbaru. User perceptions indicate that the quality of the library's physical environment is generally considered quite good, although there are still several aspects that need improvement. This finding confirms that user comfort is not only determined by the availability of collections, but also by how the library space and facilities are designed and managed. The results of multiple linear regression analysis indicate that spatial layout and ergonomics simultaneously have a significant effect on user comfort. Partially, both variables also have a significant positive effect, with spatial layout being the most dominant factor. This indicates that zoning, circulation, lighting, and room atmosphere have a greater contribution than the ergonomic aspects of furniture in shaping user comfort perceptions.

The dominant influence of spatial layout indicates that library users respond more to the macro quality of spatial design than to the details of individual facilities. This finding reinforces the concept*Learning Commons* And *user-centered library design*which places flexibility and diversity of spatial functions at the heart of academic library development. Thus, this study provides an empirical contribution to enriching the study of library spatial planning and ergonomics, particularly in the context of university libraries in Indonesia. Based on the research results, it is recommended that university library managers in Pekanbaru prioritize spatial reorganization, particularly in clarifying the zoning of quiet and discussion areas and improving noise control. Furthermore, improvements in ergonomic aspects, such as providing chairs and tables that support body posture and comfortable computer stations for long-term use, need to be implemented gradually. These efforts are expected to increase comfort, visit duration, and user satisfaction. Further research is recommended to develop this approach.*mixed-method*by adding interviews or observations to gain a deeper understanding of user experiences. Furthermore, the research could be expanded by adding other variables such as service quality, information technology, or the psychological atmosphere of the space. With a broader sample size and variables, it is hoped that future research can provide more comprehensive recommendations for the development of user-centered higher education libraries.

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