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RESEARCH ARTICLE **OPEN ACCESS**

Interest-related Psychological Factors Influencing Preservice Teachers' Attention to Health and Medical Care Reading

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Abstract:

Introduction: This study aimed to analyze medical book borrowing patterns at Nanjing Normal University from 2014 to 2023, with the goal of understanding borrowing behaviors and the discriminative power of psychological factors for better medical resource utilization and library collection development.

Materials and Methods: Data from 3,934 readers and 3,746 borrowed books were analyzed using thematic word frequency, ROC curves, factor analysis, and discriminant analysis. These methods were used to identify themes, assess model performance, extract key behavioral factors, and differentiate borrowing patterns among schools.

Results: ROC analysis revealed that test variable, *i.e.*, "active year", has low discriminative ability in predicting outcomes among male readers, while the model based on the psychology school data demonstrated moderate classification performance. Factor analysis identified four thematic areas with significant correlations. Discriminant analysis revealed significant differences among departments, with varying contributions from the identified factors. Notably, Factor 4 (F4) consistently exhibited a negative influence across all departments.

Discussion: The findings presented in this study will enhance our understanding of medical resources, explore factor relationships, and inform library collection development.

Conclusion: This study enhances our understanding of borrowing patterns, offering practical implications for libraries to better meet user needs.

Keywords: Discriminant, Health, Medical care, Preservice teachers, Psychological factors, Reading.

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1. INTRODUCTION

Health and medical care are indispensable for a high-quality life, underpinning the well-being of individuals and communities. Access to healthcare is a key indicator of human quality. Heightened public concern about health has spurred initiatives, like Medicare and Medicaid, and increased demand for healthcare-related information in libraries, covering areas, such as legislation, resources, costs, and insurance [1]. Globally, non-communicable diseases like obesity, diabetes, and asthma remain major public health burdens, associated with premature mortality and reduced quality of life. Primary healthcare is vital for preventing, detecting, and managing these diseases in children. Health promotion from early childhood, aimed at preventing risk factors, such as obesity and tobacco exposure, is crucial. Effective care coordination by primary healthcare providers is essential for children's physical, emotional, and social development [2]. Moreover, frequent public health emergencies pose a significant challenge to global health security. Recent research has identified various pressures, including interpersonal stress, financial burdens, and post-graduation anxiety, which underscore the need for comprehensive healthcare systems that address both physical and mental health [3]. For family members caring for loved ones, especially the elderly or post-surgical patients, understanding health and medical care is essential. Family involvement in home-based medical care has gained recognition [4]. Since many family caregivers lack professional medical training, educational interventions can improve patient compliance and recovery [5]. Family support also significantly impacts patients' emotional well-being, as the pandemic's restrictive visitation policies demonstrated, leading to increased loneliness and distress among patients [6]. Knowledgeable family members can create a conducive recovery environment, enhance emotional stability, and improve communication with healthcare providers [7].

Preservice teachers' engagement with health and medical care topics can boost their teaching effectiveness and support student well-being. Recent research underscores the concerningly low health literacy among preservice teachers. A study on 482 Turkish preservice teachers revealed that 68% had inadequate or limited health literacy [8]. Low health literacy has tangible negative impacts. It is linked to reduced quality of life and increased social inequalities. By enhancing their health literacy, preservice teachers can integrate health information into teaching, empowering students to make informed health decisions [9]. Social media data reveals that young people frequently discuss topics like sexually transmitted infections, anxiety, and pregnancy. Pre-service teachers' knowledge of these areas can create a supportive classroom environment. Educators well-versed in healthcare can also involve students in community health initiatives, promoting social responsibility [10]. Understanding mental health enables preservice teachers to identify student needs and collaborate with health professionals for holistic student support. Reading health and medical care books enriches knowledge of diseases, treatments, and healthcare practices. It provides insights into medical research, which aims to enhance the understanding of diseases, treatments, and prevention methods. For healthcare professionals (HCPs), reading medical literature bridges knowledge gaps, influenced by factors, such as nationality, qualifications, and training [11]. For both HCPs and patients, it facilitates informed decision-making about treatment and health management [12]. Reading demystifies medical jargon, helps understand the evolving doctor-patient relationship, and emphasizes the importance of patient narratives in healthcare decision-making [13]. Familiarity with medical terminology, which encompasses approximately 20,000 specialized terms, is essential for effective communication in healthcare.

At Nanjing Normal University, despite the absence of a medical school or medical majors, the borrowing of medical books by teachers and students reflects disciplinary interpenetration and interdisciplinary reading interests. The absence of a medical faculty in the university under study inherently shifts the research paradigm from traditional biomedical frameworks to a multidisciplinary integration of non-medical disciplines. By leveraging fields, such as education, psychology, sociology, and behavioral science, the research challenges the assumption that health literacy must be rooted in clinical or medical training. The study may pioneer frameworks where health literacy is integrated into general teacher education programs, challenging the norm where health education is often delegated to medical professionals or specialized training. The research’s novelty in a non-medical university lies in its ability to reimagine health literacy as a pedagogical and social construct rather than a medical one.

This study draws on several established psychological and behavioral theories to explore what drives preservice teachers’ interest in reading about health and medical care. The Health Belief Model focuses on how preservice teachers’ perceptions of health risks, such as stress related to teacher training, and their beliefs about the effectiveness of reading in mitigating these risks influence their reading choices. If they feel vulnerable to health issues and believe reading can help, they are more likely to engage with related materials. The Protection Motivation Theory helps analyze how messages about health threats (such as COVID-19 risks in teaching) and suggested coping strategies (through reading) influence their decision to engage with the material. If they find the strategies feasible and believe that reading can protect them, they will pay more attention to health-related reading. The Theory of Planned Behavior explains that their intention to read depends on personal attitudes (formed by values and past health experiences), social pressures from peers or mentors, and how easy they think it is to read, given their schedules and resources. Social Cognitive Theory suggests that when preservice teachers observe role models, such as experienced teachers who regularly read health-related content and benefit from it, they are more likely to adopt similar reading behaviors. Their confidence in understanding and applying reading knowledge (self-efficacy) also matters.

Studying the psychological factors influencing preservice teachers' attention to health and medical care reading is significant. It can improve health education curricula by addressing emotional and cognitive barriers. Drawing on Traditional Chinese Medicine Psychology, which empha-

sizes the mind-body connection, understanding psychological factors like stress and anxiety can lead to more targeted educational interventions [14]. Recognizing gender differences in psychological experiences, particularly among women in teacher preparation programs, can create a more inclusive learning environment. Overall, this research can enhance health literacy educational strategies, equipping future teachers to communicate health information effectively and contribute to the well-being of students and communities. This study innovatively integrates multi-method analytics (ROC curves, factor analysis, discriminant analysis, and thematic word frequency) to explore reading interest factors. It uniquely links bibliographic themes with behavioral patterns, using factor analysis to extract latent interest dimensions and discriminant models to differentiate inter-school reading preferences. The interdisciplinary approach bridges library science and psychology, providing novel metrics for analyzing readers' behavior.

1.1. Previous Research

In recent years, the mental health of individuals, especially preservice teachers, has become a focal point due to its far-reaching impact on educational outcomes. Existing research has identified several psychological factors that influence preservice teachers' engagement with reading about health and medical care. However, multiple limitations in these studies call for further investigation. Firstly, most research works offer only a broad overview of general mental health issues like anxiety and depression [15, 16], neglecting to explore how these factors specifically affect preservice teachers' interaction with health-related materials. For example, while stressors during educational transitions are recognized [17], the unique pressures preservice teachers face when shifting from practical experiences to theoretical health learning remain unexplored. Secondly, there is a lack of comprehensive interventions designed to improve health literacy among preservice teachers. Although Yüksek and Ayaz-Alkaya (2024) emphasized the importance of health education for adolescents, research on preservice teacher curricula is insufficient [18]. Current interventions fail to bridge the gap between mental health awareness and the ability to engage with health literature, overlooking a crucial aspect of preparing future educators. Thirdly, existing studies often generalize findings across different student populations, ignoring the distinct context of preservice teachers. Mental health challenges in this group can vary significantly from those in other fields [19, 20], and the influence of factors, such as teacher training demands and institutional mental health environments, on their health reading habits remains unclear. Finally, family dynamics in shaping preservice teachers' psychological factors have been understudied. While previous research has linked family adaptability and cohesion to mental health [16], the impact of these factors on the health literature is unknown. These limitations highlight the urgent need for more targeted research on preservice teachers. By addressing the specific ways mental health factors influence their health reading, developing tailored interventions, and considering their unique context, we can enhance their health literacy and better prepare them for their future roles as educators.

In the realm of biology, health, and medical technology, interdisciplinary collaboration is driving new understandings of complex diseases and innovative treatments. Hanna *et al*. (2024) noted that partnerships between engineers and physicians are advancing the design of functional biomaterials [21]. Modern medicine acknowledges that diseases result from a complex interplay of genetic, lifestyle, and environmental factors. Integrative computational biology and AI help researchers identify biomarkers and develop personalized models [22]. The interconnectedness of human and environmental health [23] underscores the need for cross-disciplinary research. However, research on the psychological factors that affect preservice teachers' attention to health and medical care remains limited. It often fails to consider psychological barriers to learning and the impact of emotional and societal factors on preservice teachers' perceptions of health education, potentially limiting their effectiveness in future classrooms. Despite significant progress in interdisciplinary research in medical fields, the specific psychological factors affecting preservice teachers' attention to health and medical care reading remain understudied. Bridging this gap is crucial for improving the effectiveness of health education delivered by future teachers.

For young athletes, sports participation offers numerous health benefits, including physical fitness, improved self-esteem, and enhanced mental well-being [24, 25]. Yet, early specialization and intense training increase the risk of injury, especially for highly specialized athletes. Young athletes with conditions like orthopedic disabilities, cerebral palsy, or sensory impairments require tailored physical education approaches [26]. However, existing studies on this topic rarely address the psychological factors influencing preservice teachers' views on athlete health and medical care. The lack of focus on athletes' mental health and emotional well-being limits the effectiveness of health education programs, highlighting the need for a more holistic approach to athlete well-being. Current research on the health of young athletes often overlooks the psychological factors that shape preservice teachers' views on athlete well-being. A more holistic approach, including an understanding of these psychological aspects, is essential for developing effective health education programs for future teachers.

In school health education, preservice teachers face challenges in effectively delivering health-related content. Insufficient time dedicated to learning health education teaching methods creates a disconnect between theory and practice [27]. Integrating health with physical education exacerbates issues of complexity, enactment, and adaptation in teacher education [28]. Health education often lacks practical, functional knowledge, leaving students ill-equipped to assess health risks and develop self-efficacy [29]. Specialization in professional education may also neglect the psychosocial aspects of health. Although interdisciplinary approaches, such as combining mental health and literature, are beneficial [30], they are not widely implemented. While peer support systems exist, the lack of formal training undermines their effectiveness [31]. Educated teachers are better at handling students' mental health issues [32], but there is still a pressing need to

enhance training on the psychological factors influencing preservice teachers' engagement with health and medical care reading. The challenges in school health education for preservice teachers, such as insufficient training time and lack of focus on psychosocial aspects, underscore the need for enhanced training. This training should prioritize understanding the psychological factors influencing their engagement with health and medical care reading.

There is a consistent need to address existing gaps by focusing on specific psychological factors, developing targeted interventions, considering unique contextual elements, and integrating psychological and socio-ecological components to improve health education and awareness. The study is unique in its focus on Nanjing Normal University, which does not have a medical school or medical majors. The analysis of the borrowing of medical books by its teachers and students reflects the interdisciplinary nature of reading interests and the mutual penetration of disciplines. This provides a distinct perspective compared to studies conducted in institutions with a strong medical focus. The use of a multi-methodological strategy allows for a more comprehensive exploration of the psychological factors influencing preservice teachers' attention to health and medical care reading. Each method provides complementary information, enabling a more detailed and accurate understanding of the complex relationships between variables. The large sample size of 3,934 readers, combined with the extensive data coverage from 2014 to 2023, including a substantial number of book borrowings and loan records, makes this study unique. Such a comprehensive dataset provides a solid foundation for statistical analysis and increases the reliability and generalizability of the findings, which are often lacking in studies on similar topics. While research exists on the mental health and reading behaviors of students in general, this study specifically targets preservice teachers. Given their future role in education and the potential impact they can have on students' health literacy, understanding their psychological factors related to health and medical care reading is of particular importance and fills a gap in the existing literature.

2. MATERIALS AND METHODS

The study sample comprises data from 3,934 readers and 3,746 borrowed medical books, totaling 25,564 book borrowings from the Nanjing Normal University library between 2014 and 2023. Records with missing borrower information (*e.g.*, department, borrowing date), duplicate entries, or invalid book codes were excluded. The dataset only included records of readers who were active in the library book management system. As it focuses solely on physical book borrowings, it provides an incomplete capture of digital resource usage.

2.1. Subject Word Frequency

To analyze bibliographic themes comprehensively, data from 3,746 loaned medical books were examined. The CNMARC and UNIMARC 6XX fields were utilized to extract relevant information. Subsequently, Excel pivot tables were employed to calculate the frequencies of topic-related terms. Finally, the generated word frequency table was used to create a thematic word cloud for visual representation.

2.2. ROC Curve

Receiver Operating Characteristic (ROC) analysis was conducted on 1,606 readers to evaluate the performance of a binary classification model. This method assesses the trade-offs between true and false positive rates across different threshold values, with the Area Under the Curve (AUC) serving as a key indicator of the model's overall efficacy. The study recorded the total number of years readers borrowed medical books from 2014 to 2023. Male readers were coded as 1, and female readers as 2; the School of Psychology was coded as 1, while other schools were coded as 2. In SPSS, the analysis was executed by selecting “Analyze” and then “ROC Curve”. “Active Years” was set as the test variable, and gender/school background as the state variable, which was initialized to 1 prior to performing the analysis.

2.3. Factor Analysis

Data from 3,934 readers with medical book loan records were collected, along with a total of 325,833 loan records spanning book categories from A to Z between 2014 and 2023. Leveraging the Chinese library classification system, common factors across various book types were identified. In SPSS, factor analysis was performed by navigating to “Analyze”, then “Dimension Reduction”, and selecting “Factor”. Book categories A to Z were designated as variables, with each category's value corresponding to the number of borrowings. Under the “Description” options, the initial solution, coefficient, Kaiser-Meyer-Olkin (KMO) measure, and Bartlett's test of sphericity were selected. For extraction, the unrotated factor solution with eigenvalues greater than one was chosen, and the Varimax rotation method was applied. Factor scores were saved for subsequent linear regression analyses.

2.4. Discriminant Analysis

Discriminant analysis, a statistical technique used to identify variables that distinguish between two or more groups, was carried out. In SPSS, the analysis was initiated by clicking “Analyze” on the top menu, selecting “Classify”, and then choosing “Discriminant”. Readers from the School of Psychology, Biology, Education Science, and Teacher Education were assigned values 1, 2, 3, and 4, respectively. The grouping variables were selected in the “Grouping Variable” box, and the range of groups was defined by setting the lowest (1) and highest (4) values. The standardized factor scores of F1, F2, F3, and F4 were entered into the “Independent Variables” box. Additional statistics, such as means, group statistics, or pooled within-groups covariance matrices, were selected under the “Statistics” option before performing the analysis.

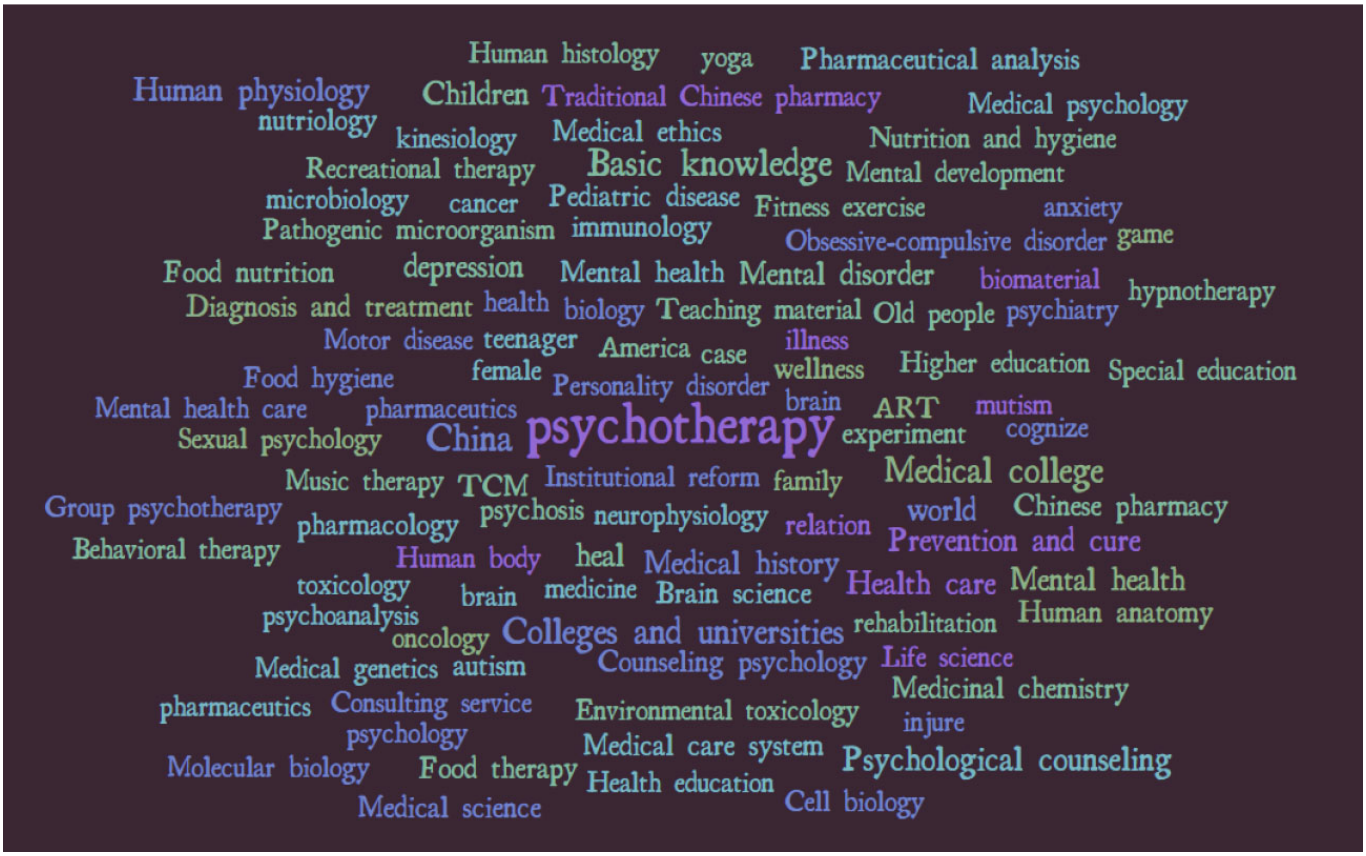

Fig. (1). The top 100 subject words.

3. RESULTS

3.1. Subject of Books

Fig. (**1**) presents the top 100 most popular subject words. The classification of borrowed medical and health books covers a wide range of subjects within the medical and health field, reflecting the complexities and various areas of study, which are as follows:

3.3.1. General Medical Knowledge

It includes basic medicine, medical history, medical ethics, medical sociology, philosophy of medicine, *etc*.

3.3.2. Psychology and Mental Health

It encompasses psychotherapy, counseling psychology, behavioral therapy, family therapy, social psychology, child psychology, psychological tests and assessments, mental disorders (*e.g*., depression, anxiety, schizophrenia), *etc*.

3.3.3. Public Health and Epidemiology

It includes public health, epidemiology, infectious diseases, chronic diseases, health education, *etc*.

3.3.4. Nutrition and Dietetics

This field encompasses topics, such as food nutrition, dietary hygiene, nutritional therapy, food safety and toxicology, and nutrient composition.

3.3.5. Traditional Medicine

It involves Traditional Chinese Medicine (TCM), Chinese Herbal Medicine, Materia Medica, and TCM Therapeutics, among other related fields.

3.3.6. Medical Science and Research

This includes biomedical engineering, molecular biology, pharmacology, immunology, toxicology, clinical applications, and research methods, *etc*.

3.3.7. Therapeutics and Treatment

It includes physical therapy, occupational therapy, rehabilitation medicine, medical care system, cancer treatment (*e.g*., oncology, tumor immunotherapy), *etc*.

3.3.8. Human Anatomy and Physiology

It encompasses human physiology, human anatomy, neurophysiology, human cytology, developmental biology, *etc*.

3.3.9. Special Populations and Conditions

This field includes pediatric diseases, geriatric health, maternal and child health care, special education needs, mental health in children and adolescents, *etc*.

3.1.10. Health Management and Policy

This involves the healthcare system, medical education, health management and administration, as well as guidelines and policies.

3.1.11. Research and Experimental Methods

This field includes clinical trials and studies, experimental psychology, data analysis, and statistical methods, *etc*.

3.1.12. Lifestyle and Wellness

It involves topics, such as fitness and exercise, yoga and mindfulness, sleep and relaxation techniques, smoking cessation and substance use, *etc*.

3.2. The Distribution of the Number of Medical Books Borrowed

Table **1** and Fig. (**2**) present the number of borrowers and medical books borrowed by the department. The School of Psychology offers assistance in borrowing medical and health books, given their direct relevance to the field of study. A strong interest in literature includes therapeutic techniques, psychological assessments, and case studies relevant to health. Life Science encompasses many sub-disciplines that may require the use of health-related materials for both academic purposes and research. The department may also engage substantially with medical literature, particularly in the fields of human biology, nutrition, and health sciences. Other schools, such as Education Science and Teacher Education, may borrow resources to incorporate health topics into their curricula and demonstrate an interest in materials that support teaching about health, wellness, and physical education methodologies. The School of Physical Education's engagement with medical and health books likely revolves around exercise science, sports medicine, and wellness literature. There is a probable interest in resources that explore physical health, fitness, and injury prevention. Social Development's focus could include social health issues, community health programs, and the social determinants of health. Their borrowings may indicate the use of resources related to public health policies and interventions, although it may be slightly more niche than the medical fields. While borrowing rates in the School of Literature are relatively low, this school might include health literature in its exploration of societal issues, narratives around health, and historical perspectives on medicine. However, the focus is not primarily medical, and the number of health-related books borrowed may be limited compared to other schools.

Table 1. The number of medical books borrowed by the school.

School	Total Borrowings	Total Borrowers
Psychology	3975	629
Life Science	1309	417
Education Science	1128	379
Teacher Education	875	332
Social Development	828	215
Physical Education	671	203
Literature	563	205

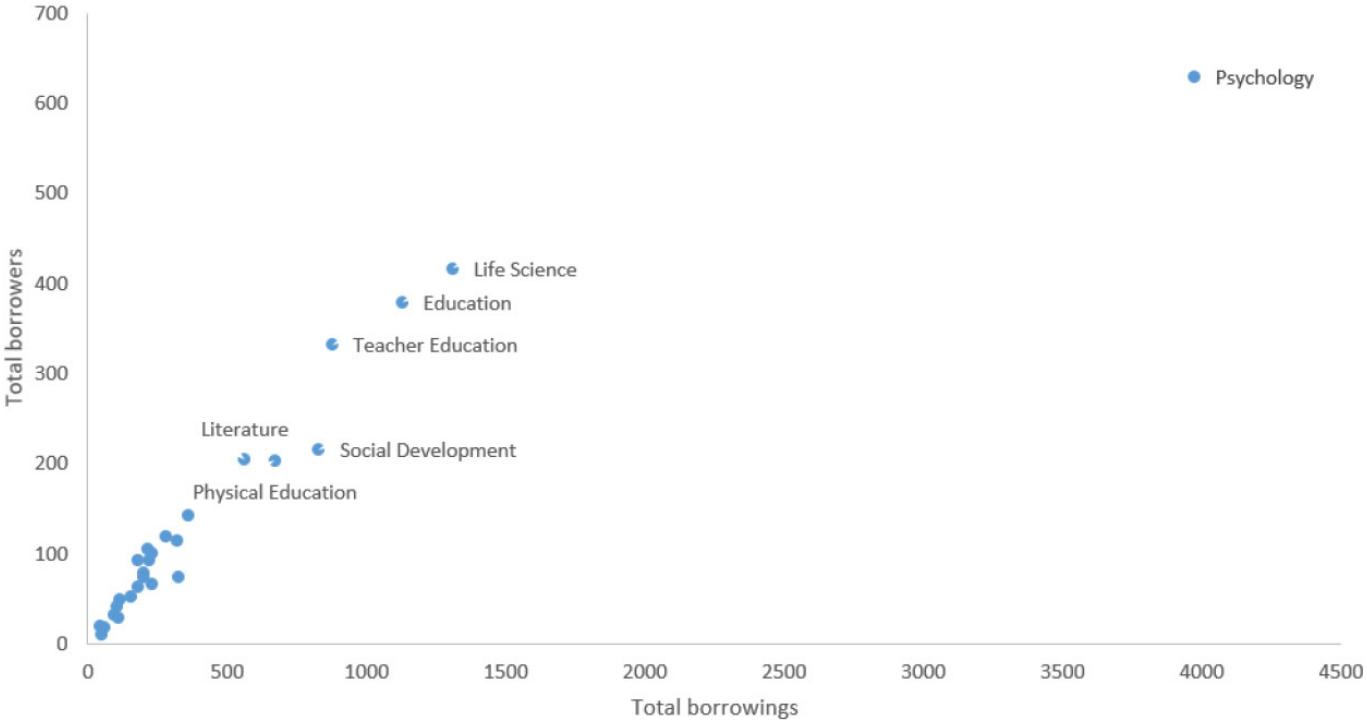

Fig. (2). Distribution of the number of borrowers and volume of books borrowed.

3.3. The School of Psychology and Medical Books

From 2014 to 2023, the volume of medical books (R) borrowed by teachers and students in the School of Psychology accounted for approximately 7%, positioning it in third place. Among the readers who borrow records for medical books, around 4% of their total borrowing involves medical books, which is lower than the percentage for the School of Psychology. Borrowers from the School of Psychology accounted for about 15.9%. This suggests that the demand for medical books among readers in the School of Psychology is greater than that of readers in other universities. Notably, approximately 29% of books were borrowed by the School of Psychology, significantly higher than by other departments, such as the School of Biology (10%) and the School of Education (8%). The borrowing percentages are illustrated in Fig. (**3**).

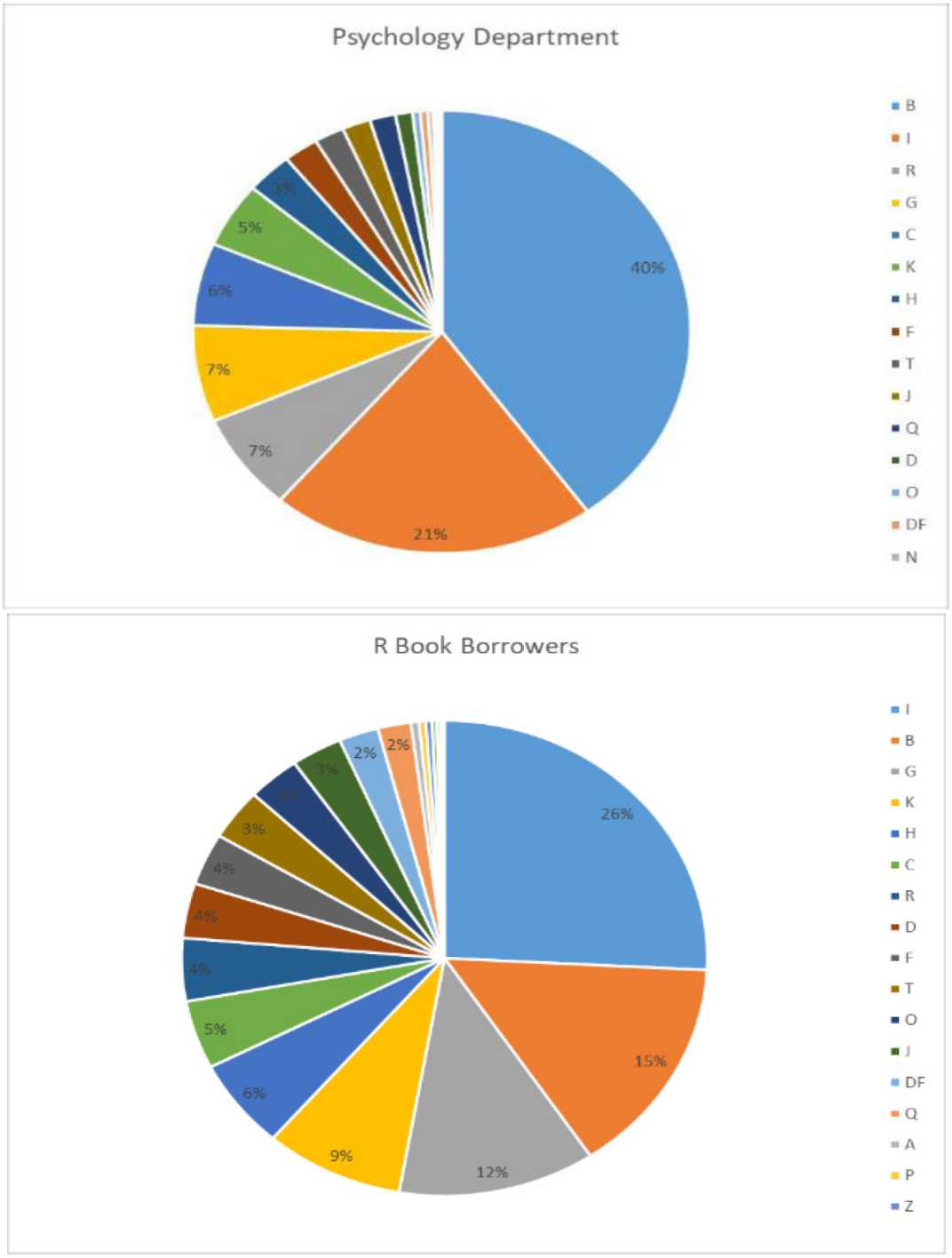

Fig. 3 contd.....

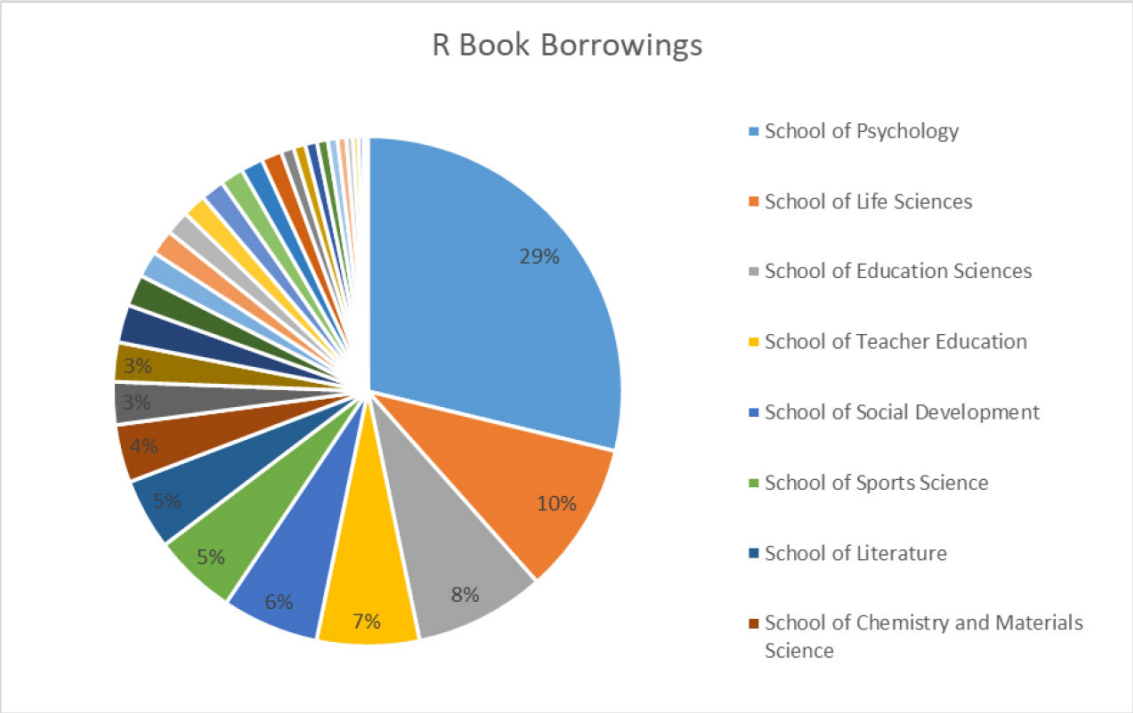

Fig. (3). Percentage distribution of medical book loans.

The data highlights a notable trend in the borrowing habits of the School of Psychology concerning medical books. Psychology students and faculty actively seek medical knowledge, which may be integral to their studies or professional practice, and they have a greater interest in medical literature than their peers in other schools. This could indicate a multidisciplinary approach to learning or a specific curriculum requirement emphasizing medical knowledge in psychology. The statistics reveal that the School of Psychology accounted for roughly 15.9% of total borrowers, which shows that they are one of the more active groups in utilizing library resources. The relatively higher borrowing rates of medical books by psychology students could reflect the interdisciplinary nature of psychology, where knowledge of medical norms, practices, or conditions can enhance understanding in areas, such as clinical psychology, neuropsychology, and health psychology.

3.4. The Performance of Diagnostic Test

3.4.1. Male and Female

The positive cases (male) were 831, and the negative cases (female) were 3103. This indicated a substantial imbalance, where female cases significantly outnumbered male cases. The AUC of 0.495 suggests that the model has a very weak discriminative ability, almost equivalent to random guessing, since the AUC is close to 0.5. The *p*-value of 0.649 indicates that the observed AUC is not statistically significant, reinforcing the conclusion that the model does not differentiate well between the two classes (Fig. **4**).

3.4.2. School of Psychology and Non-psychology Schools

The positive cases (School of Psychology) were 629, and the negative cases (Non-Psychology Schools) were 3305. Similar to the males, there was a notable imbalance, with many more negative than positive cases. The AUC of 0.606 indicates a moderate level of discriminative ability, as it is above 0.5, suggesting that the model performs better than random guessing. The *p*-value of 0.000 signifies that this result is statistically significant, indicating a meaningful separation between the positive and negative classes based on the test variable (Fig. **4**).

The ROC analysis for the male group shows poor model performance (AUC close to 0.5), suggesting that the variable “Active years” lacks discriminative power. In contrast, the School of Psychology's model exhibits moderate performance with an AUC of 0.606, indicating that the variable provides some predictive capability between the two groups.

3.5. The Extraction of Common Factors

The KMO value is reported as 0.703, which suggests a moderate level of sampling adequacy. Bartlett's Test results show an approximate Chi-Square value of 9955.868 with 253 degrees of freedom and a significance level (Sig.) of 0.000. This result is highly significant (p <0.001), indicating that the correlation matrix is not an identity matrix and that there are significant relationships among the analyzed variables. This supports the appropriateness of performing factor analysis, as it suggests that some underlying factors are likely influencing the items in the dataset.

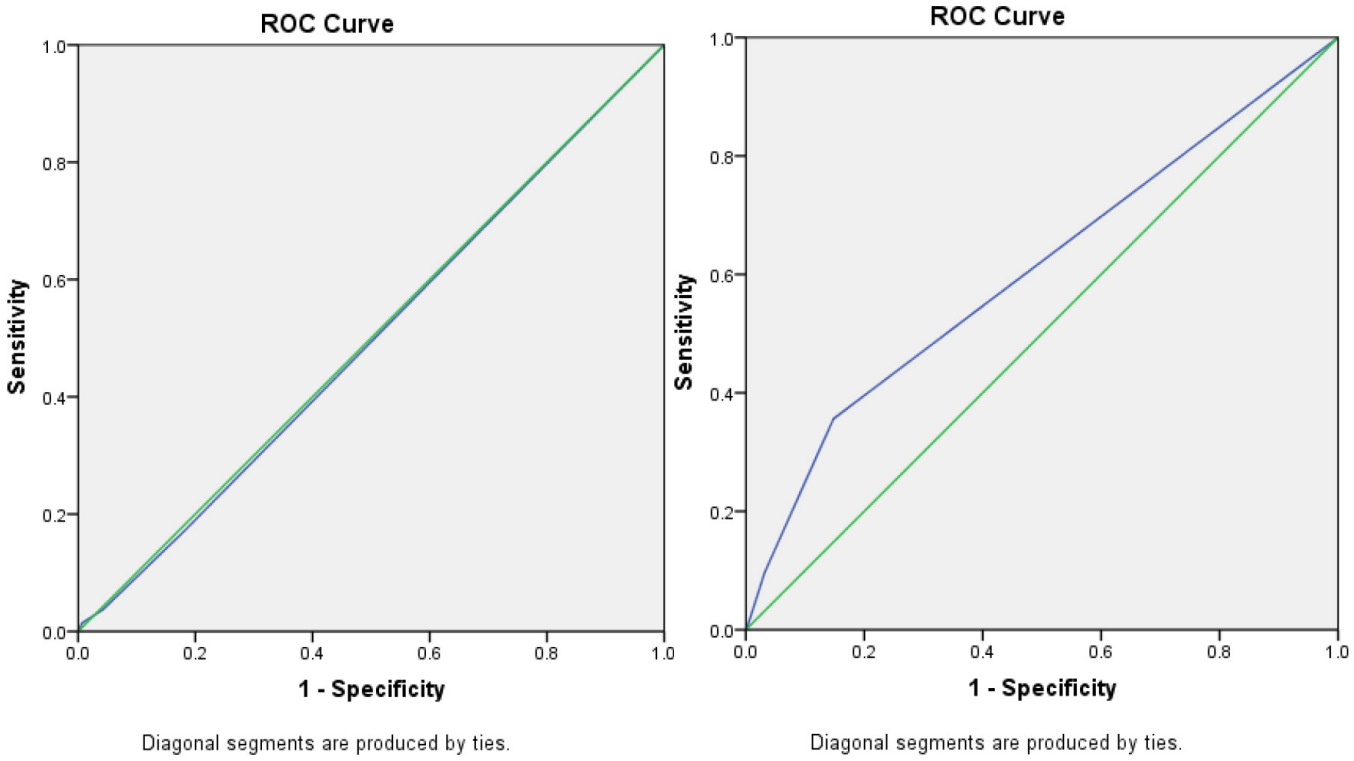

Fig. (4). ROC curve.

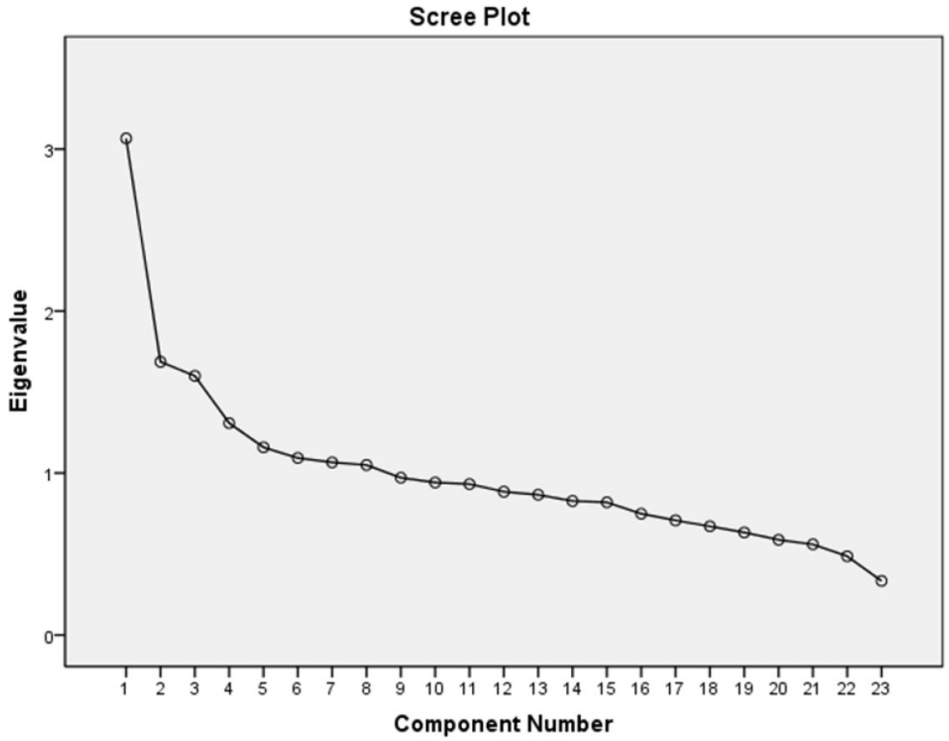

Fig. (5). The scree plot.

Table 2. The factor loadings.

-	Component			
	1	2	3	4
C	**0.85**	0.01	0.03	-0.01
F	**0.73**	-0.07	0.05	0.13
G	**0.57**	0.22	-0.01	-0.04
D	**0.50**	0.19	0.05	-0.04
I	0.04	**0.76**	0.03	-0.03
Z	0.00	**0.61**	-0.04	-0.06
K	0.09	**0.59**	0.01	0.00
J	0.01	**0.50**	0.05	0.16
S	0.10	0.08	**0.65**	0.04
Q	-0.04	0.04	**0.64**	-0.15
X	-0.01	0.01	**0.58**	0.10
U	-0.03	0.01	-0.06	**0.67**
V	0.08	0.02	-0.04	**0.59**
P	-0.06	0.04	0.32	**0.53**

Fig. (5) displays the eigenvalues associated with each factor in descending order. The x-axis represents the factors, while the y-axis shows the eigenvalues. The point where the curve starts to flatten out suggests that additional factors contribute less to the variance explanation in the data.

The factor loadings in Table 2 indicate the strength of association between each component (C, F, G, *etc*.) and the corresponding factors (F1, F2, F3, and F4). C has a very high loading on F1 (0.85), indicating that this factor strongly represents F1. I (0.76) and Z (0.61) have high loadings on F2, suggesting substantial contributions to F2. S (0.65) and Q (0.64) load significantly onto F3, pointing to their importance in this dimension. U has a high loading on F4 (0.67).

Based on the factor loading results, F1 can be labeled as “Social Sciences”; this factor shows high loadings for areas like social science, economy, culture and education, and politics, suggesting it reflects broader social and behavioral themes. F2 can be labeled as “Humanities and Literature”. The high volume of literature, comprehensive books (including compilations, encyclopedias, dictionaries, essays, abstracts, indexes, *etc*.), and history suggests that this factor is centered on human culture, the arts, and the study of texts. F3 can be labeled as “Natural Sciences.” With significant loadings for agriculture, biology, and environment, this factor represents the scientific study of natural phenomena and life sciences. F4 can be labeled as “Applied Sciences and Technology”. The strong emphasis on transportation, aviation, and technology suggests that this factor is closely related to the practical applications of scientific knowledge and engineering.

The regression weights elucidate the strength of the relationship between the indicators and their respective factors. Noteworthy observations include that C has the highest weight (0.877) associated with F1, making it a dominant contributor. I (0.652) and Z (0.484) indicate significant contributions to F2. Weights for T (0.565) and V (0.207) relate to F4, showing moderate influence.

The highest covariance is between F2 and F4 (35.245), suggesting a strong relationship. There are significant covariances among the factors, confirming a complex interrelationship. The relatively high covariances among F1 and F2, as well as F2 and F3, emphasize their interconnected nature. The correlation between F1 and F2 is noteworthy at 0.231, indicating a moderate association. All factor pairs exhibit positive correlations, with the strongest being between F2 and F4 (0.167), which supports the notion of mutual influence among the factors. F2 shows the highest variance estimate (893.174), indicating it accounts for a large amount of variability in the data. F1 also has a significant variance (134.955), while F3 shows comparatively low variability (0.161), suggesting it has less explanatory power than the other factors (Fig. 6).

The factor analysis reveals a strong structure among the components and factors. F1 and F2 emerge as particularly influential, with significant inter-factor relationships suggesting underlying dimensions that underpin the observed variables. The analysis supports the adequacy of the model in capturing the complexities of the dataset while identifying specific indicators that contribute markedly to each factor. This could provide valuable insights for further studies or applied research in the relevant field.

3.6. Discriminant Analysis

The discriminant analysis results provide insights into how different factors contribute to department discrimination. Three functions were identified. Table 3 displays the canonical discriminant function coefficients. The Z-score (F1) has a strong positive coefficient in Function 1 (0.852), indicating that it contributes significantly to distinguishing between the first group and the others. However, it has a negative coefficient in Function 3 (-0.495), indicating that it opposes the classification in the third group. Z-score (F2) shows positive coefficients in both Function 2 (0.323) and Function 3 (0.960), indicating a strong association with the classifications of those groups.

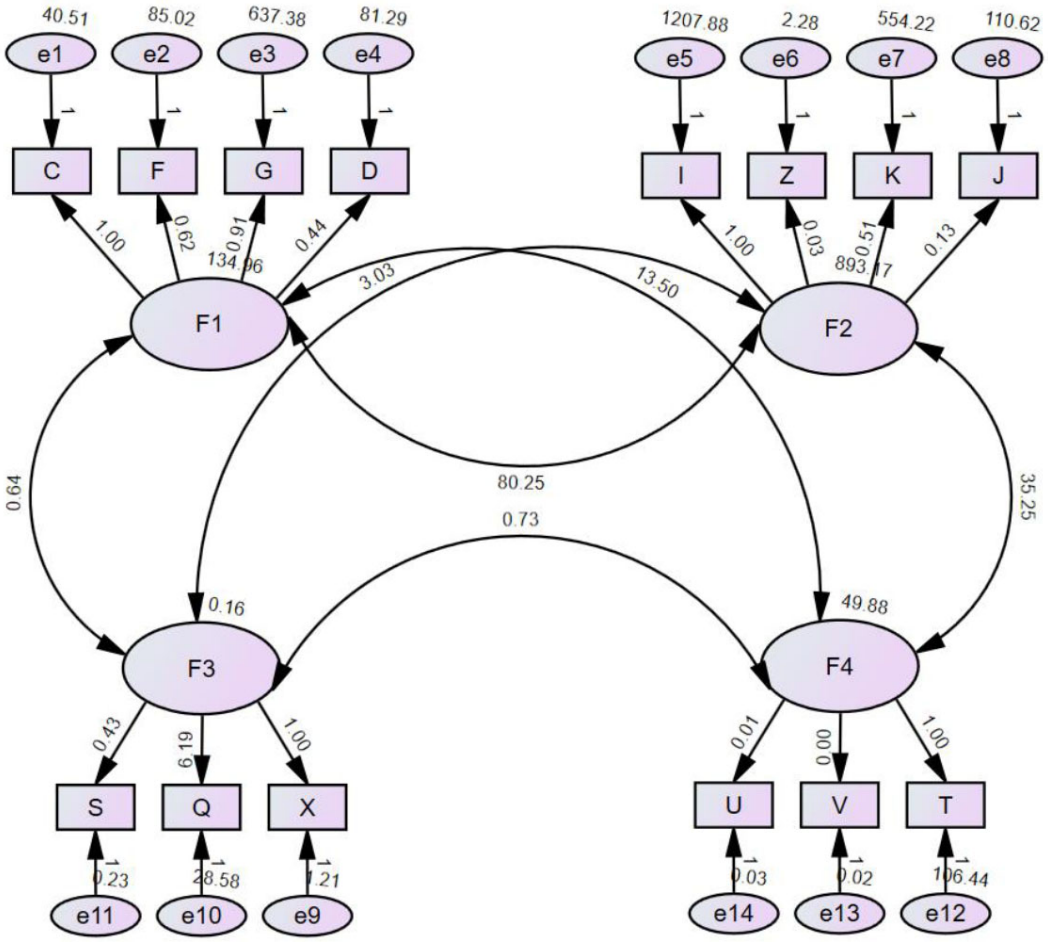

Fig. (6). Structural equation model.

Table 3. Standardized canonical discriminant function coefficients.

-	Function		
	1	2	3
Z-score (F1)	0.852	0.266	-0.495
Z-score (F2)	0.171	0.323	0.960
Z-score (F3)	-0.401	0.720	-0.288
Z-score (F4)	0.137	-0.456	0.063

Z-score (F3) has varying coefficients: it has a negative coefficient in Function 1 (-0.401) but a relatively large positive coefficient in Function 2 (0.720), suggesting it plays an important role in Function 2 but has a negative impact on the classification in Function 1. Z-score (F4) has a relatively small coefficient in Function 1 (0.137) and a negative coefficient in Function 2 (-0.456), indicating that it has a minor or negative influence on the classifications in these functions.

The coefficients in Table **4** indicate the contribution of each factor to classifying observations into specific departments. Z-score (F1) positively influences the Education Science department (0.962), suggesting that higher scores on this factor are associated with observations belonging to this department. It has negative coefficients for the Psychology (-0.159), Biology (-0.465), and Teacher Education (-0.235) departments, indicating that higher scores on this factor may reduce the likelihood of being classified into these departments. The Z-score (F2) has a negative influence on the Psychology (-0.150) and Biology (-0.218) departments but a positive contribution to the Teacher Education department (0.442). Z-score (F3) shows a significant positive influence for the Biology department (0.531) and a slight positive contribution for the Teacher Education department (0.059), while having negative coefficients for the Psychology (-0.263) and Education Science (-0.196) departments. The Z-score (F4) has a positive influence on the Psychology department (0.168) but a negative influence on the Biology (-0.222) and Teacher Education (-0.074) departments. The constant terms (-1.461 for Psychology, -1.665 for Biology, -1.803 for Education Science, and -1.486 for Teacher Education) adjust the overall classification functions for each department.

Different factors play varying roles in differentiating between groups and departments. Understanding these

coefficients helps identify key predictors of classification and guides the interpretation of underlying relationships within the dataset. It can inform strategic decisions by identifying the factors that are most influential in determining group membership, enabling targeted interventions or predictions based on new observations.

Table 4. Classification function coefficients.

-	Department			
	Psychology	Biology	Education Science	Teacher Education
Z-score (F1)	-0.159	-0.465	0.962	-0.235
Z-score (F2)	-0.150	-0.218	0.097	0.442
Z-score (F3)	-0.263	0.531	-0.196	0.059
Z-score (F4)	0.168	-0.222	0.029	-0.074
(Constant)	-1.461	-1.665	-1.803	-1.486

Note: Fisher's linear discriminant functions.

5. DISCUSSION

5.1. Influence of Medical Book Themes on Higher Education and Libraries

5.1.1. Medical Book Themes Significantly Drive Curriculum Innovation, Resource Development, and Community Engagement in Higher Education and Libraries

The prevalent themes in medical books, including general medical knowledge, psychology, public health, and nutrition, significantly impact the development of higher education institutions and libraries [1-3]. These themes play a crucial role in shaping the curriculum of medical and health-related programs. As new themes emerge, educational institutions must adapt their curricula to include contemporary medical practices, advancements in research, and evolving healthcare needs, ensuring that students are equipped with relevant knowledge and skills [11]. Medical books often emphasize interdisciplinary themes, bridging fields, such as psychology and mental health with public health, or nutrition with chronic disease management [14]. This encourages higher education institutions to develop more integrated programs that foster interdisciplinary collaboration, enhancing students' understanding of complex health issues and preparing them for holistic practice in diverse medical environments.

5.1.2. The Evolution of Medical Book Themes Necessitates Dynamic Collection Management and Research Support in Academic Libraries

Libraries in higher education should continually update their collections to reflect the latest themes and research in the medical field. As popular medical topics shift, libraries are challenged to acquire new books, journals, and digital resources [12, 13]. This necessitates a proactive approach to collection development, ensuring access to current literature supporting teaching and research. The emphasis on medical science and research themes in popular medical books underscores the importance of research within higher educational institutions. Libraries can enhance research initiatives by providing access to specialized databases, research tools, and statistical software and fostering an environment where collaboration and information sharing thrive [22].

5.1.3. Societal Health Trends Reflected in Medical Book Themes Reshape Educational Strategies and Community Outreach in Higher Education

The growing themes around lifestyle and wellness reflect a societal interest in preventive care and self-management of health [23]. Educational institutions are responding by promoting lifelong learning opportunities through workshops, continuing education programs, and library resources. This engagement signifies a shift toward empowering individuals to take charge of their health, which aligns with many contemporary medical frameworks. Popular public health and epidemiology themes compel institutions to engage with surrounding communities. Higher education institutions may collaborate with local health organizations to provide health education, reflecting insights gained from current medical literature [33]. Libraries can serve as hubs for health information dissemination, hosting events and workshops based on the themes found in popular medical texts. The rise of digital resources, including e-books and online journals related to medical themes, is transforming how libraries operate. Educational institutions must invest in technology and training to ensure that their facilities can accommodate digital access and virtual learning opportunities, aligning with the needs of modern students and researchers.

5.2. Implications of Interdisciplinary Borrowing of Medical Books

5.2.1. The Interdisciplinary Borrowing of Medical Books across Diverse Schools Signifies a Paradigm Shift toward Integrated Knowledge Systems in Higher Education

The borrowing of medical and health-related books by various schools, such as Psychology, Education Science, and Physical Education, signals the trend of interdisciplinary learning [9, 10]. This has implications for curriculum comprehensiveness, library collection development, student health literacy, research innovation, and interdepartmental collaboration. Engaging students in programs that promote borrowing medical literature fosters a more holistic educational approach, helping them recognize connections between fields such as psychology and physical health, or education and wellness. This can lead to more comprehensive curricula that prepare students for real-world challenges. As schools demonstrate increased interest in medical and health-related materials, libraries may need to adapt their collection development policies [27, 29]. This could lead to more focused acquisitions of health-related resources, enhancing the library's role as a critical support system for academic programs.

5.2.2. Interdisciplinary Medical Borrowing Reshapes Libraries into Hubs for Cultivating Health Literacy and Activating Cross-disciplinary Research

By lending materials that cover health topics, libraries play a crucial role in fostering health literacy among students, which is essential in today's society where understanding health issues, wellness strategies, and public health policies is increasingly important [7]. Higher education institutions can take the lead in equipping graduates with the knowledge to critically navigate health information. Many schools that borrow medical literature may also focus on research initiatives. Access to comprehensive and current medical resources can foster innovation, leading to new programs, projects, and research that target specific health issues or enhance community interventions. The intersection of health studies in various disciplines may encourage partnerships between departments, faculties, and external organizations. These collaborations can lead to interdisciplinary research projects, community health initiatives, and educational programs that capitalize on the strengths of various schools. Libraries may also consider evolving their services to include wellness programs, workshops on health literacy, and resources tailored to the needs of different faculties. This could enhance the library's role in the academic community and support student well-being. The focus on borrowing medical texts suggests a rising awareness of public health issues, especially within the Social Development school, which can lead to curriculum development that prioritizes community health, policy-making, and proactive health initiatives among students [32].

5.3. The Intersection of Psychology and Medical Books

5.3.1. The Borrowing Trends of Medical Books within the Field of Psychology Showcase the Burgeoning Interdisciplinary Integration in Academic Studies

The relationship between psychology and medical books highlights the interdisciplinary nature of modern academia [15, 16]. The demand for medical literature among psychology students and faculty underscores several key aspects. The increased borrowing of medical books by psychology students indicates a growing trend towards interdisciplinary studies, allowing them to enhance their understanding of psychological concepts through medical frameworks, especially in clinical psychology and health psychology [5]. The need for a holistic approach to mental health, encompassing psychological theories and medical practices, fosters a learning environment where collaboration across disciplines is encouraged. The emphasis on medical knowledge in psychology programs may influence curriculum design in higher education. Institutions may recognize the necessity of incorporating medical principles to prepare students for real-world challenges they will face in their careers [4]. As the boundaries between psychology and medicine continue to blur, education programs are more likely to adapt by incorporating courses that discuss the intersection of these fields, promoting a more comprehensive understanding of student needs and patient care.

5.3.2. Libraries Serve as Indispensable Catalysts in Facilitating the Convergence of Psychology and Medicine through Resource Provision

The significant percentage of medical books borrowed by the School of Psychology highlights the vital role of libraries in supporting interdisciplinary education [18]. Libraries must respond to this demand by curating collections that bridge psychology and medicine. By providing adequate access to medical literature, libraries can facilitate the research and study needs of students and faculty, thereby enhancing the educational experience. This increases resource utilization and ensures libraries remain relevant in an era of evolving educational practices. The active engagement of psychology students and faculty with medical literature suggests a growing recognition of the importance of evidence-based psychology practice. Access to medical books allows for incorporating the latest research findings in psychological practice, promoting better clinical outcomes [6]. This demonstrates libraries' critical role in supporting research initiatives that may contribute to advancements in both fields. As mental health issues gain more attention globally, the intersection of psychology and medicine will likely continue to grow. Increased borrowing of medical texts reflects current educational trends and signals future directions for both disciplines. This can lead to enhanced collaboration in research and practice, underscoring the importance of libraries as facilitators of knowledge sharing and innovation.

5.4. ROC Analysis: Insights for Student Engagement and Resource Allocation

5.4.1. ROC Analysis Exposes Critical Disparities in Student Data, Highlighting the Urgency for Targeted Support Strategies in Higher Education

The ROC analysis results reveal imbalances in student data, ineffective assessment methods for certain demographics, and varying model performances across different groups [19, 20]. The substantial imbalance in the positive and negative cases (*e.g.*, significantly more female cases than male cases) highlights a need for targeted support and resources. Higher education institutions, including libraries, should consider strategies to address this imbalance, perhaps by fostering more inclusive environments or developing programs that attract underrepresented groups.

5.4.2. The Varying ROC Model Performances across Demographics Underscore the Necessity of Refining Assessment Metrics and Data Practices

The weak performance of the model for the male demographic suggests that current methods or metrics used to assess engagement or success may not effectively differentiate between groups. This indicates that institutions should reevaluate their data collection and analysis practices to develop better metrics that can accurately predict and improve student outcomes. In contrast, the higher AUC score for the School of Psychology shows that some models can be effective. This suggests that institutions should analyze what factors contribute to this success and apply

similar methodologies to other departments. Libraries can play a vital role by providing access to relevant data, literature, and tools to enhance these analytical efforts.

5.4.3. The Statistical Significance of ROC Analysis Findings Offers a Data-driven Framework for Optimized Resource Allocation and Service Tailoring

The *p*-value of 0.000 for the psychology model indicates strong statistical significance and a meaningful differentiation between the groups [17]. This could lead to better-informed decisions regarding resource allocation, ensuring that programs or libraries that support psychology students continue to receive attention and funding, ultimately enhancing the educational experience for those students. Libraries can utilize such analysis to tailor services and resources based on student demographics. For instance, if specific programs have a significant impact on certain student groups, libraries can develop specialized collections, workshops, or outreach initiatives to enhance overall engagement and performance across diverse populations. Recognizing the need for ongoing assessment and adaptation is crucial. Institutions should cultivate a culture of continuous assessment, regularly conducting ROC analyses and other evaluations to ensure that interventions remain practical and relevant as student populations evolve.

5.5. Factor Analysis: Shaping Curriculum and Library Collections

5.5.1. Factor Analysis Uncovers Pivotal Factors, Prompting Transformative Changes in Academic Strategies

Factor analysis identifies key factors, such as "Social Sciences," "Humanities and Literature," which have implications for curriculum design, library collection development, and cross-disciplinary programming [24-26]. The identification of these factors indicates that higher education institutions may need to tailor their curricula to emphasize interdisciplinary approaches. By fostering connections between these areas, institutions can better prepare students for the complexities of modern societal issues, encouraging a more integrated understanding of knowledge.

5.5.2. The Variance Estimates of Identified Factors Offer Strategic Guidance for Library Resource Management and Programming

The high variance estimates for "Humanities and Literature" suggest that this factor accounts for substantial variability in the dataset, likely reflecting areas of significant interest or demand within the educational context. Libraries can use this information to guide their collection development strategies, ensuring that resources in areas identified as influential (like "humanities and social sciences") are adequately supported and accessible to students and faculty. Understanding the interconnectedness of "Social Sciences" and "Humanities and Literature" and other factors can help libraries design programming that fosters collaboration across disciplines. For example, workshops that integrate social sciences with technology can prepare students for research that requires diverse methodological approaches and data sources.

5.5.3. Factor Loadings and Covariances Drive Comprehensive Enhancements in Academic Support and Institutional Development

The factor loadings point to a broad range of subjects essential for comprehensive academic support. Libraries should aim for diverse collections that include literature, history, science, and technology resources to meet the varying needs of their users. This diversity can enrich research and coursework, encouraging students to draw on multiple perspectives. The significant covariances among the factors imply strong relationships that could be harnessed for collaborative research initiatives. Higher education institutions could encourage partnerships between schools, such as social sciences and applied sciences, to enhance research outputs and address real-world problems more effectively. Analytical insights regarding variance and correlation among factors can aid in continuously assessing and evaluating academic programs and library services. Institutions can utilize this data-driven approach to identify areas that need improvement or further investment, thereby fostering an environment of growth and responsiveness to educational trends. Understanding the trends and significance of different factors for library staff can lead to targeted professional development opportunities. Librarians can enhance their data science, technology, or cultural literacy skills, aligning their expertise with the evolving demands of higher education.

5.6. Humanities Integration in Medical Education for Preservice Teachers

5.6.1. The Integration of the Humanities into Medical Education through Storytelling Enhances Preservice Teachers' Empathetic and Humanistic Approach to Health Education

Integrating the humanities into medical education through storytelling and exploration of ethical "gray areas" enriches the learning experience of preservice teachers [34-36]. Research indicates that storytelling is a powerful pedagogical tool that enhances empathy and understanding among learners. The essence of a therapeutic relationship, a crucial component in healthcare, emphasizes the importance of meaningful interpersonal connections. This is particularly relevant in the context of preservice teachers who will play a significant role in educating future generations about health and wellness. By understanding patients as individuals with unique narratives, preservice teachers can cultivate a more humanistic approach in their future teaching practices.

5.6.2. Exploring Ethical Ambiguities in Medicine through the Humanities Equips Preservice Teachers to Address Complex Health Issues Holistically

Storytelling not only helps patients understand their experiences but also develops the skills necessary for effective clinical practice. Preservice teachers can benefit from this approach as they learn to appreciate diverse

perspectives, improving their ability to address health and medical care content with sensitivity and awareness. Exploring "gray areas" in medicine is essential for preservice teachers. A strictly biomedical approach risks oversimplifying complex health issues. By engaging with the humanities, preservice teachers can navigate these ambiguities, understanding that health and medical care are not merely symptoms and diagnoses but involve emotional, social, and psychological dimensions that significantly impact patient experiences.

5.6.3. Holistic Wellness Frameworks in Humanities-based Medical Education Empower Preservice Teachers to Integrate Psychological Factors into Health Literacy Education

Medical learners have identified wellness as a holistic concept encompassing multiple domains, including social, mental, physical, intellectual, and occupational wellness [37]. This holistic definition resonates with preservice teachers as they prepare to teach health education, emphasizing the need to address the psychological factors that influence well-being. By drawing connections between these wellness domains and pedagogical practices, preservice teachers can incorporate health education in an inclusive manner that reflects their students' diverse experiences. In conclusion, humanities-based medical education can profoundly influence preservice teachers' attention to health and medical care reading. By embracing storytelling and understanding psychological factors, preservice teachers will be better equipped to foster meaningful discussions around health, ultimately leading to a more compassionate and practical approach in their future roles as educators.

5.7. Discriminant Analysis: Informing Educational and Library Strategies

5.7.1. Discriminant Analysis Uncovers Key Factors that Serve as a Roadmap for Strategic Educational and Library Planning

Discriminant analysis results identify distinct factors that can guide the creation of specialized educational programs, refine library collection development, optimize resource allocation, and foster interdisciplinary collaborations [28, 30]. The distinct factors identified, including "Social Sciences," "Humanities and Literature," "Natural Sciences," and "Applied Sciences and Technology," suggest that educational institutions can curate specialized programs that align with these areas. Libraries could leverage these discriminant analysis findings to refine their collection development strategies. Understanding that certain schools may have a stronger association with specific factors can guide libraries in acquiring resources, such as digital databases, journals, and archival materials, that support these programs effectively.

5.7.2. The Insights from Discriminant Analysis Enable more Efficient Resource Allocation and Spark Interdisciplinary Opportunities in Higher Education

Higher education institutions can allocate resources more efficiently by recognizing which factors strongly correlate with specific schools. Programs under the School of Education Science might receive more funding or support for technology and literature resources. At the same time, those in the School of Biology could benefit from enhancing the biological sciences collections. The varying influences of the factors also highlight the potential for interdisciplinary collaborations. For instance, the overlapping influences of "Humanities and Literature" on the Schools of Education Science and Teacher Education suggest opportunities for joint programs or research initiatives that merge insights from both disciplines, ultimately enriching the educational experience.

5.7.3. The Predictive Power of Discriminant Analysis Coefficients Offers Multifaceted Support for Academic Decision-making and Community Engagement

The coefficients can assist academic advisors and administrators in understanding which factors predict a student's likelihood of success in a particular department. This predictive capability can inform advising practices and support systems that help direct students toward programs where they are most likely to thrive. The emphasis on practical applications within factors related to "Applied Sciences and Technology" may indicate a need for curricula that focus on theoretical aspects and hands-on learning experiences that prepare students for real-world challenges. Higher education institutions can utilize this analysis for strategic planning. Understanding how different factors contribute to classification can help leaders make informed decisions about future departmental growth, program adjustments, and aligning institutional missions. Based on the highlighted social themes, libraries and schools can initiate community engagement programs that reflect the needs and interests of the surrounding community, integrating higher education resources into societal development. The results underscore the importance of continuously assessing how academic offerings and library resources align with evolving disciplines. Institutions should remain adaptable to refine their strategies in response to shifts in the academic landscape.

5.8. Community Health and Preservice Teachers

5.8.1. Community Health's Multifaceted Framework Provides Preservice Teachers with Critical Tools to Address Student Well-being in Educational Contexts

Community health, with its various components and ethical considerations, is highly relevant to preservice teachers [38, 39]. It encompasses essential components, such as disease control, maternal and child care, and occupational health. Preservice teachers will often encounter diverse health issues among their students and families. Understanding the intersection of public health concerns with clinical medicine emphasizes the importance of addressing both population health and individual healthcare needs in educational settings. A critical aspect for preservice teachers to consider is the ethical complexity surrounding the use of medical expertise to achieve non-medical goals, especially when examining how health

intersects with national security. The relationship between health professionals and their broader obligations raises questions about how educators and social workers within the school system can advocate for their students' health and navigate these ethical landscapes. Understanding these dynamics is essential for preservice teachers as they prepare to support students affected by policies or practices driven by such intersecting concerns.

5.8.2. The Collaborative Role of Hospital Social Workers and Social Support Systems Offers Preservice Teachers a Blueprint for Fostering Student Health Literacy

The role of hospital social workers is paramount in enhancing health literacy, a crucial skill for navigating illness challenges [40]. Social workers actively engage with patients and their families, helping them to understand medical information, providing emotional support, and coordinating necessary services. For preservice teachers, recognizing the importance of social workers in the healthcare system can enhance their ability to advocate for their students, particularly those who face barriers to accessing health care or understanding medical information. Moreover, social support has a significant influence on individual health outcomes, which preservice teachers should integrate into their educational practice [41]. This support can come from relationships with significant others, perceived social support, and practical assistance. Perceived social support, feeling valued and connected, can enhance an individual's well-being and is critical for students managing personal health challenges. Understanding how to foster a supportive classroom environment that values student connections can empower students dealing with health issues, allowing them to thrive academically and personally.

5.8.3. Family Social Support Serves as a Cornerstone for Managing Chronic Health Conditions, Guiding Preservice Teachers in Community Health Intervention Strategies

Family social support emerges as a particularly vital aspect, especially for students with chronic conditions like diabetes [42]. Family members can act as a buffer against distress and play a significant role in enhancing diabetes self-care through both emotional and practical support. This encompasses sharing informational resources and facilitating better access to healthcare, which are crucial in managing health effectively. As preservice teachers learn to incorporate health literacy into their curricula, they can also educate families about the available resources and support networks, fostering a culture of health within the school community. Through medical care readings that focus on these interconnected areas, preservice teachers can gain a deeper understanding of how community health, social support, and the role of social workers contribute to enhancing health outcomes for their students.

CONCLUSION

This study underscores the critical role of integrating health and education, offering actionable insights for future educators, higher education institutions, and libraries. By preparing to collaborate with healthcare providers and leveraging family-accessible resources, future educators can promote a holistic approach that prioritizes both academic excellence and student well-being. This integration not only addresses students' educational needs but also equips teachers to create supportive environments that tackle complex health challenges, thereby recognizing the inextricable link between health and learning. The themes prevalent in medical literature extend beyond academia, shaping higher education and libraries by influencing curriculum design, interdisciplinary collaboration, research initiatives, and community engagement. Academic schools' active engagement with medical and health-related materials enriches educational experiences, stimulates innovation, and improves community health outcomes, prompting libraries to adapt and expand their roles in academic settings. The interplay between psychology and medical books further highlights libraries' vital role in facilitating interdisciplinary learning, contributing to students' academic and professional growth. Statistical analyses provide strategic guidance for institutional development. ROC analysis highlights disparities and model effectiveness, enabling institutions to enhance equity and support. Factor analysis identifies relationships among disciplines, informing resource management and educational programming. Discriminant analysis findings offer a foundation for decision-making in program design, resource allocation, and interdisciplinary collaboration.

However, this research has limitations. The sample of 3,934 preservice teachers from Nanjing Normal University may limit generalizability to other contexts, as regional variations in health education, cultural attitudes, and resource accessibility could introduce bias. The study period (2014–2023) may not capture shifts in engagement influenced by external events like public health crises or policy changes, particularly in the post-pandemic era. Focusing solely on psychological factors overlooks socioeconomic status, prior health education, personal experiences, and support systems, all of which significantly impact engagement. While rigorous, statistical methods may oversimplify complex relationships through binary classifications, limiting nuanced interpretations. Uncontrolled variables, such as curriculum changes or extracurricular activities, may confound the results, and reliance on quantitative data restricts the understanding of emotional and psychological subtleties.

Future research should address these gaps by expanding samples to diverse educational contexts to enhance generalizability, incorporating socioeconomic, cultural, and policy variables to capture multifaceted influences, adopting mixed-methods approaches (*e.g.*, interviews, focus groups) to explore contextual nuances, and investigating how libraries can optimize services and resources to support interdisciplinary learning and preservice teacher development. These directions aim to advance understanding of the psychological factors that shape engagement with health literature and inform evidence-based practices in education and healthcare.

AUTHORS' CONTRIBUTIONS

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The research was conducted in strict accordance with the ethical principles outlined in the Declaration of Helsinki and the guidelines of the Council for International Organizations of Medical Sciences (CIOMS), ensuring the protection of the rights, safety, and privacy of all participants.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

All the data and supporting information are provided within the article.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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