International Journal of Emerging Trends in Social Sciences
Vol. 19, No. 1, pp. 21-36, 2025
DOI: 10.55217/103.v18i3.1010

Time series regression modeling and prediction of book borrowing volume with time-space-interest psychological factors

Jiexuan Liu

Nanjing Normal University, Nanjing, Jiangsu, China.
Email: 79821434@qq.com

Abstract

This study analyzes the borrowing volume of 5,272 male and 15,935 female readers from Nanjing Normal University during 2022-2024. Conducting a classification statistic across 12 months, 22 library locations, and 23 major book categories, it extracts common factors in time, space, and interest dimensions via factor analysis. Using the standardized scores of these factors as independent variables and the logarithmically transformed borrowing volume as the dependent variable, regression analysis is performed to assess the influence of each dimension, emphasizing the significance of time. A time series model is applied to explore the monthly average change patterns of borrowing volume from 2022 to 2024 and predict the per capita borrowing volume for each month in 2025. Results indicate distinct gender differences. Female temporal factors show significant seasonal clustering, while male temporal factors remain consistent throughout the year. Females' spatial patterns are more regionally fixed, whereas males exhibit multi-dimensional and specialized spatial selections. Female reading interests center on humanities, while males' interests are distributed across theory, history, and application. The predicted per capita borrowing volumes in 2025 for males range from 2.84 (August) to 4.13 (March), and for females, from 2.49 (August) to 3.48 (July), with upper and lower control limits provided for each month, offering insights into future borrowing trends.

Keywords:
Interest
Psychology
Reading behavior
Space
Time.

Publisher:
Scientific Publishing Institute

Received: *24 August 2025*
Revised: *4 September 2025*
Accepted: *18 September 2025*
Published: *8 October 2025*

Funding: This research was supported by Teaching Reform Research Project of Jiangsu University Library, China (Grant number: 2025JTYB39).
Institutional Review Board Statement: Not applicable.
Transparency: The author confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Competing Interests: The author declares that there are no conflicts of interests regarding the publication of this paper.

1. Introduction

Management theory's historical perception of space and time has undergone significant transformation, shaping the way we understand organizational and individual behaviors. Management theory has conceptualized space and time as quantifiable resources. As Carr and Hancock (2006) astutely observed, industrial-era organizations treated them as a priori categories—fixed entities optimized through job design and control mechanisms. This deterministic view, however, oversimplifies the complex interplay between human agency and environmental structures, potentially limiting our understanding of how individuals

actively shape and are shaped by space-time configurations. Contemporary scholars have challenged this instrumental perspective, emphasizing the social construction of space-time. Hammond (2023) compellingly argues that "place and time-space" function not as passive containers but as active mediators of embodied experiences, enabling individuals to transcend geographical and ecological constraints. This shift in paradigm—from treating space-time as static to recognizing its dynamic, relational nature—marks a significant advancement in management research, yet its application to educational contexts remains under-explored. In higher education, Moss and Pryke (2007) have shown that academic spaces carry historical layers of meaning—disciplinary traditions, physical layouts, and management models—that subtly mold researchers' identities and practices. This insight underscores the need to consider context-specific factors when analyzing human behavior within spatial-temporal frameworks.

Recent research on reading behaviors has uncovered key mediators, but also highlighted the necessity of broader environmental considerations. Kambara, Lin, Lin, and Chen (2025) recent study illuminates the mediating role of reading volume in the relationship between intrinsic motivation and comprehension. While this research enriches our understanding of cognitive processes, it primarily focuses on individual-level factors. Integrating broader environmental variables, such as library accessibility and borrowing patterns, could offer a more comprehensive model of reading behaviors. If reading volume acts as a full mediator, spatial-temporal factors (e.g., library accessibility, reading time allocation) and interest structures (e.g., topic engagement) may influence comprehension indirectly. For instance, consistent library access and dedicated study time can increase reading volume, enhancing comprehension—assuming intrinsic motivation drives initial engagement (Kambara et al., 2025).

To fully capture the complexity of reading behaviors, incorporating psychological constructs like interest theory is crucial. Reading behaviors are inherently complex, intertwined with cognitive and affective processes (Boscolo, Ariasi, Del Favero, & Ballarin, 2011). The reading-writing relationship, central to academic tasks, involves "writing to learn" and "reading to write." Notably, the role of interest as a catalyst for information-seeking behavior remains under-theorized in time-series research. By incorporating Soemer and Schiefele (2019) distinction between individual and situational interest, this study addresses this gap. This research posits that individual interest (Stable subject preferences), situational interest (Transient task engagement), spatial accessibility, and temporal borrowing patterns jointly modulate borrowing behaviors. However, operationalizing these constructs in regression models poses challenges. For example, measuring "situational interest" objectively requires innovative data collection methods, such as real-time user interactions or dynamic surveys. By integrating psychological constructs into time-series regression, the study aims to forecast borrowing volumes accurately, aiding libraries in resource allocation and engagement strategies. This applied goal, while practical, must balance generalizability with context-specific nuances to ensure actionable insights for diverse educational settings.

The chronotope concept provides a valuable theoretical lens, yet its practical application in predicting organizational outcomes is still in its infancy. The chronotope concept (Ritella, Rajala, & Renshaw, 2021) offers a dynamic framework for analyzing space-time as socially negotiated configurations. Compared to static managerial models, chronotopic research better captures the fluidity of human-environment interactions. However, its empirical application in predicting organizational outcomes, such as library usage, remains scarce. Trento, Pyyry, Aiava, and Jäntti (2025) found that youth's "safer spaces" emerge from collective practices, reinforcing the need for context-sensitive analyses.

In the face of rapid technological and societal changes, there is an urgent need to study how user behaviors adapt within evolving space-time contexts. Contemporary society experiences rapid space-time transformations due to technology (e.g., Industry 4.0) and global crises (e.g., COVID-19). Fonseca i Casas (2025) notes that digital integration in education decouples learning from physical classrooms, challenging modernist time concepts. Yet, existing research often focuses on technological affordances without adequately exploring how these changes reshape user behaviors. This study bridges this gap by examining borrowing patterns in evolving spatial-temporal contexts. Lockdown studies reveal paradoxical space-time shifts. Boucher, Giovanelli, Harrison, Love, and Godfrey (2024) found that reduced commuting created potential reading time, but increased screen time for work and homeschooling competed with reading habits. These findings highlight the multifaceted nature of space-time use, underscoring the importance of disentangling competing demands in predictive models. Luo, Junfeng, Abbasi, and Zilong (2024) call for "dynamic governance" resonates with this study's aim to adapt to fluctuating user needs.

Guided by these insights, the research addresses the following questions:

Q1: To what extent and through what mechanisms do the common factors of temporal dynamics, spatial accessibility, and reading interest configurations modulate the borrowing volume disparities between male and female readers?

Q2: What are the specific and implementable ramifications of gender-divergent seasonal/periodic borrowing patterns for time-oriented resource allocation strategies in academic libraries, particularly in terms of cyclical collection adjustment and promotional scheduling?

Q3: In light of the gender-specific spatial selection preferences, how should library spatial layout optimization be strategically tailored to accommodate differential user behaviors?

Q4: How do gendered distributions of reading interests inform evidence-based decisions in collection development and reading engagement initiatives?

Q5: How can time-series predictions of 2025 borrowing volumes, modeled on 2022–2024 longitudinal data, be operationalized in library management to optimize resource allocation and service design, with the aim of enhancing operational efficiency and user experience?

This study embarks on a pioneering exploration at the intersection of space-time dynamics, gendered behaviors, and reading practices, aiming to revolutionize our understanding of borrowing patterns and inform practical applications in library management. The manner in which humans engage with space and time constitutes a foundational framework for understanding our relationship with the world and forging individual identities. This study integrates interdisciplinary perspectives to explore how space-time experiences, shaped by managerial logics, technological disruptions, and educational practices, influence cognitive processes and social behaviors.

Through a groundbreaking multi-dimensional approach, the research redefines the analysis of readers' borrowing behaviors, transcending traditional single-dimensional paradigms. Particular emphasis is placed on gender-divergent patterns in temporal-spatial-interest dynamics, as revealed in empirical research on reading behaviors. The study innovatively classifies borrowing data of readers from three dimensions: time, space, and reading interest. This multi-dimensional classification breaks through the single-dimensional research paradigm in traditional studies, enabling a more comprehensive and fine-grained analysis of readers' borrowing behaviors. It performs separate common factor extraction for male and female readers in time, space, and reading interest dimensions, and calculates the Z-scores of common factors. This gender-differentiated analysis considers the potential behavioral differences between genders, and the extracted common factors can effectively represent the overall characteristics of borrowing rules in different dimensions, providing a new perspective for exploring gender-specific reading behaviors.

By leveraging advanced statistical methodologies, the study offers a nuanced understanding of the complex interplay between various factors influencing borrowing volume. By introducing the Z-scores of common factors in three dimensions as covariates, it controls the influence of multi-dimensional factors on borrowing volume, and uses quantile regression to explore the variable influence relationship at different quantiles. This method overcomes the limitation of traditional regression analysis that only focuses on the average effect, and can comprehensively reveal how renewal behavior and common factors affect borrowing volume. The study bridges the gap between theoretical insights and practical implications by providing data-driven forecasts for library management. Combining the characteristics of borrowing data and regression analysis results, it forecasts the annual per capita borrowing volume through time series, and predicts the monthly borrowing volume in 2025 based on the historical data from 2022 to 2024. This forward-looking analysis links the current research with future trends, providing practical guidance for library resource allocation and service optimization, which is of great significance for practical applications.

2. Previous Research

Gender plays a role in how people read, and this matters for predicting book borrowing trends using time, space, and psychological factors. Peras, Klemenčič Mirazchiyski, Japelj Pavešić, and Mekiš Recek (2023) reviewed reading habits of 6–18 year olds and found gender differences in attitudes toward reading and how well kids perform. They also noted that family background (like having more books at home) links more strongly to better reading skills for paper books than digital ones—and this connection can vary by gender. This means when modeling borrowing, we should consider whether boys and girls (or men and women) prefer print or digital, and how their backgrounds affect that. Dirzyte, Patapas, and Perminas (2022) looked at psychological traits and found that for men, being mindful and having strong mental resilience (psychological capital) is tied to reading more books. This suggests that certain mindset factors in men might drive their reading habits, which in turn affects how often they borrow books. For time-based models, this could mean accounting for how these traits interact with time (e.g., busier vs. slower periods) or space (e.g., quiet library corners vs. noisy cafes) to change borrowing patterns. Ivanski, Humphries, van Dalen-Oskam, and Mar (2022) tested whether people care if a book is by a male or female author. They found college students barely favored male authors over female ones. This implies author gender might not strongly shape borrowing choices, but broader gender norms (like which genres are seen as "for men" or "for women") could still play a subtle role—something to consider when linking reading interests to borrowing. Martins et al. (2025) found that men with more control over their work hours read more books/magazines than those with less control. This connects gender to how time and space (Work vs. leisure settings) interact: men with flexible schedules might have more time to read (And borrow books) in certain environments. For time series models, this means tracking how work-related time changes (e.g., busy seasons vs. holidays) could affect borrowing differently for men than for others. Gender differences don't dominate reading behavior, but they add important details to borrowing models. Gender helps refine how we connect time, space, and psychology to predict borrowing volume—making models more accurate.

The interplay of time, space, and interest factors significantly shapes reading behavior, offering critical insights for developing time series regression models to predict book borrowing volume.

Space factors: Spatial characteristics of reading environments directly influence how, when, and why individuals engage with books. Lim, Lee, and Lim (2019) document evolving public library designs since 2010, noting a rise in low-visual-depth spaces and a shift from isolated "sociofetal" seating to more interactive ("Socialofetal") or private ("Socialofugal") configurations. This adaptation to user needs underscores that spatial design is not merely physical but a behavioral cue—one that could correlate with borrowing patterns (e.g., group-focused spaces may boost fiction or collaborative reading materials, while private nooks might align with academic or solitary reading genres). Chang and Wang (2016) further highlight that space interacts with user demographics, showing that child-friendly interiors and diverse seating enhance parent-child reading intent. Crucially, they demonstrate that spatial changes (e.g., switching locations) paired with temporal adjustments (Every 10 minutes) prolong reading duration, bridging space and time as joint predictors. Meanwhile, Geddert, Madlon-Kay, O'Neill, Pearson, and Egner (2025) emphasize context-specific cognitive demands: coffee shops require focus (Supporting sustained reading), while interruptions (e.g., phone calls) demand flexibility, suggesting that borrowing volume may fluctuate with the prevalence of "distraction-friendly" vs. "focused" reading spaces in a community.

Time factors: Time operates as both a direct modifier of reading behavior and a mediator of other factors. Chang and Wang (2016) finding that 10-minute intervals of spatial and material switching extend reading time points to short-term temporal rhythms that could influence daily or weekly borrowing peaks. Over longer horizons, Schwabe, Lind, Kosch, and Boomgaarden (2022) note that digital texts' multimedia features consistently aid comprehension regardless of time elapsed, implying that borrowing of digital materials might exhibit stable demand over weeks or months, unlike print materials sensitive to transient trends. Gfrörer, Stoll, Rieger, and Nagengast (2024) add a longitudinal perspective, showing that sustained out-of-school reading of science books correlates with long-term STEM interest. This suggests that borrowing volume for science texts may follow cumulative, year-long trends tied to educational stages, rather than short-term spikes.

Interest factors: Interest—operationalized as situational cues, personal preferences, or cognitive traits—emerges as a linchpin connecting time and space to behavior. Clinton-Lisell (2022) finds that situational interest (e.g., engaging content in the moment) better predicts screen reading performance than individual interest, indicating that digital borrowing may hinge on timely, trending materials. Conversely, Bains, Spaulding, Ricketts, and Krishnan (2025) show that choice in reading materials (e.g., genre) boosts enjoyment and purchasing intent, a logic extendable to borrowing: libraries curating user-selected genres may see higher repeat usage. Deeper psychological motivations also matter. Loi (2025) identifies "sense of possibility" (A desire for experiential diversity) as a predictor of fiction reading, linking trait-based interest to genre-specific borrowing (e.g., fantasy or literary fiction). Andrews-Fearon and Davidai (2023) similarly find that zero-sum beliefs about social hierarchies drive interest in dominance-themed books, highlighting how societal attitudes (Time-bound, as they shift with events) may correlate with borrowing spikes for such content. Kneuer, Green, and Cairo (2024) and Yıldız, Özdemir Cihan, and Kurşun (2024) connect interest to emotional and habitual patterns: re-reading favorites evokes nostalgia (Sustaining demand for classic titles), while personal library size reflects long-term engagement (Readers with more books at home may borrow less frequently but seek niche titles).

These findings collectively argue that book borrowing volume is not a static metric but a function of dynamic interactions: Space provides the context, time structures the rhythm, and interest fuels the motivation. A critical gap is the lack of direct linkage between these factors and borrowing data—existing studies focus on reading behavior, not lending records. Future work should map spatial usage logs, temporal borrowing patterns, and interest metrics (e.g., circulation of trending vs. classic titles) to validate these interactions. Doing so would transform time-series models from descriptive tools to predictive ones, capable of anticipating not just how much but which books will be borrowed, when, and why.

Literature relevant to reading behavior and its significance during the COVID-19 period highlights the role of reading as a critical psychological coping mechanism. Participants identified reading books as one of the most important facilitating factors in coping with Fear of COVID-19 (Yalcin, Sabir Erbicer, & Akin, 2022). This directly demonstrates that reading served as a key psychological support tool during the pandemic, helping individuals manage anxiety and distress induced by the crisis. Although not explicitly tied to COVID-19, studies on reading's mental health effects provide contextual support. Liu (2024) found that reading print texts and audio materials effectively reduced anxiety and improved sleep quality, while reading positive psychology literature significantly enhanced college students' quality of life. Such findings suggest that similar mechanisms may have operated during the pandemic, where reading—especially in specific formats (e.g., print) and content areas (e.g., positive psychology)—could alleviate pandemic-induced psychological strain. Reading self-help books was associated with positive thinking ideology (PTI) (Felipe, Estrada-Mesa, & Cardona-Arias, 2022) and randomized controlled trials showed that self-help books were no less effective than digital mental health interventions for patients awaiting face-to-face psychotherapy (Huang, Wang, Li, Hall, & Nyman, 2024). This implies that self-help reading may have been a practical and accessible resource for individuals seeking to maintain psychological balance during the COVID-19 period, reinforcing reading's role as a self-directed coping strategy. Collectively, these insights underscore that during the COVID-19 pandemic, reading

behavior held significant meaning as a psychological buffer, aiding in the management of fear, anxiety, and emotional distress, with specific formats and content potentially enhancing this effect.

This study aims to develop a comprehensive predictive framework that integrates time, space, and interest-related psychological factors to forecast book borrowing volume dynamically. Existing literature highlights the multi-dimensional nature of reading behavior: Spatial contexts (Such as reading environments) shape engagement patterns; temporal dynamics, from daily time allocation influenced by motivational states (e.g., staying up late to read a fascinating book, Koh (2022)) to long-term trends tied to educational stages, affect reading frequency; and psychological factors, including eudaimonic motivations (Loi, Kuijpers, Ensslin, & Lauer, 2023) beliefs about social hierarchies (Andrews-Fearon & Davidai, 2023) and trait-based enjoyment (Jones et al., 2025) drive reading choices and engagement. By quantifying interactions between these factors, the model seeks to address gaps in current research—such as the lack of a unifying framework for predicting borrowing behavior (Locher & Philipp, 2023)—and enhance prediction accuracy using validated indicators (e.g., author recognition tests for fiction exposure, Wimmer and Ferguson (2023)). Theoretically, it advances understanding of how time (e.g., seasonal trends), space (e.g., library design), and interest (e.g., genre preferences) collectively influence borrowing behavior, bridging fragmented findings such as print's superiority in comprehension Salmerón, Altamura, Delgado, Karagiorgi, and Vargas (2024) and personalized guidance's role in sustaining engagement (Van der, Lisa, Wildeman, Bus, & van Steensel, 2022). Practically, it informs library resource allocation (e.g., balancing print and digital materials) and literacy initiatives, such as promoting self-help books (Khorrami et al., 2023) or fiction for social attitude improvement (Oľhová, Lášticová, Kundrát, & Kanovský, 2023). Additionally, by anticipating demand for therapeutic literature (Ding, 2024), it supports mental health efforts.

3. Materials and Methods

3.1. Data Source and Classification

The data originates from the book borrowing records of 5,272 male readers and 15,593 female readers at Nanjing Normal University between 2022 and 2024. Figure 1 illustrates the research design. First, the data is categorized by gender (Male and female). Then, for each gender, it is further divided based on different dimensions:

Time dimension: Count the monthly borrowing situations of each reader (covering 12 months such as January, February, etc.).

Spatial dimension: Classify according to 22 different library storage locations (e.g., Suiyuan Location, Jingwen Location, Compact Storage Area shown in the diagram).

Reading interest dimension: Categorize by 23 major book categories (Represented by A, B, C, etc. in the diagram, including the classification numbers of the 22 major categories of the Chinese Library Classification (CLC) and the DF classification numbers used in the Law discipline at Nanjing Normal University). The Chinese Library Classification (CLC) includes 22 core categories: A stands for Marxism, Leninism, Mao Zedong Thought, and Deng Xiaoping Theory; B represents Philosophy and Religion; C refers to General Works of Social Sciences; D covers Politics and Law, with NJNU marking law-related materials with DF; E is for Military Science; F denotes Economics; G includes Culture, Science, Education, and Sports; H stands for Language and Linguistics; I represents Literature; J refers to Art; K covers History and Geography; N is for General Works of Natural Sciences; O denotes Mathematics, Physics, and Chemistry; P stands for Astronomy and Geoscience; Q represents Biological Science; R refers to Medicine and Hygiene; S is for Agricultural Science; T denotes Industrial Technology; U stands for Transportation; V represents Aeronautics and Astronautics; X refers to Environmental Science and Safety Science; and Z is for Comprehensive Books.

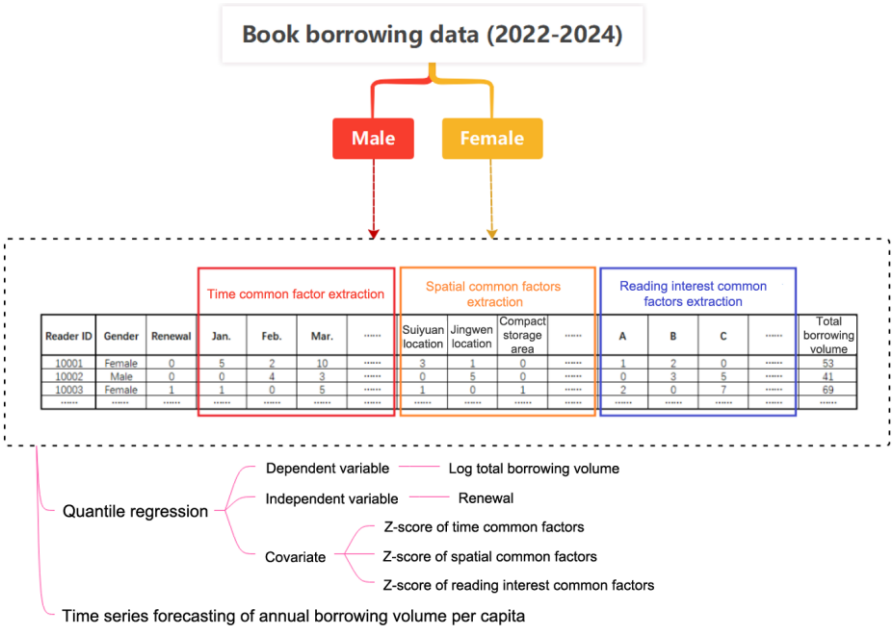

Figure 1. Research design.

3.2. Common Factor Extraction

For each gender, common factor extraction is performed separately for the three dimensions of time, space, and reading interest, and the varimax method is adopted:

Time common factor extraction: Based on the monthly borrowing data of readers, extract factors that can represent the overall characteristics of the borrowing rules in the time dimension, and calculate the Z - score of the time common factor. Spatial common factor extraction: According to the borrowing data of different library locations, extract factors that can reflect the borrowing characteristics in the spatial dimension, and calculate the Z - score of the spatial common factor. Reading interest common factor extraction: Based on the borrowing data of different book categories, extract factors that can represent the characteristics in the reading interest dimension, and calculate the Z - score of the reading interest common factor.

3.3. Regression Analysis

Dependent variable: Take the logarithmically transformed total borrowing volume (LogTotal Borrowing Volume) as the dependent variable, which is used to measure the actual borrowing amount of readers.

Independent variable: Use the renewal status (Renewal) of readers as an independent variable.

Covariates: Select the Z - scores of the time common factor, spatial common factor, and reading interest common factor extracted above as covariates, which are used to control the influence of factors in different dimensions on the borrowing volume.

Quantile regression: Conduct quantile regression analysis by combining the set dependent variables, independent variables, and covariates. Through this method, the influence relationship between variables at different quantiles can be explored, so as to comprehensively understand how renewal behavior and various common factors affect the borrowing volume in different situations.

3.4. Time Series Forecasting

Based on the above obtained borrowing data characteristics and regression analysis results, conduct time series forecasting on the annual per capita borrowing volume. By analyzing the change rules of the monthly average borrowing volume from 2022 to 2024, predict the per capita borrowing volume of each month in 2025, so as to understand the future development trend of readers' borrowing behavior.

4. Results

4.1. Common Factors Comparison

4.1.1. Time Common Factors Comparison (2022-2024)

The temporal factors of females exhibit significant seasonal clustering, whereas those of males demonstrate holistic consistency and stable characteristics throughout the annual cycle.

As can be seen from the KMO values (A core indicator of factor analysis suitability) and factor structure characteristics in Tables 1, 2, and 3: For time data, the factorability is extremely high and it demonstrates the best suitability for factor analysis. For interest data, the factorability falls into the below average category, with its suitability for factor analysis being moderate. For space data, the factorability is low, making it the dimension with the worst suitability among the three when it comes to factor analysis.

Table 1. Comparison of the characteristics of the extracted time common factors between male and female groups.

Dimension	Male	Female
Factor structure	1 Factor (Unified annual pattern)	2 Factors (Divided into first half and second half of the year)
KMO value	0.948 (higher, indicating stronger data suitability)	0.927
Key Month loadings	Factor 1: September (0.85), March (0.826), May (0.816), June (0.809), April (0.802)	Factor 1: March (0.784), May (0.744), April (0.739), June (0.679) Factor 2: October (0.737), December (0.715), November (0.681), September (0.663)
Temporal pattern	More unified annual temporal correlation	More obvious seasonal segmentation characteristics

As shown in Table 1 the KMO values for both males and females are far higher than 0.9. This indicates that the partial correlation among time-related variables is extremely strong, with abundant shared latent information, thus providing an extremely robust foundation for factor extraction. The types of factor structures can clearly reflect the core patterns of the time dimension, and the explanatory power of the factors for time data is more concentrated.

4.1.2. Spatial Common Factors Comparison (2022-2024)

As shown in Table 2 the original KMO values of spatial data are already relatively low (0.574 for males and 0.554 for females), indicating weak factorability. The partial correlation among spatial-related variables (e.g., lending data from different regions and venues) is extremely weak, with low information overlap. The extracted spatial common factors may be forced splits caused by high variable heterogeneity, and the explanatory power of these factors for spatial data is limited.

Table 2. Comparison of the characteristics of the extracted space common factors between male and female groups.

Dimension	Male	Female
Factor structure	3 Factors (More complex spatial regional segmentation)	2 Factors (Campus differentiation)
KMO value	0.574 (Slightly higher than females, indicating slightly stronger data suitability)	0.554 (Moderate, suitable for factor analysis)
Key location loadings	Factors 1: Social Sciences Location (0.744) Social Sciences Location Four Histories Special Shelf (0.685) Jingwen Chinese Sample Book Location (0.671) Factors 2: Suiyuan Chinese Sample Book Location (0.826) Suiyuan Chinese Book Location (0.727) Suiyuan Hong Kong-Taiwan Book Location (0.623) Factors 3: Xianlin Compact Storage Area (0.686) Jingwen Chinese Book Location (0.551) Mathematics-Physics-Chemistry Book Location (0.545)	Factors 1: Suiyuan Chinese Sample Book Location (0.769) Suiyuan Chinese Book Location (0.753) Suiyuan Hong Kong-Taiwan Books Location (0.586) Factors 2: Jingwen Chinese Book Location (0.704) Jingwen Chinese Sample Book Location (0.571) Law Specialty Location (0.535)
Spatial pattern	Spatial use exhibits three-dimensional differentiation of "Social Sciences-Jingwen Area", "Suiyuan Area", and "Dense Stacks-STEM Library Area", with more detailed regional segmentation	Spatial use shows binary differentiation between "Suiyuan Area" and "Jingwen Area", with the Law Specialty Location independently belonging to the second component

Table 3. Comparison of the characteristics of the extracted interest common factors between male and female groups.

Dimension	Male	Female
Factor structure	3 Factors (Multidimensional differentiation of reading interests)	1 Factor (Centralized reading interests)

KMO value	0.631 (Slightly lower than females, indicating acceptable data suitability)	0.691 (Moderate, suitable for factor analysis)
Key category loadings	Factor 1: A (0.740) B (0.623) N (0.530) Factor 2: K (0.692) E (0.659) Z (0.584) Factor 3: P (0.655) S (0.654) X (0.565)	Factor 1: Z (0.693) K (0.633) I (0.564)
Interest pattern	Reading interests exhibit three-dimensional differentiation of "theoretical foundation", "historical-military", "natural applications", with broader disciplinary coverage	Reading interests focus on comprehensive, historical-geographical, and literary categories, showing a "humanities-integrated" orientation

4.1.3. Reading Interest Common Factors Comparison (2022-2024)

As shown in Table 3, The factorability of interest data falls within the "acceptable to moderate" range, with suitability weaker than that of time data but stronger than that of spatial data. The KMO values for males (0.631) and females (0.691) both lie in the 0.6-0.7 interval, which indicates that the partial correlation among interest-related variables (e.g., borrowing preferences for different types of books) is relatively weak, and the information overlap is lower than that of time data. The data foundation for factor extraction is moderate. The multidimensional factors for males may suffer from high heterogeneity in some variables, while the concentrated factor for females may fail to fully decompose the potential interest dimensions.

4.2. Quantile Regression

As presented in Table 4, the upper quantile (q = 0.9) of the male model exhibits robust explanatory power (Pseudo R^2 = 0.588), effectively capturing high-frequency behavioral patterns. Notably, the female model demonstrates superior performance across all quantiles. At the median (q = 0.5), it achieves a Pseudo R^2 of 0.420, signifying its peak explanatory capacity. This, combined with its consistent performance, suggests a more stable relationship between predictors and the response variable.

Table 4. Model quality.

Dimension	Gender	q=0.1	q=0.5	q=0.9
Pseudo R^2	Male	0.238	0.361	0.588
	Female	0.274 (+15.1%)	0.420 (+16.3%)	0.628 (+6.8%)
Mean absolute error	Male	0.5442	0.3073	0.4392
	Female	0.5055 (-7.1%)	0.2594 (-15.6%)	0.3456 (-21.3%)

Table 5. Parameter estimates by different quantiles[a].

Gender	Parameter	q=0.1	q=0.5	q=0.9
Male (N=5272)	(Intercept)	0.688	1.121	1.243
	[Renewal=0]	-0.579	-0.358	-0.030
	[Renewal=1]	0[b]	0[b]	0[b]
	Zscore F1 (Month)	0.288	0.601	0.922
	Zscore F1 (Space)	0.019	0.035	0.010
	Zscore F2 (Space)	-0.023	-0.024	0.004
	Zscore F3 (Space)	-0.029	-0.012	-0.003
	Zscore F1 (Book category)	-0.039	-0.055	-0.016
	Zscore F2 (Book category)	-0.009	-0.032	-0.005
	Zscore F3 (Book category)	0.007	0.007	0.004
Female (N=15593)	(Intercept)	0.711	1.047	1.141
	[Renewal=0]	-0.564	-0.229	-0.020
	[Renewal=1]	0[b]	0[b]	0[b]
	Zscore F1 (Month)	0.210	0.422	0.551
	Zscore F2 (Month)	0.204	0.375	0.488
	Zscore F1 (Space)	-0.004	-0.001	0.001
	Zscore F2 (Space)	0.015	0.014	0.003
	Zscore F1 (Book category)	-0.027	-0.023	0.001

Note: a. Dependent variable: LogTotal.
b. Set to zero because this parameter is redundant.

Table 5 presents parameter estimates derived from quantile regression analysis, revealing nuanced gender disparities in the determinants of book borrowing volume. For non-renewal status (Renewal=0), male borrowers exhibit a pronounced gradient effect: the coefficient decreases from -0.579 at the 10th percentile (q=0.1) to -0.030 at the 90th percentile (q=0.9), suggesting that non-renewal exerts a disproportionately stronger negative impact on low-volume male borrowers. In contrast, female borrowers demonstrate a similar but attenuated trend, indicating relative insensitivity to renewal status across borrowing quantiles. This divergence underscores fundamental gender differences in borrowing behavior.

Notably, temporal factors (e.g., Zscore F1 Month) exhibit progressively stronger effects among high-quantile male borrowers (Coefficient increasing from 0.288 to 0.922), whereas female borrowers show consistent but less pronounced responsiveness (0.210 to 0.551). This pattern aligns with the broader observation that most predictor variables—including spatial and book category factors—yield larger marginal effects at higher quantiles (q=0.9), suggesting that high-volume borrowers are more susceptible to external stimuli. Spatial factors, in particular, exert minimal influence on female borrowing (e.g., Zscore F1 Space coefficients near zero), while interest-based effects (e.g., Zscore F1 Book category) diminish for high-volume female borrowers, shifting from negative (-0.027) to neutral (0.001) at the upper quantile.

4.3. Time Series Forecasting

4.3.1. Autocorrelation

Figure 2 depicts the autocorrelation function for the "Mean of Male" dataset, where all blue bars representing autocorrelation coefficients across varying lag orders lie within the 95% confidence intervals (Delineated by dashed black lines). This visual inspection confirms the absence of statistically significant linear autocorrelation in the time series. This conclusion is further supported by the Ljung-Box Q test, which yields a p-value of 0.115—exceeding the conventional significance level of 0.05. The model constructed for the "Mean of Male" dataset effectively captures the underlying data-generating process, demonstrating a robust goodness-of-fit that explains approximately 82.7% of the variance in observed values.

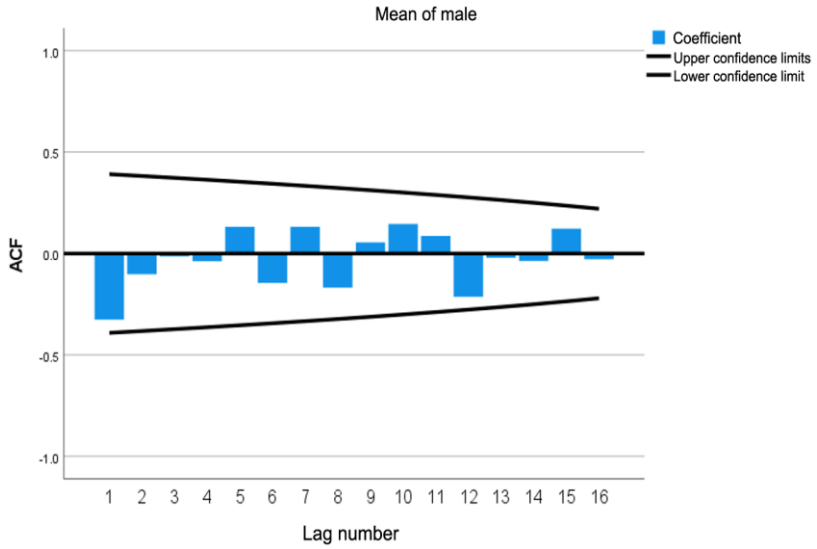

Figure 2. Mean of male.

In Figure 3 the autocorrelation coefficients (ACF) for the "Mean of Female" dataset exhibit a distinct pattern: Blue bars exceed the black confidence intervals exclusively at Lag=1, indicating statistically significant linear autocorrelation at the first lag order. By contrast, ACF values for lags 2 to 16 remain within the confidence bounds, confirming the absence of significant linear autocorrelation in higher-order lags. For the female mean dataset, the model demonstrates a strong goodness-of-fit (Explaining 85.5% of variance), yet the Ljung-Box Q test yields a p-value of 0.021 (Below the 0.05 significance threshold), indicating persistent significant autocorrelation in model residuals. This suggests the model has not fully captured the underlying dynamic patterns of the time series.

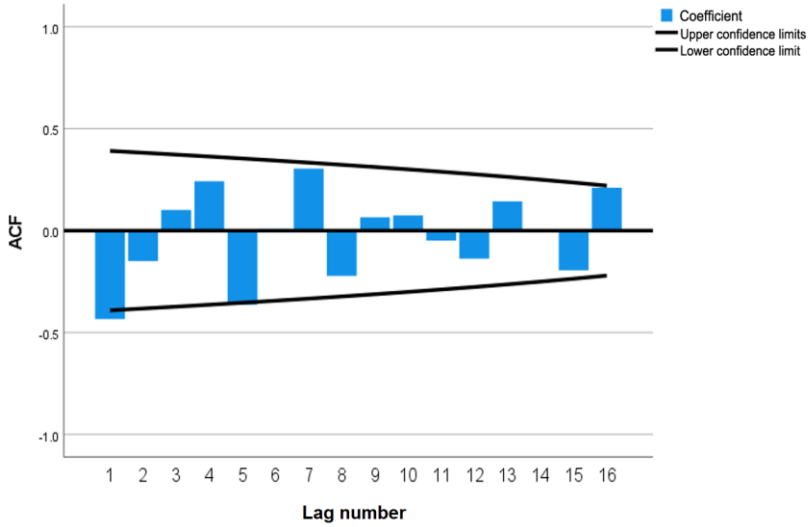

Figure 3. Mean of female.

The observed residual autocorrelation (Ljung-Box p=0.021) can be attributed to inherent data constraints and modeling trade-offs. Monthly female mean values exhibit notable year-to-year volatility—for example, February values ranged from 2.6 to 3.8 between 2022 and 2024—introducing random fluctuations that hinder pattern extraction. With only 36 monthly observations (Spanning three years), the model lacks sufficient data to reliably estimate long-term trends and seasonal cycles. The outlier in November 2024 (Value=2.5) exemplifies this limitation, highlighting the challenge of modeling time-series dynamics with sparse longitudinal data.

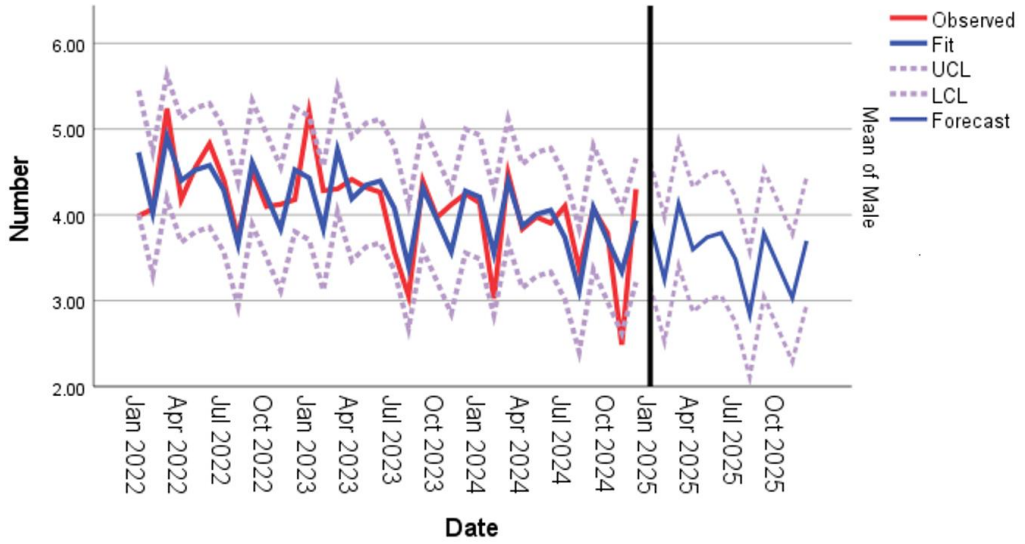

Figure 4. Forecast of mean of male.

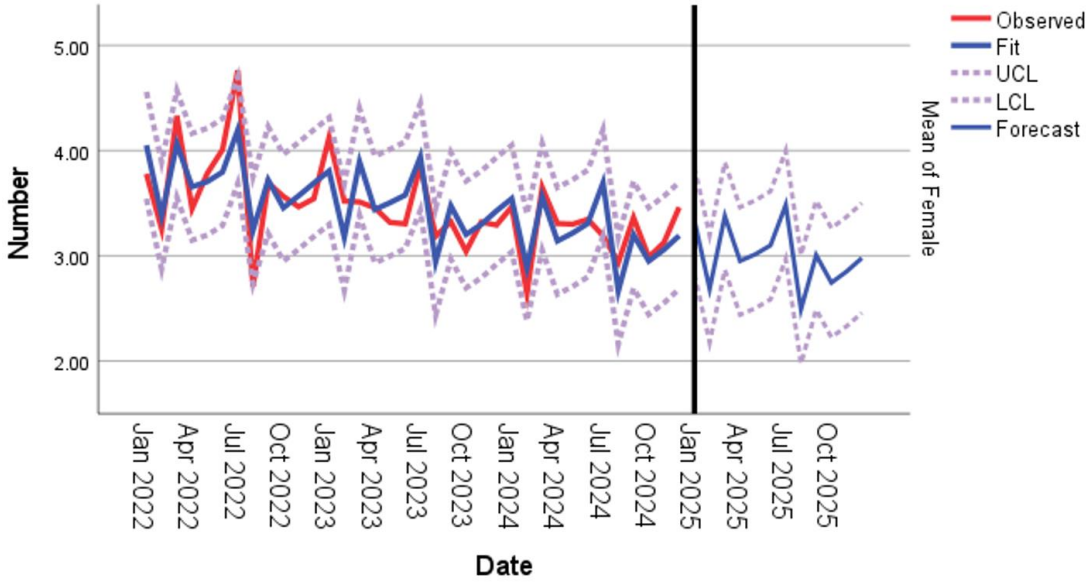

Figure 5. Forecast of mean of female.

The 2025 borrowing volume forecasts in Figures 4–5 and Table 6 reveal pronounced gender disparities. Male borrowers exhibit significantly higher mean values (2.84–4.13) across all months compared to females (2.49–3.48), with the largest discrepancy observed in March (4.13 vs. 3.38) and only July showing statistical parity (3.48). Temporal dynamics further diverge: Male borrowing demonstrates muted seasonality, peaking in March (4.13) and June (3.79) with a nadir in August (2.84), whereas female borrowing shows more pronounced cyclicality, dropping steeply from 3.38 in March to 2.49 in August before a modest recovery from November to December.

Table 6. Forecast of mean (2025).

Model		Jan 2025	Feb 2025	Mar 2025	Apr 2025	May 2025	Jun 2025	Jul 2025	Aug 2025	Sep 2025	Oct 2025	Nov 2025	Dec 2025
Male	Forecast	3.90	3.25	4.13	3.60	3.74	3.79	3.48	2.84	3.78	3.41	3.03	3.70
	UCL	4.62	3.97	4.86	4.33	4.47	4.52	4.22	3.58	4.52	4.15	3.78	4.44
	LCL	3.18	2.53	3.41	2.87	3.01	3.06	2.75	2.11	3.05	2.67	2.29	2.95
Female	Forecast	3.34	2.69	3.38	2.95	3.01	3.10	3.48	2.49	3.01	2.74	2.85	2.98
	UCL	3.84	3.20	3.89	3.46	3.53	3.61	4.00	3.01	3.52	3.26	3.37	3.50
	LCL	2.83	2.18	2.87	2.44	2.50	2.59	2.97	1.97	2.49	2.23	2.33	2.46

Confidence interval analyses underscore divergent prediction uncertainties: The March interval for males (1.45) exceeds that of females (1.02), reflecting greater variability in borrowing behaviors. Females' narrower

intervals (Mean width = 0.87) suggest more consistent borrowing patterns, likely rooted in gender-specific disciplinary demands and habitual borrowing practices. These findings align with prior research on academic library usage, where male patrons often exhibit more volatile borrowing linked to project-based research cycles, while female borrowing tends to follow steadier semester-based rhythms.

5. Discussion

5.1. Gender-Driven Heterogeneity in Temporal-Spatial-Interest Patterns

Temporal patterns: Unified annual cycles in males vs. seasonal segmentation in females. The study reveals significant gender divergence in temporal borrowing dynamics, with males demonstrating a stable annual pattern and females exhibiting seasonal segmentation into two components, reflecting potential differences in academic or lifestyle rhythms. This aligns with broader research on cognitive and behavioral differences, such as Joo, Cha, Freese, and Hayes (2022) finding that cognitive capacity is strongly associated with book reading as a leisure activity—a link that may interact with gendered time allocation, as males' stable rhythms could stem from more consistent cognitive engagement with reading across the year, while females' seasonal shifts might reflect fluctuating priorities tied to academic or social demands.

Spatial differentiation: Three-dimensional regionalization in males vs. binary clustering in females. Spatially, males show three-dimensional regional differentiation across social science, humanities, and STEM library areas, while females exhibit binary segmentation between fixed zones, a disparity linked to disciplinary distributions and spatial familiarity in information seeking. This spatial divergence resonates with research on reading and cognitive abilities: Jarvers et al. (2023) found that the number of books read predicts mentalizing performance, which involves understanding others' perspectives—an ability that may influence how males navigate diverse library spaces to access varied materials, while females' fixed zones could reflect a preference for familiar environments that support focused engagement with humanities content, as noted in their interest patterns.

Reading interests: Multidimensional disciplinary scope in males vs. humanities-focused homogeneity in females. Reading interest analysis highlights males' three-dimensional factorization across theoretical, historical-military, and natural science domains, whereas females concentrate in a single humanities-integrated component, supported by their higher KMO value indicating homogeneous interest structures. This aligns with findings on fiction's role in emotional engagement (Rydén Gramner, 2022) as females' focus on humanities—often rich in narrative and social themes—may reflect a preference for content that fosters emotional and social cognition. In contrast, males' broader interests could relate to Joo et al. (2022) observation of a strong association between cognitive capacity and book reading, with diverse disciplinary engagement potentially reinforcing cognitive flexibility across theoretical and scientific domains. Additionally, (Xie, Zuo, Tan, & Liu, 2024) noted that elevation—an emotion tied to moral beauty—influences cooperation; this could indirectly link to females' humanities focus, as such content often emphasizes moral narratives, fostering interests aligned with social and emotional themes.

5.2. Superiority of Female Model in Quantile Regression

Overall model performance: Female models exhibit higher explained variance and lower prediction errors across quantiles. Quantile regression revealed that the female model outperformed males across all quantiles. At the median (q=0.5), the female Pseudo R^2 (0.420) exceeded males (0.361) by 16.3%, with lower mean absolute errors (0.2594 vs. 0.3073), indicating more stable predictor-response relationships. The female model's consistent performance may stem from their concentrated temporal-spatial-interest patterns, which are easier to model—potentially reinforced by their homogeneous humanities interests, as noted by their higher KMO value. Conversely, males showed stronger upper-quantile explanatory power (q=0.9, Pseudo R^2=0.588), capturing high-frequency borrowing behaviors, which could relate to their broader disciplinary engagement and stable annual cycles, making extreme borrowing patterns more predictable when modeled. This aligns with Smejkalova and Chetail (2023) finding that adult readers efficiently learn from book reading, suggesting that males' frequent borrowing might correlate with higher engagement in skill-building or knowledge acquisition, strengthening model fit at upper quantiles.

Parameter dynamics: Diverging effects of renewal behavior and temporal factors by gender at extreme quantiles. The "Renewal" parameter showed diminishing negative effects at higher quantiles for both genders (e.g., males: -0.579 at q=0.1 vs. -0.030 at q=0.9), suggesting that non-renewal behaviors increasingly diverge from typical patterns at extreme borrowing frequencies. Temporal factors exerted the strongest influence on males (0.922 at q=0.9), while females responded more to both monthly components (F1=0.551, F2=0.488 at q=0.9), reinforcing their seasonal duality. This could reflect gendered differences in how reading integrates with daily rhythms: Koh (2022) noted that motivational states regulate sleep, such as staying up late to read—males' strong temporal effects might indicate that their reading is more tightly linked to structured schedules, while females' seasonal shifts could align with fluctuating motivational states tied to academic or personal cycles.

5.3. Time Series Dynamics and Forecasting Limitations

Autocorrelation and model fit: Male Time series show stability, while female data exhibit residual autocorrelation and sampling constraints. The male time series showed no significant autocorrelation (Ljung-Box p=0.115), with an 82.7% variance explanation, enabling robust 2025 forecasts (e.g., March=4.13, 95% CI=[3.41, 4.86]). In contrast, females exhibited residual autocorrelation (p=0.021), likely due to three-year data constraints (36 monthly points) and annual volatility (e.g., February values 2.6–3.8 in 2022–2024). The 2024 November outlier (2.5) further highlighted sampling limitations for capturing rare events, such as unexpected disruptions—analogous to Yildirim (2024) observation that external events (e.g., the February 6 earthquake) can alter book access patterns, introducing volatility that disproportionately affects female models due to their seasonal sensitivity. Mou, Tian, Fang, and Qiu (2022) finding that reading influences working memory might also play a role: males' stable reading patterns could reinforce consistent cognitive engagement, reducing temporal variability, while females' fluctuating patterns may lead to more variable cognitive responses, increasing autocorrelation in borrowing data.

Forecast disparities: Males display consistent borrowing, while females show pronounced seasonal fluctuations. Forecasted 2025 means showed males borrowing more consistently (2.84–4.13) than females (2.49–3.48), with males displaying narrower confidence intervals. This may reflect gendered study habits: males sustain higher borrowing volumes year-round, while females exhibit sharper seasonal peaks (e.g., March=3.38) and troughs (August=2.49). Jarvers et al. (2024) found that the number of books read predicts autism-spectrum traits, but more broadly, consistent reading is linked to stable cognitive routines—males' consistency could reflect stronger habit formation, while females' fluctuations might align with variable engagement tied to interest shifts or external demands, as seen in their humanities focus which may be more responsive to cultural or seasonal trends.

5.4. Mechanisms Underlying Gender Disparities

Disciplinary and behavioral determinants: Academic specializations and study patterns drive gendered borrowing disparities. The observed patterns likely reflect disciplinary and behavioral differences. Males' multidimensional interests in theory, history, and applied sciences align with STEM and social science curricula, driving diverse spatial choices (e.g., STEM Library Area)—consistent with Joo et al. (2022) link between cognitive capacity and reading, as STEM engagement may reinforce broader cognitive exploration. Females' humanities focus may foster reliance on fixed zones (e.g., Suiyuan Chinese collections) and concentrated reading categories, supported by Rydén Gramner (2022) note that fiction's emotional engagement suits humanities content, encouraging repeated use of familiar spaces. Additionally, males' stable annual cycles may indicate consistent research demands, whereas females' seasonal splits could relate to course scheduling or project deadlines, as highlighted by Vilma, Nuccio, Durik, and Britt (2025) who found that structured reading supports academic performance—females' seasonal patterns might reflect aligned reading with academic milestones.

Practical implications for library services: Gender-tailored interventions enhance resource allocation and user experience. These findings inform targeted library services. For males, enhancing interdisciplinary spatial connectivity (e.g., integrating social science and STEM collections) could optimize browsing efficiency, supporting their diverse interests. Females may benefit from seasonal resource promotions (e.g., literature displays in March-June) and law-specific guidance in Jingwen Area, aligning with their humanities focus and seasonal peaks. The superior female model accuracy also suggests gender-tailored predictive tools could improve resource allocation, especially during peak borrowing seasons. Hattan and Kendeou (2024) emphasized expanding the science of reading beyond narrow frameworks—applying gender-specific insights to library design and resource management represents such an expansion, ensuring services address the unique temporal-spatial-interest dynamics of both genders. Steinmayr and Kessels (2024) noted that home book ownership reflects socioeconomic background, but here, gendered patterns highlight that equitable service design must also account for behavioral differences, ensuring that both males' diverse and females' focused needs are met.

6. Conclusion

This study comprehensively analyzed the borrowing behaviors of male and female readers at Nanjing Normal University from 2022 to 2024 across time, space, and reading interests dimensions. Empirical research reveals striking gender disparities in how space, time, and interest intersect in reading behaviors. Lepper, Stang-Rabrig, and McElvany (2022) found that text-based interest correlates more strongly with reading comprehension in males than females, a trend contextualized by broader patterns: Males exhibit stable annual borrowing cycles, while females show seasonal segmentation; Males display three-dimensional library use, while females cluster in binary fixed zones; Males demonstrate multidimensional disciplinary interests while females concentrate in homogeneous humanities categories. Quantile regression models show female reading patterns are more predictable, likely due to their concentrated space-time-interest behaviors. Males, however, show stronger upper-quantile explanatory power, capturing high-frequency borrowing. Time series analysis further reveals males' stable borrowing vs. females' seasonal volatility, with females facing autocorrelation

issues due to data constraints These findings inform contextualized interventions. Libraries could enhance interdisciplinary spatial connectivity for males and implement seasonal resource promotions for females. Theoretically, they challenge universalist space-time models, advocating instead for dynamic, context-sensitive approaches. As Walgermo, Frijters, and Solheim (2018) emphasize, reader self-concept and interest are interdependent—positive space-time experiences reinforce reading motivation, while deficits in either domain (e.g., mixed reading difficulties; Jéldrez, Silva, and Cain (2024) disrupt this cycle.

Despite its valuable findings, this research has several limitations. Firstly, the sample was restricted to Nanjing Normal University, whose disciplinary structure and regional culture may limit the generalizability of the results to other institutions. The three-year time span may not be sufficient for accurate long-term trend analysis. Secondly, subjective factors such as reader characteristics and borrowing purposes were not considered, which hindered a deeper understanding of the motivations behind borrowing behaviors. Additionally, the spatial dimension failed to account for borrowing channels, and the time series forecasting assumed historical patterns would remain unchanged, ignoring potential external influences. The residual autocorrelation in the female model also suggested that the dynamic patterns of borrowing behaviors were not fully captured.

To advance the understanding of borrowing behaviors, future research can follow multiple directions. As Ritella et al. (2021) stress, space-time is a "sociocultural and dialogical" construct, urging scholars to analyze how power structures and identities are negotiated within these fluid configurations. Expanding the data scope to include diverse universities, integrating reader survey data, and introducing external variables would enhance the generalizability and depth of the research. Methodologically, adopting machine learning frameworks like LSTM and network analysis could improve prediction accuracy and reveal complex correlations. Exploring new research areas such as e-resource utilization, interdisciplinary reading trajectories, or cognitive mechanisms would provide a more comprehensive view of reading behaviors.

References

Andrews-Fearon, P., & Davidai, S. (2023). Is status a zero-sum game? Zero-sum beliefs increase people's preference for dominance but not prestige. *Journal of Experimental Psychology: General, 152*(2), 389-409. https://doi.org/10.1037/xge0001282

Bains, A., Spaulding, C., Ricketts, J., & Krishnan, S. (2025). EXPRESS: Providing choice enhances reading motivation. *Quarterly Journal of Experimental Psychology*, 17470218251370916. https://doi.org/10.1177/17470218251370916

Boscolo, P., Ariasi, N., Del Favero, L., & Ballarin, C. (2011). Interest in an expository text: How does it flow from reading to writing? *Learning and Instruction, 21*(3), 467-480. https://doi.org/10.1016/j.learninstruc.2010.07.009

Boucher, A., Giovanelli, M., Harrison, C., Love, R., & Godfrey, C. (2024). *Reading and time in reading habits in the COVID-19 pandemic*. Cham: Palgrave Macmillan. doi:https://doi.org/10.1007/978-3-031-52753-1_3

Carr, A. N., & Hancock, P. (2006). Space and time in organizational change management. *Journal of Organizational Change Management, 19*(5), 545-557. https://doi.org/10.1108/09534810610686058

Chang, J.-H., & Wang, J.-Y. (2016). *Analysis of parent-child interaction at various space and furniture of reading environment—take parent-child reading areas in taipei public libraries as an example*. Paper presented at the Advances in Physical Ergonomics and Human Factors: Proceedings of the AHFE 2016 International Conference on Physical Ergonomics and Human Factors, July 27-31, 2016, Walt Disney World®, Florida, USA.

Clinton-Lisell, V. (2022). Reading medium and interest: Effects and interactions. *Educational Psychology, 42*(2), 142-162. https://doi.org/10.1080/01443410.2021.2016635

Dirzyte, A., Patapas, A., & Perminas, A. (2022). Associations between leisure preferences, mindfulness, psychological capital, and life satisfaction. *International journal of environmental research and public health, 19*(7), 4121. https://doi.org/10.3390/ijerph19074121

Felipe, H.-G. L., Estrada-Mesa, D. A., & Cardona-Arias, J. A. (2022). The relation of ideology of positive thinking with the perception of cancer risk and ways of treating it in Medellin, Colombia. *Psychology Research and Behavior Management, 15*, 3329-3345. https://doi.org/10.2147/PRBM.S380641

Fonseca i Casas, P. (2025). Decoupling learning from time and space towards the implementation of the ubiquitous class using industry 4.0 main levers. *Technology, Knowledge and Learning*, 1-37. https://doi.org/10.1007/s10758-025-09845-7

Geddert, R., Madlon-Kay, S., O'Neill, K., Pearson, J., & Egner, T. (2025). Modeling of control over task switching and cross-task interference supports a two-dimensional model of cognitive stability and flexibility. *Psychonomic Bulletin & Review*, 1-21. https://doi.org/10.3758/s13423-025-02712-7

Gfrörer, T., Stoll, G., Rieger, S., & Nagengast, B. (2024). The effects of unstructured out-of-school engagement in science on adolescents' vocational interests, occupational aspirations, competencies, school grades, and ability self-concepts. *Journal of Educational Psychology, 116*(5), 742-761. https://doi.org/10.1037/edu0000867

Hammond, L. (2023). Who are the children we teach? Considering identities, place and time-space in education. *Oxford Review of Education, 49*(3), 342-359. https://doi.org/10.1080/03054985.2022.2085086

Hattan, C., & Kendeou, P. (2024). Expanding the science of reading: Contributions from educational psychology. *Educational Psychologist, 59*(4), 217-232. https://doi.org/10.1080/00461520.2024.2418048

Huang, S., Wang, Y., Li, G., Hall, B. J., & Nyman, T. J. (2024). Digital mental health interventions for alleviating depression and anxiety during psychotherapy waiting lists: Systematic review. *JMIR mental health, 11*(1), e56650. https://doi.org/10.2196/56650

Ivanski, C., Humphries, S., van Dalen-Oskam, K., & Mar, R. A. (2022). Do we judge fiction by the author's gender? *Journal of Media Psychology, 34*(5), 299–312. https://doi.org/10.1027/1864-1105/a000319

Jarvers, I., Döhnel, K., Blaas, L., Ullmann, M., Langguth, B., Rupprecht, R., & Sommer, M. (2023). "Why do they do it?": The short-story task for measuring fiction-based mentalizing in autistic and non-autistic individuals. *Autism Research*, *16*(3), 558-568. https://doi.org/10.1002/aur.2871

Jarvers, I., Pfisterer, J., Döhnel, K., Blaas, L., Ullmann, M., Langguth, B., . . . Sommer, M. (2024). Specificity of the short-story task for autism diagnosis when controlling for depression. *Autism Research*, *17*(9), 1928-1933. https://doi.org/10.1002/aur.3191

Jéldrez, E., Silva, M., & Cain, K. (2024). The relationship between specific reading difficulties and reading motivation dimensions. *Reading and Writing*, 1-20. https://doi.org/10.1007/s11145-024-10600-0

Jones, H., Bains, A., Randall, L., Spaulding, C., Ricketts, J., & Krishnan, S. (2025). Investigating reading enjoyment in adults with dyslexia. *Dyslexia*, *31*(1), e1803. https://doi.org/10.1002/dys.1803

Joo, Y. Y., Cha, J., Freese, J., & Hayes, M. G. (2022). Cognitive capacity genome-wide polygenic scores identify individuals with slower cognitive decline in aging. *Genes*, *13*(8), 1320. https://doi.org/10.3390/genes13081320

Kambara, H., Lin, Y.-C., Lin, H.-C., & Chen, P.-Y. (2025). Examining the mediating role of reading amount between reading motivation and reading comprehension among American college students: ethnic similarities and differences. *Social Psychology of Education*, *28*(1), 106. https://doi.org/10.1007/s11218-025-10034-8

Khorrami, Z., Sayarifard, A., Ghahari, S., Memaryan, N., Pirmoradi, M., & Ghadirian, L. (2023). High school students' depression literacy about interventions and prevention: A survey in Tehran. *Depression research and treatment*, *2023*(1), 8540614. https://doi.org/10.1155/2023/8540614

Kneuer, M. A., Green, J. D., & Cairo, A. H. (2024). Psychological effects of reading: The role of nostalgia in re-reading favorite books. *Journal of Social Psychology*, *164*(5), 695-703. https://doi.org/10.1080/00224545.2022.2151403

Koh, K. (2022). *Sexually-dimorphic regulation of sleep*. Philadelphia, PA: Thomas Jefferson University.

Lepper, C., Stang-Rabrig, J., & McElvany, N. (2022). Gender differences in reading: Examining text-based interest in relation to text characteristics and reading comprehension. *Learning and Instruction*, *82*, 101680. https://doi.org/10.1016/j.learninstruc.2022.101680

Lim, H. S., Lee, G. N., & Lim, C. (2019). A study on the characteristics of reading seat through the analysis of visual depth in public libraries - focus on the Gwangju Metropolitan City·Jeollanam-do. *Journal of the Korean Institute of Culture Architecture*, *65*, 39–48.

Liu, Y. (2024). A study of the effects of four reading styles on college students' mental health and quality of life based on positive psychology-A first-of-its-kind study. *Plos one*, *19*(8), e0308475. https://doi.org/10.1371/journal.pone.0308475

Locher, F. M., & Philipp, M. (2023). Measuring reading behavior in large-scale assessments and surveys. *Frontiers in Psychology*, *13*, 1044290. https://doi.org/10.3389/fpsyg.2022.1044290

Loi, C. (2025). Is fiction a remedy for our wish to live many lives? Testing a popular assumption among contemporary readers. *Poetics*, *111*, 102018. https://doi.org/10.1016/j.poetic.2025.102018

Loi, C., Kuijpers, M., Ensslin, A., & Lauer, G. (2023). Paths to transformation across contemporary reading practices: The role of motivations and genre preferences. *Psychology of Aesthetics, Creativity, and the Arts*. https://doi.org/10.1037/aca0000622

Luo, Z., Junfeng, M., Abbasi, B. N., & Zilong, L. (2024). Institutional structure and governance capability in universities: an empirical study from the perspectives of time, space, and quantity dimensions. *Humanities and Social Sciences Communications*, *11*(1), 1-17. https://doi.org/10.1057/s41599-024-03558-5

Martins, H. X., Siqueira, J. H., Patrão, A. L., Griep, R. H., Pereira, T. S. S., & Molina, M. d. C. B. (2025). Remote work-time control and well-being activities during COVID-19 pandemic: ELSA-Brasil results. *WORK*, 10519815251353212. https://doi.org/10.1177/10519815251353212

Moss, D., & Pryke, J. (2007). Creating space and time for feminist approaches in higher education. *Women's Studies International Forum*, *30*(5), 367-379.

Mou, H., Tian, S., Fang, Q., & Qiu, F. (2022). The immediate and sustained effects of moderate-intensity continuous exercise and high-intensity interval exercise on working memory. *Frontiers in Psychology*, *13*, 766679. https://doi.org/10.3389/fpsyg.2022.766679

Oľhová, S., Lášticová, B., Kundrát, J., & Kanovský, M. (2023). Using fiction to improve intergroup attitudes: Testing indirect contact interventions in a school context. *Social Psychology of Education*, *26*(1), 81-105. https://doi.org/10.1007/s11218-022-09708-4

Peras, I., Klemenčič Mirazchiyski, E., Japelj Pavešić, B., & Mekiš Recek, Ž. (2023). Digital versus paper reading: A systematic literature review on contemporary gaps according to gender, socioeconomic status, and rurality. *European journal of investigation in health, psychology and education*, *13*(10), 1986-2005. https://doi.org/10.3390/ejihpe13100142

Ritella, G., Rajala, A., & Renshaw, P. (2021). Using chronotope to research the space-time relations of learning and education: Dimensions of the unit of analysis. *Learning, Culture and Social Interaction*, *31*, 100381. https://doi.org/10.1016/j.lcsi.2020.100381

Rydén Gramner, A. (2022). Moving books and sensitive readers. *Communication & Medicine*, *18*(1), 78-90. https://doi.org/10.1558/cam.20400

Salmerón, L., Altamura, L., Delgado, P., Karagiorgi, A., & Vargas, C. (2024). Reading comprehension on handheld devices versus on paper: A narrative review and meta-analysis of the medium effect and its moderators. *Journal of Educational Psychology*, *116*(2), 153-172. https://doi.org/10.1037/edu0000830

Schwabe, A., Lind, F., Kosch, L., & Boomgaarden, H. G. (2022). No negative effects of reading on screen on comprehension of narrative texts compared to print: A meta-analysis. *Media Psychology*, *25*(6), 779-796. https://doi.org/10.1080/15213269.2022.2070216

Smejkalova, A., & Chetail, F. (2023). Learning new words by reading books: Does semantic information help? *Quarterly Journal of Experimental Psychology*, *76*(3), 568-582. https://doi.org/10.1177/17470218221095735

Soemer, A., & Schiefele, U. (2019). Text difficulty, topic interest, and mind wandering during reading. *Learning and Instruction*, *61*, 12-22. https://doi.org/10.1016/j.learninstruc.2018.10.003

Steinmayr, R., & Kessels, U. (2024). Does students' level of intelligence moderate the relationship between socio-economic status and academic achievement? *Journal of Intelligence*, *12*(12), 123. https://doi.org/10.3390/jintelligence12120123

Trento, F., Pyyry, N., Aiava, R., & Jäntti, L. (2025). Creating safer spaces in higher education: Failure and discomfort in spacing for difference. *Emotion, Space and Society*, *55*, 101095. https://doi.org/10.1016/j.emospa.2025.101095

Van der, Lisa, S., Wildeman, I., Bus, A. G., & van Steensel, R. (2022). Personalized expert guidance of students' book choices in primary and secondary education. *Reading Psychology*, *43*(5-6), 380-404. https://doi.org/10.1080/02702711.2022.2113944

Vilma, T., Nuccio, D. A., Durik, A. M., & Britt, M. A. (2025). Supports for discipline-specific reading in introductory psychology. *Psychology Learning & Teaching*, *24*(1), 92-103. https://doi.org/10.1177/14757257241296112

Walgermo, B. R., Frijters, J. C., & Solheim, O. J. (2018). Literacy interest and reader self-concept when formal reading instruction begins. *Early Childhood Research Quarterly*, *44*, 90-100. https://doi.org/10.1016/j.ecresq.2018.03.002

Wimmer, L., & Ferguson, H. J. (2023). Testing the validity of a self-report scale, author recognition test, and book counting as measures of lifetime exposure to print fiction. *Behavior Research Methods*, *55*(1), 103-134. https://doi.org/10.3758/s13428-021-01784-2

Xie, Z., Zuo, B., Tan, X., & Liu, C. (2024). Facing the future: Intended moral acts evoke greater elevation than completed ones. *Current Psychology*, *43*(25), 21673-21686. https://doi.org/10.1007/s12144-024-05994-7

Yalcin, M., Sabir Erbicer, E., & Akin, E. (2022). Facilitating and complicating factors in coping with fear of COVID-19. *Psychiatria Danubina*, *34*(4), 758-765. https://doi.org/10.24869/psyd.2022.758

Yildirim, S. (2024). Spiritual counseling services after the february 6 earthquake: Kırşehir example. *Cumhuriyet Ilahiyat Dergisi*, *28*(2), 547-570. https://doi.org/10.18505/cuid.1516398

Yıldız, M., Özdemir Cihan, M., & Kurşun, E. (2024). What is the difference between good and poor young adult readers? *Reading Psychology*, *45*(4), 362-385. https://doi.org/10.1080/02702711.2024.2308929