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Eye-tracking Experiment of Agenda Setting Function on TouTiao APP

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Abstract:
Building upon the profound influence of traditional media on public agendas through agenda setting, this study focuses on how the widespread penetration of AI technology reshapes the landscape of news dissemination within the rapidly evolving media ecosystem. Specifically, with the emergence of novel news media platforms like China's Toutiao APP, these platforms, armed with data-driven content distribution mechanisms, challenge the traditional sender-centric information transmission model. Against this backdrop, this research aims to explore whether agenda setting retains its effectiveness and influence in the era of AI-driven news. To validate this inquiry, this study adopts a comprehensive empirical research methodology, integrating eye-tracking technology with questionnaire surveys, to delve into audience reading behavior patterns under the influence of AI recommendation algorithms. Specifically, by selecting China's Toutiao APP as the experimental material, this study manipulates the order of news items displayed on the interface (top versus bottom), meticulously observing and recording participants' reading attention allocation, comprehension depth, and memory retention, thereby scientifically assessing the effectiveness and underlying mechanisms of agenda setting in an AI-news environment. This research not only enriches the application boundaries of agenda setting theory in the digital age but also provides empirical evidence for understanding the profound impact of AI technology in the field of news dissemination. It holds significant implications for guiding future news media strategy formulation, optimizing user experience, and promoting the healthy development of the media ecosystem.

Keywords: agenda setting theory, news ranking, eye-tracking experiment, toutiao app, importance assessment

INTRODUCTION

In this era, even without flipping through the morning paper or tuning in to the "9 O'clock News" in the evening, there are myriad avenues for accessing news. News is omnipresent, accessible at all times, and encountered by audiences through diverse means [1]. In the United States, an increasing number of young individuals are turning to social media and mobile news apps to consume news, aligning with the evolving trend of news consumption becoming a social act. The Pew Research Center's findings reveal that approximately 44% of the American population utilizes Facebook as a channel for news acquisition, and notably, among young adults in South Korea, this figure soars to a staggering 77%, with social media being their primary source of news [2].

Currently, technologies such as artificial intelligence (AI), big data, cloud computing, algorithms, and 5G communications have swept into the media industry, with AI particularly standing out for its technical prowess in reshaping the entire content production-distribution-consumption-feedback value chain in a targeted manner. This trend is evident not only among overseas media enterprises like Google, Facebook, Amazon, NAVER, and Kakao but also among Chinese new media service providers like Toutiao APP, who are leveraging AI for innovation and growth in the news domain. Amidst this transformation, audience reading habits, comprehension, and memory have undergone changes, consequently altering the Agenda Setting theory and functions that were once highly regarded in journalism and communication studies.

Since the seminal work of McCombs and Shaw on agenda setting, hundreds of empirical studies have delved into the various dimensions of this concept. In more practical terms, agenda setting is defined as "the media's ability to determine what issues the public thinks about and talks about by the news they present" [3].

Over the past five decades, the exploration of agenda setting effects has expanded beyond the first level of agenda setting (the transmission of issue salience) to encompass the second level (the transmission of attribute salience). Recently, the research methodologies in agenda setting studies have escalated to the third level, which focuses on the bundling and transfer of issues and attributes from media network agendas to public network agendas [4]. The agenda setting hypothesis has been tested across different media institutions employing varied methodologies [5], observing agenda setting effects within and beyond the US political and non-political contexts [6]. More recently, the agenda setting theory has expanded to encompass a broader range of media channels (such as cable news, news websites, blogs), wider fields within the communication domain (e.g., health or corporate communication, public relations), and even beyond[7].

China's academic community embarked on the research of agenda setting in the 1990s, with the publication of an article titled "The First Pioneer in Agenda Setting Research—A Profile of Dr. Maxwell McCombs" in the March 1996 issue of the "Journal

of Journalism & Communication Research," marking the commencement of domestic studies in this field. Domestic research on agenda setting can be broadly categorized into the following aspects:

Firstly, the introduction and historical development of foreign agenda setting theories. These articles primarily focus on elucidating the formation and evolution of agenda setting theory, tracing its intellectual lineage.Secondly, analyzing the functions and effects of agenda setting through specific case studies. These works primarily delve into the capabilities and roles of agenda setting, particularly its impact on public opinion guidance.Thirdly, examining the application of agenda setting theory in disciplines such as political science, advertising, and public relations.

With the advent and rapid proliferation of the internet, research on online media agendas in China has gradually increased. In summary, these studies encompass three main categories:The first category primarily investigates the characteristics, functions, and distinctions between online agenda setting and traditional agenda setting theories.The second category focuses on the impact and influence of online media on the agenda setting of traditional media.The third category integrates online trending events to analyze the unique characteristics and applications of agenda setting in networks, online forums, blogs, and other digital platforms.

In the internet era, as the explosive growth and usage of the internet have permeated every aspect of life, and academic concepts have been subjected to the "high-tech" explosion, there is a discernible trend affecting the theory of agenda setting itself, coupled with the public's decreasing reliance on traditional media. An increasingly pertinent question arises: Are the processes of agenda setting equally relevant and applicable in the context of the internet as they are in traditional media?

This paper adopts an empirical research methodology, integrating eye-tracking experiments with survey questionnaires. The experiment was conducted with 40 Chinese international students recruited online, excluding 7 invalid samples, resulting in a total sample of 33 participants, comprising 16 males and 17 females. Utilizing the Toutiao App as the experimental material, five economic news articles were selected, and their arrangement order (top, bottom) and comment volume were manipulated to investigate participants' reading attention, comprehension and memory behaviors, as well as their judgments of news importance. This served to examine the crucial function of agenda setting in the Toutiao App within the era of AI-driven news.

Data analysis primarily relied on four metrics: fixation duration, fixation count, visit duration, and visit count. By comparing the attention and perceived importance between news articles, the study validated the effects of arrangement order. Corresponding sample T-tests revealed that news positioned at the top garnered significantly higher levels of attention than those at the bottom. Post-experiment survey results echoed this finding, indicating that perceptions of importance aligned with attention levels, demonstrating a positive correlation between news order, attention, and perceived importance.

Thus, the agenda setting function of the Toutiao App discussed in this paper is amply validated. In other words, the Toutiao App leverages algorithms to influence the transformation of media agendas into public agendas. Put simply, the algorithmic curation of the Toutiao App not only effectively attracts public attention but also guides public perceptions of news importance.

OBJECTIVES

The theory of visual perception posits that reading behavior involves a process where the eyes receive symbols such as text and images, process information for comprehension, and generate short-term memory. This process encapsulates the fundamental mechanism by which individuals acquire and interpret information from visual stimuli.

Visual perception encompasses two primary components: visual reception and visual cognition. Vision, as a form of distance sensation, enables us to comprehend objects, environments, and interact with them by receiving information about their features and locations. The goal of perception is to acquire and interpret information about the world, serving as the raw material for human cognition. However, the advanced cognitive processing of visual perception is highly complex. Visual perception is considered a product of both bottom-up and top-down processing. Bottom-up processing is driven by sensory information from the physical world, while top-down processing actively seeks and extracts sensory information, guided by knowledge, expectations, and goals [8].

Originating from the "Chapel Hill Study" in 1968, the agenda setting theory has evolved over 50 years, developing into three primary levels and inspiring numerous related studies that have significantly enriched its theoretical content. Agenda setting has become a classic theory in the field of communication studies, with its research scope expanding from initial electoral behavior to broader public issues. In recent years, agenda setting research in journalism and communication, both domestically and internationally, has closely aligned with the vibrant development of new media and real-world events. While affirming the dominant role of traditional media in agenda setting, these studies have also recognized the influence of agenda setting in the

new media environment, demonstrating the interactive nature of agenda setting between traditional and new media. Compared to the past, there are many new perspectives and insights into the theory and application of agenda setting in new media, as well as empirical analyses. However, it is evident that the relationship between media agenda, public agenda, and policy agenda in the new media environment requires further exploration, and many issues at the micro-level of agenda setting in new media need to be uncovered [9].

News and information dissemination activities essentially involve the stimulation and response process of visual information, and the communication effect can be largely measured and verified through people's visual activities. The introduction of eye-tracking visual tracking technology into news testing research allows for the recording of data such as the first information content that users gaze at, the order of gaze, and the duration of gazing at specific types of information while browsing news. Researchers can analyze these eye-tracking data to study users' habits and patterns during newspaper reading, enabling the application of improvements that make news reading smoother and more efficient, thereby enhancing users' experience.

In the era of AI-driven journalism, the agenda setting theory necessitates a deeper exploration of high-engagement, frequently used new media platforms, encompassing dimensions of agency, psychology, and effects. Furthermore, enhancements in research angles and methodologies are imperative. Notably, the algorithms behind personalized news recommendation systems face issues such as informational narrowing and the proliferation of vulgar content. To address these, refinements in algorithmic technology, upgrades in platform ideologies, and enhancements in users' media literacy are vital. This necessitates advocating for stricter gatekeeping standards, refining internet governance laws, and intensifying government oversight. Additionally, the reading behaviors and habits of audiences engaging with new media platforms in the AI news era merit renewed scrutiny.

Given the vast user base, rapid growth, and promising future of news apps, investigating them is paramount. However, existing research on mobile news apps, both domestically and internationally, primarily focuses on their status as new media or their commercial aspects, with a bias towards user satisfaction or usage intentions. Consequently, empirical studies centering on agenda setting within mobile news apps, particularly those examining user reading habits, are exceedingly scarce.

Amidst the emergence of novel news clients, the agenda setting theory and its functions, highly regarded in journalism academia, have undergone transformations. Scholars have raised numerous queries: How have audience reading behaviors and habits evolved in the new media environment? Do personalized news algorithm recommendations align with audience needs? Can prioritized topics based on individual preferences elicit audience interest and attention? Additionally, can factors such as the overall position of an online news article, the layout and combination of text and image news, directly influence audience attention towards specific issues?

A comprehensive review of research on AI-driven news agenda setting mechanisms reveals a concentration on AI's role in news arrangement and algorithmic fairness. Thus, research in this area remains inadequate. While studies on new news clients have yielded some insights, a comprehensive and well-established research framework is yet to emerge. The limited literature on news app audiences largely focuses on usage habits, offering superficial and theoretically weak analyses, with empirical studies primarily descriptive. This paper endeavors to bridge this gap by adopting a combined qualitative and quantitative approach for empirical investigation.

Moreover, as AI technology revolutionizes the news industry, it also impacts news dissemination order and the social media landscape. Strengthening media platforms' sense of responsibility, ethical considerations in algorithmic design, news curation strategies, and enhancing news literacy are essential for fostering a new order in intelligent news production.

In summary, this paper selects Toutiao APP as the research subject, utilizing the recommended pages accessed by participants as experimental materials. An eye-tracking experiment is conducted, employing an eye tracker to trace participants' reading attention and perceived importance of news items while viewing the recommended pages of Toutiao APP. Subsequently, pre- and post-test questionnaires are administered to assess participants' reading outcomes, including comprehension and memory, as well as their attitudes towards Toutiao's personalized news algorithm recommendations. This approach aims to explore the agenda setting function of Toutiao APP in the era of AI-driven journalism.

Furthermore, as AI technology comprehensively propels transformations within the journalism and communication industry, it concurrently influences the order of news dissemination, the social media landscape, and the news production mechanisms of media outlets. Consequently, fostering a robust sense of responsibility among media platforms, adhering to ethical standards in algorithmic design, enhancing news curation strategies, and improving news literacy capabilities hold significant positive implications for constructing a new order in intelligent news production. These efforts are vital for navigating the evolving landscape of journalism in the age of AI.

Therefore, this paper aims to conduct an empirical study using eye-tracking experiments on Toutiao APP, a representative platform among AI-powered news clients. The objective is to investigate audience reading behaviors and habits in the era of AI news and to validate the theory of media Agenda Setting in this new context. By doing so, we seek to gain insights into how AI is reshaping the news consumption landscape and the implications for media Agenda Setting in the digital age.

METHODS

The application of AI technology in news gathering, editing, publishing, and column management has ushered in unprecedented changes in the field of journalism and communication. However, it has also introduced several adverse effects. For instance, news often lacks a discernible value system, and an abundance of unchecked negative information proliferates. The diversification of information is transforming into homogenization, leading to a narrowing of perspectives. Furthermore, the decline in news quality is evident, with pronounced negative societal impacts.

Research Object

This paper employs survey questionnaires and eye-tracking experiments to investigate the reading behaviors of Toutiao APP users and validate its personalized news algorithm recommendations, thereby verifying its media agenda setting: How does the order of news presentation influence audience visual perception, and does agenda setting fulfill its intended function?

The experimental stimuli used in this study consist of 5 relatively neutral "real estate economic news" items from Toutiao APP recommendation pages1.The most explosive news of housing prices! 280,000 to buy three rooms with lake view. 2.National commercial property sales down 28%. 3.Encourage the group purchase of commercial housing: some cities can be 30% off the price of housing. 4.Families with multiple children buy houses with a maximum reward of 30,000 yuan. 5. First mortgage rates have been cut to below 4% in more than 20 cities nationwide.), evenly distributed across one simulated pages. To control the impact of experimental stimuli on participants, the news recommendation pages were reproduced in equal proportions, and the experiment was designed using a Latin square design, adjusting the screen pixels to 607×1080 and importing them into the eye tracker.

Research Hypotheses

This paper, through a combination of survey methodology and empirical research, employs an eye-tracking experiment to investigate the reading behaviors of audiences engaging with Toutiao APP. It examines the effectiveness of its personalized news algorithm recommendations and validates its media agenda setting capabilities. Specifically, it delves into how the positioning of news items, as well as the layout and combination of text and images on Toutiao APP, influence audience visual perception and shape their reading behaviors and outcomes. The primary focus is on the distribution of attention among audience members while reading the materials, assessing whether they attend to key information. The pre-test questionnaire serves to evaluate audience usage of Toutiao APP and their acceptance of personalized algorithms, while the post-test questionnaire complements and enhances the eye-tracking experiment, quantifying audience characteristics such as memory retention and perceived importance after reading the news materials. The experimental procedure broadly consists of the following steps:

A. Pre-test: Participants complete a survey questionnaire.

B. Pre-experiment briefing: Participants are thoroughly informed about the experimental process.

C. Eye-tracking experiment on the client's recommended page: Tracking participants' gaze patterns as they navigate the page.

D. Post-experiment survey: Participants fill out a questionnaire.

E. Analysis of memory retention and perceived importance: Investigating how well participants remember and prioritize the information presented.

The study aims to uncover the reading patterns exhibited by individuals when browsing the recommended pages of Toutiao APP, exploring whether there is a top-down or bottom-up processing mechanism at play. For news content producers, it seeks to identify how page design can more effectively capture attention and create lasting impressions. Lastly, it questions the persistence of the traditional agenda setting theory in the contemporary era. This paper endeavors to uncover the behavioral patterns and cognitive mechanisms of news reading through a combined qualitative and quantitative research approach. The research questions are:

Research Question: Does the order of news presentation on the Toutiao APP affect audience attention and perceived importance?

H1: For the pages of text news, audiences pay more attention to the news arranged in the top than to the news arranged in the bottom.

H2: For the pages of text news, the audiences think the news that is arranged in the top is more important than the news arranged in the bottom.

The inherent characteristics of participants, such as age, educational background, occupation, among others, can potentially influence the experimental variables. Therefore, a total of 40 university students (19 males and 21 females) were selected as the experimental subjects. All participants possessed either normal or corrected-to-normal visual acuity of 1.0 or above, with no color blindness or other ocular diseases. To mitigate the potential bias stemming from individual preferences towards different types of news, the experimental materials were designated as news articles sourced from the financial section of the news application "Toutiao", which was commonly used by the participants.

The primary variables involved in this experiment include: Fixation Duration (FD), Fixation Count(FC), Visit Duration(VD), Visit Count(VC).

During the formal experiment, participants were first required to complete a pre-test questionnaire. Following this, they were instructed to adjust based on the attention points highlighted during the practice session. The participants were then presented with the following guidance: "Welcome to this experiment. You will be shown 1 images. Please try to keep your body still during the experiment." Once the experiment officially began, participants were informed that they would be completing a single browsing session. Upon confirming their understanding of the requirements, the testing commenced. The experimenter recorded the participants' eye movement data, while the eye-tracking device automatically captured the duration of fixations, fixation count, and regression count. Upon completion, the system prompted the end of the experiment, and the eye-tracking device ceased recording.

To compensate for any potential data gaps, participants were asked to fill out a post-experiment survey related to the experiment. The data collected from this survey served as a supplementary source to the conclusions drawn from the experiment.

Upon completion of the experiments, further data organization and analysis are necessitated, primarily utilizing Excel and SPSS as the primary software tools for data analysis.

RESULTS

The participants in this experiment comprised 40 Chinese international students recruited online. Due to the low quality of sample data collection attributed to visual issues such as high myopia, astigmatism, and imbalance between left and right eyes, suboptimal experimental samples (7 in total) were excluded from the study. As a result, the actual total sample size for analysis was 33 individuals, with an average age of 26.79 years (M=26, SD=6.712). This cohort consisted of 16 males and 17 females, who were randomly assigned to various experimental conditions.

H1: For the pages of text news, audiences pay more attention to the news arranged in the top than to the news arranged in the bottom.

The researcher conducted paired-sample t-tests for the textual news items, comparing the 1st to 5th news items in experimental stimulus, respectively, based on their arrangement order (Table 1-8).

Table 1. Paired samples statistics of fixation duration

FD	Mean	Std. Deviation	Std. Error Mean
1st News	0.8161	0.26313	0.04580
2nd News	0.7558	0.33931	0.05907
1st News	0.8161	0.26313	0.04580
3th News	0.7379	0.31088	0.05412
1st News	0.8161	0.26313	0.04580
4th News	0.6785	0.37353	0.06502
1st News	0.8161	0.26313	0.04580
5th News	0.6158	0.32030	0.05576

By paired samples t-test, the FD means of the 1st news is 0.816 higher than that of the 2nd news is 0.7558, but a weak significant difference (p=0.294> 005). The 1st news is 0.8161 higher than that of the 3th news is 0.7379, but weak significant difference (p=0.138> 0.05). The 1st news is 0.816 is higher than that of the 4th news is 0.6785, which is strongly significant

(p=0.040*<0.05). The 1st news is 0.816 higher than that of the 5th is 0.6158, with a significant difference (p=0.005**<0.01). In the data observations, the researcher can see that the 1st news has a higher mean value of FD than the 2nd news, the 3th news, the 4th news, and the 5th news.

Table 2. Paired samples test of fixation duration

FD	Paired Differences			t	df	p
	Mean	Std. Deviation	Std. Error Mean			
1st News 2nd News	0.06030	0.32485	0.05655	1.066	32	0.294
1st News 3th News	0.07818	0.29546	0.05143	1.520	32	0.138
1st News 4th News	0.13758	0.36955	0.06433	2.139	32	0.040*
1st News 5th News	0.20030	0.38124	0.06636	3.018	32	0.005**
*p ＜0.05, **p ＜0.01, ***p ＜0.001						

Table 3. Paired samples statistics of fixation count

FC	Mean	Std. Deviation	Std. Error Mean
1st News 2nd News	14.97 12.12	4.489 5.776	0.782 1.005
1st News 3th News	14.97 11.33	4.489 8.978	0.782 1.563
1st News 4th News	14.97 9.61	4.489 7.697	0.782 1.340
1st News 5th News	14.97 5.79	4.489 5.085	0.782 0.885

Table 4. Paired samples test of fixation count

FC	Paired Differences			t	df	p
	Mean	Std. Deviation	Std. Error Mean			
1st News 2nd News	2.848	7.168	1.248	2.283	32	0.029*
1st News 3th News	3.636	9.103	1.585	2.959	32	0.028*
1st News 4th News	5.364	8.181	1.424	3.799	32	0.001**
1st News 5th News	9.182	7.217	1.256	7.308	32	0.000***
*p ＜0.05, **p ＜0.01, ***p ＜0.001						

By paired samples t-test, the FC means of the 1st news is 14.97 higher than that of the 2nd news is 12.12, which is strongly significant (p=0.029*<005). The FC means of the 1st news is 14.97 higher than that of the 3th news is 11.33, which is strongly significant (p=0.028*<0.05). The FC means of the 1st news is 14.97 is higher than that of the 4th news is 9.61, which is strongly significant (p=0.001**<0.01). The FC means of the 1st news is 14.97 higher than that of the 5th is 5.79, with a significant difference (p=0.000***<0.001). In the data observations, the researcher can see that the 1st news has a higher mean value of FC than the 2nd news, the 3th news, the 4th news, and the 5th news.

By paired samples t-test, the VD means of the 1st news is 2.5942 higher than that of the 2nd news is 2.0539, which is strongly significant (p=0.023*<005). The 1st news is 2.5942 higher than that of 3th news is 1.8397, which is strongly significantly (p=0.001**<0.01). The 1st news is 2.5942 is higher than that of the 4th news is 1.5430, which is strongly significant (p=0.000***<0.001). The 1st news is 2.5942 higher than that of the 5th is 1.5009, with a significant difference (p=0.000***<0.001). In the data observations, the researcher can see that the 1st news has a higher mean value of VD than the 2nd news, the 3th news, the 4th news, and the 5th news.

By paired samples t-test, the VC means of the 1st news is 5.394 higher than that of the 2nd news is 4.939, but a weak significant difference (p=0.211> 0.05). The 1st news is 5.394 higher than that of 3th news is 4.667, but a weak significant difference

(p=0.144> 0.05). The 1st news is 5.394 is higher than that of 4th news is 3.970, which is strongly significant (p=0.005**<0.01). The 1st news is 5.394 higher than that of the 5th is 2.636, with a significant difference (p=0.000***<0.001). In the data observations, the researcher can see that the 1st news has a higher mean value of VC than the 2nd news, the 3th news, the 4th news, and the 5th news.

Table 5. Paired samples statistics of visit duration

VD	Mean	Std. Deviation	Std. Error Mean
1st News 2nd News	2.5942 2.0539	1.11753 1.16335	0.19454 0.20251
1st News 3th News	2.5942 1.8397	1.11753 1.00931	0.19454 0.17570
1st News 4th News	2.5942 1.5430	1.11753 0.67911	0.19454 0.11822
1st News 5th News	2.5942 1.5009	1.11753 1.26620	0.19454 0.22042

Table 6. Paired samples test of visit duration

VD	Paired Differences			t	df	p
	Mean	Std. Deviation	Std. Error Mean			
1st News 2nd News	0.54030	1.29805	0.22596	2.391	32	0.023*
1st News 3th News	0.75455	1.20903	0.21046	3.585	32	0.001**
1st News 4th News	1.05121	1.24648	0.21698	4.845	32	0.000***
1st News 5th News	1.09333	1.53926	0.26795	4.080	32	0.000***
*p ＜0.05, **p ＜0.01, ***p ＜0.001						

Table 7. Paired samples statistics of visit count

VC	Mean	Std. Deviation	Std. Error Mean
1st News 2nd News	5.394 4.939	2.2212 2.2768	0.3867 0.3963
1st News 3th News	5.394 4.667	2.2212 3.0069	0.3867 0.5234
1st News 4th News	5.394 3.970	2.2212 2.8338	0.3867 0.4933
1st News 5th News	5.394 2.636	2.2212 1.6737	0.3867 0.2913

Table 8. Paired samples test of visit count

VC	Paired Differences			t	df	p
	Mean	Std. Deviation	Std. Error Mean			
1st News 2nd News	0.4545	2.0477	0.3565	1.275	32	0.211
1st News 3th News	0.7273	2.7869	0.4851	1.499	32	0.144
1st News 4th News	1.4242	2.7160	0.4728	3.012	32	0.005**
1st News 5th News	2.7576	2.7730	0.4827	5.713	32	0.000***
*p ＜0.05, **p ＜0.01, ***p ＜0.001						

H2: For the pages of text news, the audiences think the news that is arranged in the top is more important than the news arranged in the bottom.

To validate this perception of importance, researchers must employ correlation analysis to further examine the relationship between attention and perceived importance. This involves analyzing the correlation between the "Memory and Importance Ranking" post-test questionnaire, structured as follows:

Please list 2-3 news items that you recall vividly and summarize each with a keyword.

① ② ③

Please rank the news items from Question 1 in order of their importance.

Upon analyzing the questionnaires completed by 33 participants, we compiled a list of remembered news items from the first question, arranged in descending order of recall, labeled as M-1, M-2, M-3. The news items from the second question were similarly labeled as I-1, I-2, I-3, based on their reported importance (Table 9).

Table 9. Results of correlation analysis between memory and importance

Index	M-1	M-2	M-3	I-1	I-2	I-3
M-1	1					
M-2	0.19	1				
M-3	-0.253	-0.370*	1			
I-1	**0.826****	0.336	-0.219	1		
I-2	0.234	**0.649****	0.007	0.371*	1	
I-3	-0.288	-0.202	**0.602****	-0.389*	-0.335	1
* Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).						

From the data, it can be seen that the correlation coefficient between memory and importance for the first parity is 0 with a probability of significance of 0.826**(0.8<|r|<1), is highly correlated; the correlation coefficient between memory and importance for the second parity is 0 with a probability of significance of 0.649**(0.5<|r|≤0.8), is significantly correlated; the correlation coefficient between memory and importance for the third parity is 0 with a probability of significance of 0.602**(0.5<|r|≤0.8), is significantly correlated.

Table 10. Description of the three news items

Case Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
$T1a	33	100%	0	100%	33	100%
$T2a	33	100%	0	100%	33	100%
$T3a	33	100%	0	100%	33	100%

In addition, the researcher correlated the 5 news items in experimental stimuli and organized the data for the memory and importance judgments. In the first order of memorability and importance, the highest importance was in the first news item (1. The most explosive news of housing prices! 280,000 to buy three rooms with lake view. n=26, P=78.8%). In the second order of memorability and importance, the second most important news item (2. National commercial property sales down 28%. n=19, p=57.6%). In the third order of memorability and importance, the most important news was the third news item (3. Encourage the group purchase of commercial housing: some cities can be 30% off the price of housing.n=11, p=33.3%). Among the 5 news items, we selected the top 3 news items in terms of memorability and importance and organized their data, the top 5 news items were 1, 2, 3. Among them, the audience's selection degree in the first three news items was 100% (Table 10).

DISCUSSION

Toutiao APP primarily focuses on highlighting major unexpected events, predictable landmark occurrences, significant social phenomena, or issues by pinpointing them in its coverage. This emphasis is manifested both formally and content-wise, particularly through the use of the red "Pinned" label beneath news headlines and the prominent display of news sources, which prompt the audience's visual and intuitive assessments of attention and relevance. Additionally, editorial enhancements such as the incorporation of images are employed to amplify the presentation of news, thereby engaging in agenda setting practices.

Drawing upon the core theories of agenda setting, the effectiveness of Toutiao APP in agenda setting is achieved by selecting content editing approaches, leveraging comment volumes, and distinguishing between official and non-official releases to captivate users' attention. This process realizes the first level of traditional agenda setting, namely, agenda salience. Furthermore, by manipulating the attributes of various issues, selecting specific methods to arrange news items, and establishing thematic focal points, Toutiao APP influences users' value judgments towards these issues, thereby achieving the second level of agenda setting: attribute salience. During the experimental process, researchers observed that the sequence in which news items are presented exerts a discernible influence on users' level of engagement and perceived importance.

Discussion on the Influence of Toutiao's Agenda Setting on Attention

Regarding the arrangement order (top versus bottom) of news items, the researcher, in the process of analyzing experimental data, discovered a positive correlation between the fixation duration, fixation count, visit duration, and visit count of news items and their order. In other words, the audience's attention to news items decreases sequentially with their order, and this trend is statistically significant and highly pronounced. This finding aligns with the primary argument of the agenda setting theory proposed by McCombs and Shaw.

Further Discussion on the Impact of Toutiao's Agenda Setting on Attention and Perceived Importance

In analyzing the correlation between the attention and perceived importance of the five news items, the researcher found a highly significant positive relationship between the two. Additionally, the analysis of experimental data clearly showed a positive correlation between the audience's attention to news and their memory retention. This observation resonates with scholars' assertions that memory is influenced by attention and positively affects attention-directed processes [10], as well as the notion that visual attention facilitates the transition of information from perceptual to memory representations, enhancing storage performance [11]. In other words, the higher the audience's attention to news, the greater their memory retention and perceived importance. Regarding the order of news presentation, news items placed higher on the page garnered more attention from the audience and influenced their judgments of news importance compared to those positioned lower.

Thus, the agenda setting of Toutiao APP, which is the primary focus of this study, has been thoroughly examined. The media agenda setting of Toutiao, achieved through algorithmic news ordering, influences the public agenda. Specifically, Toutiao's algorithmic ordering not only effectively attracts audience attention but also shapes their judgments of news importance.

Research Limitations and Future Directions

In terms of research subject selection, given the myriad of mobile news apps globally, this study focused solely on "Toutiao APP" in China, resulting in a relatively narrow scope. To enhance the comparability and representativeness of findings, future research should encompass a broader range of subjects.

Regarding experimental participant selection, to minimize the influence of individual factors, the study exclusively recruited university students, differing from the diverse readership of data visualization works in real-life scenarios, which comprises individuals of varying ages and professions. Additionally, excluding the study of target users and limiting pre-test questionnaires to the 33 participants involved in the experiment introduced certain limitations to statistical analysis. Therefore, the conclusions of this study can only reflect the general browsing habits of university students. For broader applicability and deeper objectivity, future research should expand to more diverse user groups.

In terms of experimental sample selection, the lack of strict control over the word count of news headlines in the test materials may have impacted the results. This study focused primarily on static text and image-based news, whereas most human-computer interfaces dynamically convey information through interactive interfaces. Future research should encompass a wider variety of interfaces.

Theoretically, while the author delved into agenda setting theory, algorithms, and visual perception theory, the complexity of actual news users and the continuous evolution of theoretical knowledge systems may have led to incomplete summaries or omissions.

Addressing the aforementioned limitations, the following directions are proposed for future research and development:

First, refine the theoretical framework for user experience measurement. With the advancing development of big data and artificial intelligence, and the deepening of user experience research, the author will continue to enhance the theoretical framework for user experience measurement through in-depth study.

Second, strengthen data analysis using statistical knowledge. Relying on accumulated design experience and theoretical knowledge, the author will apply statistical methods to process user experience measurement data more rigorously and comprehensively, addressing existing deficiencies in data handling.

Third, expand the scope of user experience measurement for products. Beyond assessing physiological, operational, and overall user feelings, future research should leverage multi-faceted efforts to quantify content quality and emotional value-added aspects of news reading apps, thereby enriching the perspectives of user experience measurement.

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