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The Moderating Effect of Information Literacy on the Relationship Between Social Media Information Overload and Information Anxiety Among College Students

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Abstract *[Purpose] This study explores the influence of social media information overload on college students' information anxiety, and examines the differentiated moderating effects of information literacy dimensions, including information filtering ability, critical evaluation ability, and ethical awareness, together with differences by disciplinary background. [Method] A mixed-method approach was used, combining a questionnaire survey (N=307) with semi-structured interviews (N=8). Hierarchical regression and the PROCESS macro were used to analyze the data. [Results] Both the quantity and quality dimensions of social media information overload significantly and positively predicted information anxiety. Information filtering ability and critical evaluation ability significantly and negatively moderated the relationship between information overload and information anxiety. The overall moderating effect of ethical awareness was not significant. Disciplinary background influenced the moderating effects, with the moderating role of critical evaluation being stronger among students in natural science disciplines. The qualitative results further supported and explained the quantitative findings. [Conclusion] Information literacy, particularly filtering and evaluation abilities, can effectively buffer the negative effects of social media information overload on college students' information anxiety, and these effects are discipline-specific. The findings offer practical implications for university information literacy education and social media platform optimization.*

Keywords: *information literacy; social media; information overload; information anxiety; moderating effect; college students*

1 Introduction

1.1 Research Background and Significance

In the digital and intelligent era, in which social media has deeply penetrated everyday life, information overload has become a core cognitive challenge for college students. Through algorithmic recommendation mechanisms and instant communication functions, social media platforms expose users to massive amounts of fragmented information, which may lead to a series of negative psychological and behavioral consequences, such as information anxiety, decision fatigue, and shallow cognitive processing [Error! Reference source not found.][Error! Reference source not found.][Error! Reference source not found.]. Recent studies show that college students spend more than four hours per day on social media on average, and 67% of respondents reported attention distraction and insomnia symptoms caused by information overload [Error! Reference source not found.]. This highlights both the prevalence and severity of information anxiety. Although prior

research has examined the influence mechanism of information overload from the perspective of technostress, such as information anxiety models and limited-capacity theory, there is still a lack of systematic research on how individual-difference factors alleviate or intensify this negative effect. In particular, the role path of information literacy as a key moderating variable in the relationship between information overload and information anxiety remains unclear [Error! Reference source not found.]. As a core competence framework in the field of information behavior [Error! Reference source not found.], information literacy includes key dimensions such as information filtering, critical evaluation, and ethical awareness. Theoretically, it may effectively buffer the impact of information overload on information anxiety by reducing cognitive load and enhancing self-efficacy. For example, eHealth literacy has been shown to significantly weaken the promoting effect of health information overload on cyberchondria [Error! Reference source not found.][Error! Reference source not found.]. This suggests that information literacy may have considerable potential to moderate the negative effects of information overload in other contexts, such as social media, but further empirical support is needed. At the theoretical level, this study aims to test and extend the interaction model of individual differences, technostress, and stress response [Error! Reference source not found.][Error! Reference source not found.], focusing on how information literacy moderates the relationship between information overload as a stressor and information anxiety as a stress response, and revealing the threshold role of information literacy in maintaining the dynamic balance of college students' information behavior. At the practical level, understanding this moderating mechanism can provide scientific evidence for universities to design more targeted information literacy courses, such as courses that focus on strengthening specific abilities to cope with anxiety, and for social media platforms to optimize functions, such as personalized information filtering support [Error! Reference source not found.][Error! Reference source not found.][Error! Reference source not found.]. The ultimate goal is to help college students better cope with the social media environment and reduce information anxiety.

1.2 Research Objectives and Questions

This study aims to address the following questions:
(1) The main-effect path from information overload to college students' information anxiety: Does social media information overload, distinguished by information quantity and information quality dimensions, significantly influence college students' information anxiety through cognitive resource depletion and emotional stress amplification, and if so, how?
(2) The moderating effects of information literacy and their boundaries: How do different dimensions of information literacy, namely filtering, evaluation, and ethics, differentially moderate the effect of information overload on information anxiety? Is there significant group heterogeneity in these moderating effects?
(3) Practical intervention pathways: Based on the findings on the moderating effects of information literacy, how can a more effective and targeted information literacy education framework and technical optimization strategy be constructed to strengthen college students' ability to use information literacy to alleviate information anxiety?
Taking college students as the research subjects, this study adopts a mixed-method design. Questionnaire data and small-scale in-depth interview data are collected, and hierarchical regression analysis and qualitative content analysis are used to test the hypothesized model. The study focuses on the mechanism through which information literacy functions as a moderator, and on operational individual behavioral and cognitive intervention pathways, thereby providing empirical support for alleviating college students' information anxiety in social media environments.

2 Literature Review

2.1 Clarification of Core Concepts

Information literacy is the core concept of this study. According to the Framework for Information Literacy for Higher Education released by the Association of College and Research

Libraries (ACRL) in 2016 [Error! Reference source not found.], information literacy is defined as an integrated set of abilities involving reflective discovery of information, understanding how information is produced and valued, and using information in creating new knowledge and participating ethically in learning communities. The framework emphasizes that information literacy is a metacognitive competence system covering information awareness, information need recognition, information retrieval strategies, source evaluation, information synthesis and use, and information ethics. This study adopts the ACRL definition and focuses on individuals' ability to effectively obtain, filter, critically evaluate, and ethically use information to solve problems in academic and everyday contexts. The scope of media literacy is broader. It usually refers to individuals' ability to access, analyze, evaluate, create, and use media information in various forms [Error! Reference source not found.]. Media literacy includes not only understanding and critiquing traditional media content, such as newspapers and television, but also understanding digital media, such as social media and online video. Compared with information literacy, a distinctive feature of media literacy is its emphasis on interpreting and critiquing media messages, and it often includes content creation ability, namely the ability to use media tools for expression and communication. For example, the media literacy discussed in reference [Error! Reference source not found.] places more emphasis on how individuals understand and produce media content. Although media literacy and information literacy overlap in areas such as information evaluation and critical thinking, information literacy focuses more on the acquisition, evaluation, and management of information itself, whereas media literacy focuses more on understanding media forms, content, and social influence, as well as active participation [Error! Reference source not found.]. Digital literacy is closely related to digital technologies and digital environments. It is usually defined as individuals' ability to find, access, use, evaluate, create, and communicate digital information in digital environments [Error! Reference source not found.]. Digital literacy emphasizes information activities supported by digital tools and platforms, such as computers, smartphones, and the Internet. It is highly related to information literacy; information literacy can be regarded as a core component of digital literacy, and information literacy practices in digital environments constitute a major part of digital literacy. However, digital literacy may also include a broader range of technical operation skills, such as software use and hardware maintenance, digital security awareness, online collaboration, and digital identity management, which are not traditional core concerns of information literacy. In summary, information literacy in this study strictly follows the ACRL framework and focuses on information processing and evaluation abilities at the individual cognitive level. This distinguishes it from media literacy, which emphasizes media content creation and communication, and from digital literacy, which emphasizes operational skills for specific digital technologies. Although the three concepts intersect in the digital media context of social media, the core concern of this study is how individuals use the core abilities of information literacy, including filtering, evaluation, and ethical awareness, to cope with information overload on social media platforms and the information anxiety it produces. This clarification helps define the theoretical perspective and research scope of this study more clearly.

2.2 Influence Mechanisms of Information Overload

There is broad consensus that information overload has negative psychological and behavioral effects on college students. Studies show that social media overload causes anxiety, decision fatigue, and sleep disturbance through two pathways: cognitive resource depletion and emotional stress amplification [Error! Reference source not found.]. Specifically:

(1) Cognitive resource depletion: Continuous interruptions from social media information streams distract attention and exceed the limited-capacity threshold of individual information processing, as discussed by Savolainen (2016) [Error! Reference source not found.]. This often manifests as reduced information filtering efficiency and shallow cognitive processing, that is, 'cognitive bloating' [Error! Reference source not found.]. In empirical research, Li Yuelin et al. (2021) found that

information redundancy in collaborative information seeking among college students extended decision time by 30% [Error! Reference source not found.].

(2) Emotional stress amplification: Information overload indirectly induces anxiety through information stress and uncertainty avoidance. Xu Ruichao et al. (2017) pointed out that information overload triggers a sense of loss of control, stimulates sympathetic nervous activity, and increases cortisol secretion [Error! Reference source not found.]. Recent empirical evidence further shows that social media overload may increase insomnia risk through the chain mediating effect of information stress and depressive symptoms [Error! Reference source not found.].

In addition, the influence of social media overload is context-specific. In learning contexts, information overload reduces academic performance through the dual mediation of technostress and emotional exhaustion [Error! Reference source not found.][Error! Reference source not found.]. In social contexts, overload is more likely to cause information avoidance behavior, such as a reduction in active information sharing [Error! Reference source not found.][Error! Reference source not found.].

2.3 Core Dimensions of Information Literacy

This study adopts the ACRL framework mainly for the following reasons. First, the framework is one of the most influential information literacy standards in higher education and is highly relevant to the college student population examined in this study. Second, it emphasizes information literacy as a dynamic and integrated set of abilities that covers the whole process from information awareness to ethical use. Its multidimensional perspective helps deepen the understanding of the specific mechanisms through which information literacy operates in complex information environments such as social media. Based on the core ideas of the ACRL framework and the characteristics of social media information overload, this study selects information filtering ability, critical evaluation ability, and information ethical awareness as key operational dimensions of information literacy. These three dimensions correspond directly to the core challenges of coping with information quantity overload, information quality overload, and information behavior norms. Theoretically, they are considered the ability elements most directly related to alleviating information overload and its negative consequences, such as information anxiety.

(1) Information filtering ability: Based on the 'strategic information searching' dimension in the ACRL framework, this ability emphasizes active selection of information sources and priority ordering (ACRL, 2016) [Error! Reference source not found.]. For example, highly literate users are more likely to use advanced retrieval syntax to filter low-quality content (Tian Q, 2022) [Error! Reference source not found.].

(2) Critical evaluation ability: This dimension involves judgments about information authenticity, authority, and ethical risks. Wen Zhonglin et al. (2005) found that critical evaluation reduces the influence of false information by weakening confirmation bias [Error! Reference source not found.].

(3) Information ethical awareness: This dimension includes privacy protection and a sense of responsibility in information dissemination. In a study of social media health information, Li Yuelin et al. (2018) found that users with stronger ethical awareness were less likely to repost false health information [Error! Reference source not found.].

It should be noted that the moderating effects of information literacy are dimensionally heterogeneous. For example, filtering ability has a stronger moderating effect on information anxiety than ethical awareness, whereas critical evaluation is more advantageous in reducing shallow cognitive processing.

2.4 Theory of Moderating Effects

Research on moderating effects is often grounded in social cognitive theory and conservation of resources theory. Wen Zhonglin et al. (2005) proposed that moderators operate by changing

the strength or direction of the relationship between an independent variable and a dependent variable [Error! Reference source not found.]. In the relationship between information literacy and information overload, possible mechanisms include the following:
(1) Cognitive load buffering: High information literacy reduces cognitive load by optimizing information processing strategies, such as chunking and metacognitive monitoring, thereby weakening the negative effects of overload (Savolainen, 2016) [Error! Reference source not found.].
(2) Enhancement of self-efficacy: Information literacy improves individuals' sense of control over technostress. For example, the ACRL framework emphasizes confidence in information mastery (ACRL, 2016) [Error! Reference source not found.], which may inhibit the upward spiral of anxiety.
Recent studies have further verified group differences in moderating effects. For instance, students in natural science disciplines, because of their logical training, show a significantly stronger moderating effect of critical evaluation ability on information overload than students in social science and humanities disciplines [Error! Reference source not found.].

2.5 Literature Review Summary

Based on the review of existing literature, this study identifies the following limitations:
(1) Single-dimensional moderation paths: Most studies focus only on the overall moderating effect of information literacy and lack differentiated analyses of subdimensions such as filtering, evaluation, and ethics. This limits their value for precise practical intervention.
(2) Neglect of group heterogeneity: Existing conclusions are mostly based on homogeneous samples and have not sufficiently examined boundary conditions such as disciplinary background and use motivation, thereby limiting the generalizability of the findings.
(3) Single-method designs: Existing studies mainly rely on cross-sectional data, making it difficult to reveal the dynamic interaction between information literacy and information overload, such as the potential cycle of literacy improvement and reduced overload perception.
(4) Characteristics of college students' information behavior: Existing studies have paid insufficient attention to the unique information acquisition and use patterns of college students, such as the coexistence of academic and social information needs and the alternation between learning and entertainment scenarios. To address these gaps, this study combines questionnaire survey and in-depth interviews to systematically test the multidimensional moderating effects of information literacy and group heterogeneity. It also preliminarily explores intervention strategies based on individual differences, laying a foundation for future longitudinal research.

3 Theoretical Framework and Research Hypotheses

3.1 Theoretical Model

Based on social cognitive theory and conservation of resources theory, this study constructs a model of the moderating effects of information literacy on social media information overload, as shown in Figure 1. Social cognitive theory emphasizes the moderating role of individual cognitive abilities, such as self-efficacy, in responses to environmental stimuli [Error! Reference source not found.]. Conservation of resources theory argues that individuals tend to use ability resources, such as information literacy, to buffer the depletion of psychological resources caused by stressors [Error! Reference source not found.]. The core logic of the model is that information literacy may weaken the positive influence of information overload on information anxiety through two pathways: cognitive resource optimization and emotional regulation strategies [Error! Reference source not found.][Error! Reference source not found.].

Model elements are defined as follows:

(1) Independent variable: Information overload, including two dimensions, information quantity overload, such as daily exposure to more than 50 pieces of information, and information quality overload, such as false information accounting for more than 30%. It reflects the objective pressure characteristics of the social media environment [Error! Reference source not found.][Error! Reference source not found.].

(2) Dependent variable: Information anxiety, operationalized as subjective experiences such as frequency of attention distraction, perceived decision delay, and changes in sleep quality [Error! Reference source not found.][Error! Reference source not found.].

(3) Moderating variable: Information literacy, divided according to the ACRL framework [Error! Reference source not found.] into filtering ability, such as prioritizing information sources; critical evaluation, such as credibility judgment; and ethical awareness, such as privacy protection and dissemination responsibility. It plays a potential moderating role by reducing cognitive load, such as optimizing information processing strategies, and enhancing self-efficacy, such as strengthening confidence in information control.

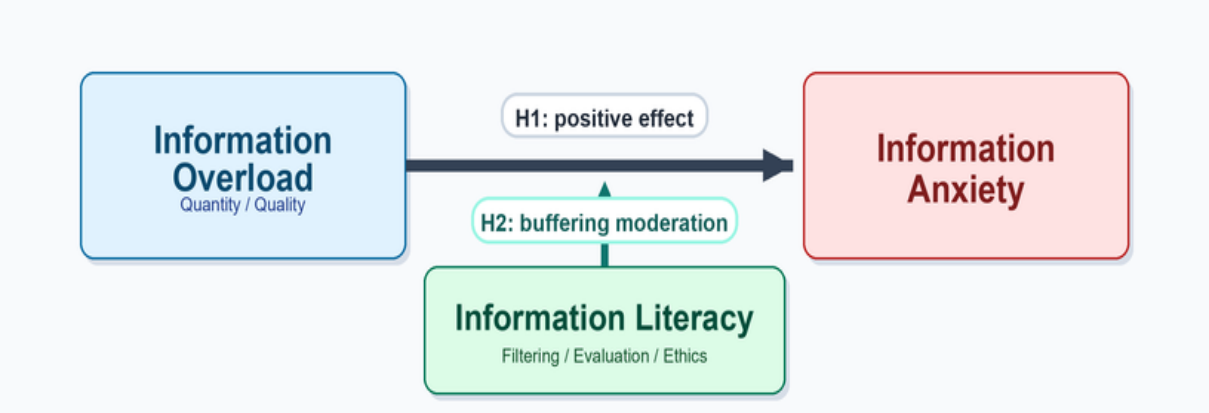


Fig. 1. Theoretical model of the moderating effect of information literacy on information overload

3.2 Research Hypotheses

3.2.1 Direct Effect of Information Overload on Information Anxiety

H1: Social media information overload may positively influence college students' information anxiety.

(1) Theoretical basis: Limited-capacity theory suggests that when information input exceeds the working memory threshold of approximately 4 +/- 1 chunks, cognitive processing ability may decline, resulting in attention distraction and decision fatigue [Error! Reference source not found.]. Cheng Huiping et al. (2023) suggest that information overload may affect sleep quality through changes in information stress and emotional states [Error! Reference source not found.].

(2) Dimensional hypotheses:

H1a: Information quantity overload may be positively correlated with information anxiety, as a large amount of information arriving simultaneously may deplete cognitive resources [Error! Reference source not found.].

H1b: Information quality overload may be positively correlated with information anxiety, as low-quality information may trigger emotional stress by increasing information uncertainty [Error! Reference source not found.].

3.2.2 Differential Moderating Effects of Information Literacy Dimensions

H2: Each dimension of information literacy may negatively moderate the relationship between information overload and anxiety, and the moderating effects may differ across dimensions.

(1) Filtering effect of information filtering ability:

H2a: Filtering ability may help individuals effectively filter and organize information, reduce exposure to ineffective information, and thereby potentially weaken the negative effect of overload [Error! Reference source not found.][Error! Reference source not found.].

(2) Calibration effect of critical evaluation:

H2b: Critical evaluation may play a moderating role by improving individuals' ability to judge

information credibility, especially when facing information of uneven quality [Error! Reference source not found.][Error! Reference source not found.].

(3) Constraint effect of ethical awareness:

H2c: Ethical awareness may moderate the effect of information overload by guiding individuals to contact and share information in a more restrained manner [Error! Reference source not found.][Error! Reference source not found.].

3.2.3 Group Heterogeneity: Boundary Conditions of Disciplinary Background

H3: The moderating effects of information literacy may differ by disciplinary background.

H3a: The critical evaluation ability of students in natural science disciplines may show distinctive characteristics in moderating information overload, possibly because of their logical thinking training [Error! Reference source not found.][Error! Reference source not found.].

H3b: The ethical awareness of students in social science and humanities disciplines may show distinctive characteristics in the moderating effect, possibly because of their sensitivity to information ethics issues [Error! Reference source not found.][Error! Reference source not found.].

4 Research Methods

4.1 Research Design

This study adopts a mixed-method design combining questionnaire survey and semi-structured interviews to examine the moderating effects of information literacy on social media information overload. The quantitative study uses a questionnaire survey to test relationships among variables and the hypothesized model. The qualitative study uses in-depth interviews to supplement the formation process of the moderating mechanism and differences in individual experience, thereby achieving methodological complementarity and data triangulation.

4.2 Research Subjects and Data Collection

4.2.1 Questionnaire Survey

This study used convenience sampling combined with quota control to collect data. The sample consisted of undergraduate and graduate students from the author's university and two to three surrounding universities. The planned sample size was 300-350 valid questionnaires, with a basic balance across disciplinary backgrounds, including natural sciences, social sciences and humanities, arts, medicine, grade levels, and gender. Data were collected mainly through the Wenjuanxing platform, supplemented by offline paper questionnaires and online questionnaire distribution. Before the formal survey, a small-sample pretest was conducted to examine the reliability and validity of the questionnaire.

4.2.2 Semi-structured Interviews

On the basis of the questionnaire survey, eight college students were selected for semi-structured interviews, including four students in the high information literacy group, whose total information literacy scores were in the upper quartile, and four students in the low information literacy group, whose scores were in the lower quartile. Each interview lasted approximately 30-45 minutes. The interview content focused on information overload experience, coping strategies, and the role mechanism of information literacy in the moderation process.

4.3 Variable Measurement

The core variables in this study were measured mainly by mature scales or by items revised from existing studies according to the research context. All scale items used a five-point Likert scale, with 1 indicating strongly disagree and 5 indicating strongly agree:

(1) Information overload: Drawing on the social media overload scale (SMIO) and adapting it

to the research context, this study measured two dimensions: information quantity overload, for example, 'I often feel that the amount of information on social media exceeds my processing capacity,' and information quality overload, for example, 'It is difficult for me to judge the authenticity of content on social media.' The scale contained 11 items in total. The SMIO scale was chosen as the basis because it is a commonly used tool for studying information overload in social media contexts, and its dimensional structure, including system feature overload, information overload, and social overload, is highly related to the information quantity and quality overload issues examined here. Considering that some original SMIO items may differ from the specific usage contexts of Chinese college students, such as WeChat, Weibo, Douyin, and other platforms, the items were localized based on the pretest and literature analysis. Subsequent reliability and validity tests, reported in Section 5.1.1, also verified the applicability of the revised scale.

(2) Information literacy: Guided by the ACRL framework and the social media use context of college students, this study developed a scale covering three dimensions: information filtering ability, for example, 'I can effectively filter social media information according to my needs'; critical evaluation ability, for example, 'I check the reliability of the sources of social media information'; and information ethical awareness, for example, 'I pay attention to protecting personal privacy and information security.' The scale contained 15 items in total. Existing general information literacy scales, which often focus on library resource use and academic information retrieval, may not fully capture college students' literacy performance in the specific and informal information environment of social media. To closely address the core hypotheses H2a, H2b, and H2c, which test the three dimensions theoretically most directly related to coping with information overload, this study developed a targeted scale under the guidance of the authoritative ACRL framework. The items were designed to be contextualized and behavioral, aiming to measure college students' practical application of information literacy in social media interaction more accurately. The development process included expert consultation and a small-scale pretest, and the reliability and validity results, reported in Section 5.1.1, showed good psychometric properties.

(3) Information anxiety: The information anxiety scale developed by Song Xiaokang et al. was adopted and revised [**Error! Reference source not found.**]. It measured attention distraction, decision delay, and sleep-quality effects during social media use, with 10 items in total. This scale was chosen for two main reasons. First, it was developed by Chinese scholars for user anxiety in mobile social media environments, especially fear of missing out, and has good local adaptability and contextual relevance to the college student population and social media background of this study. Second, its dimensions, such as information acquisition anxiety, information processing anxiety, and perceived loss of control over information, adequately reflect the negative psychological experiences that may be caused by information overload. According to the specific focus of this study and feedback from the pretest, several item expressions were slightly adjusted to ensure semantic clarity and content validity. The reliability and validity tests of the revised scale, reported in Section 5.1.1, also indicated its applicability to this study.

(4) Control variables: These included demographic variables, such as gender, grade, and disciplinary background, and social media use characteristics, such as daily use duration, main platforms used, and use motivation.

The interview outline was designed according to the research objectives and focused on core issues such as subjective experiences of information overload, diversity of coping strategies, and concrete manifestations of information literacy in the moderation process, ensuring both focus and depth.

4.4 Data Analysis Methods

4.4.1 Quantitative Data Analysis

Questionnaire data were analyzed using SPSS 26.0. The main steps were as follows:

(1) Descriptive statistical analysis and reliability and validity tests: Means and standard deviations of variables were calculated, Cronbach's alpha was used to test scale reliability, and confirmatory factor analysis was used to test construct validity.

(2) Correlation analysis: Pearson correlation coefficients were used to examine correlations among variables.

(3) Hierarchical regression analysis: The SPSS PROCESS macro (Model 1) was used to test moderating effects. Control variables, independent variables, moderating variables, and interaction terms were entered successively to analyze the moderating effects of information literacy dimensions on the information overload-anxiety relationship.

(4) Simple slope analysis: The strength of the main effect was examined at different levels of the moderator (M +/- SD).

4.4.2 Qualitative Data Analysis

Interview data were processed using thematic analysis to extract core themes and patterns related to the research questions and to explore the specific pathways and mechanisms through which information literacy moderates information overload. Finally, quantitative and qualitative results were integrated through methodological triangulation to enhance the reliability of the findings.

5 Results Analysis

5.1 Quantitative Results

5.1.1 Sample Characteristics and Scale Reliability and Validity

A total of 328 questionnaires were collected. After excluding 21 questionnaires with abnormal response time of less than three minutes, insufficient completion, or incorrect answers to attention-check items, 307 valid questionnaires were obtained, with a valid response rate of 93.6%. In the valid sample, gender distribution was relatively balanced, with 46.3% male and 53.7% female respondents. Undergraduates accounted for 68.7%, and graduate students accounted for 31.3%. Disciplinary backgrounds were mainly natural sciences (40.4%) and social sciences and humanities (38.1%). The most common daily social media use duration was 2-4 hours (46.2%), and 36.5% of respondents used social media for more than four hours per day.

Reliability and validity tests showed good internal consistency for the information overload scale (alpha=0.856), information literacy scale (alpha=0.873), and information anxiety scale (alpha=0.842). Confirmatory factor analysis indicated satisfactory construct validity for each scale: the two-factor model of information overload (chi-square/df=2.35, CFI=0.941, RMSEA=0.066), the three-factor model of information literacy (chi-square/df=2.18, CFI=0.953, RMSEA=0.062), and the single-factor model of information anxiety (chi-square/df=2.41, CFI=0.937, RMSEA=0.068) all met the fitting requirements.

5.1.2 Descriptive Statistics and Correlation Analysis

Table 1. Descriptive statistics and correlations of variables (N=307)

Variable	M	SD	1	2	3	4	5	6
1.Information quantity overload	3.72	0.76	1					
2.Information quality overload	3.58	0.81	.625**	1				
3.Filtering ability	3.24	0.84	-.346**	-.293**	1			
4.Critical evaluation	3.41	0.79	-.258**	-.412**	.371**	1		
5.Ethical awareness	3.63	0.73	-.157**	-.196**	.285**	.324**	1	
6.Information anxiety	3.48	0.87	.483**	.427**	-.361**	-.314**	-.173**	1

Note: **p<0.01; *p<0.05.

As shown in Table 1, information quantity overload (M=3.72) and information quality overload (M=3.58) were both at medium-high levels, indicating that college students generally perceived social media information overload. Among the information literacy dimensions, ethical awareness had the highest score (M=3.63), followed by critical evaluation (M=3.41), while filtering ability was relatively low (M=3.24). Information anxiety was also above the medium level (M=3.48).

Correlation analysis showed that the two dimensions of information overload were significantly and positively correlated with information anxiety (r=.483, r=.427, p<.01), providing preliminary support for H1. All three dimensions of information literacy were significantly and negatively correlated with information anxiety. Filtering ability had the strongest correlation (r=-.361, p<.01), followed by critical evaluation (r=-.314, p<.01), whereas ethical awareness had a relatively weaker correlation (r=-.173, p<.01). These results suggest that information literacy may have a potential buffering effect on information anxiety.

5.1.3 Effect of Information Overload on Information Anxiety

Table 2. Regression analysis of information overload on information anxiety

Variable	Model 1	Model 2
Control variables		
Gender	.089	.063
Education level	-.081	-.074
Discipline (natural sciences)	-.075	-.038
Discipline (social sciences and humanities)	-.043	-.021
Social media use duration	.185**	.092*
Predictors		
Information quantity overload		.367***
Information quality overload		.294***
Model statistics		
R^2	.068	.357
ΔR^2	.068**	.289***
F	4.273**	23.681***

Note: Standardized regression coefficients beta are reported; ***p<0.001, **p<0.01, *p<0.05.

After controlling for demographic variables, information quantity overload (beta=.367, p<.001) and information quality overload (beta=.294, p<.001) both showed significant positive predictive effects on information anxiety, and the model's explanatory power increased significantly (Delta R2=.289, p<.001). This indicates that H1 is supported: social media information overload significantly and positively affects college students' information anxiety, and the effect of information quantity overload is slightly stronger than that of information quality overload.

5.1.4 Test of the Moderating Effects of Information Literacy

The PROCESS macro (Model 1) was used to test the moderating effects of information literacy dimensions. The results are shown in Table 3.

Table 3. Moderating effects of information literacy dimensions

Variable	Filtering ability model	Critical evaluation model	Ethical awareness model
Information overload	.431***	.398***	.452***
Moderator	-.274***	-.231***	-.128*
Interaction term	-.159**	-.176**	-.072
R^2	.412	.385	.361
ΔR^2(Interaction term)	.021**	.025**	.004

Note: Standardized regression coefficients beta are reported; ***p<0.001, **p<0.01, *p<0.05. Control-variable parameters are omitted.

The results show that the interaction term between filtering ability and information overload had a significant negative predictive effect on information anxiety (beta=-.159, p<.01). The interaction term for critical evaluation was also significant (beta=-.176, p<.01), whereas the interaction term for ethical awareness did not reach significance (beta=-.072, p>.05). This indicates that filtering ability and critical evaluation ability significantly and negatively moderate the relationship between information overload and information anxiety, while the moderating effect of ethical awareness is not significant. Simple slope analysis (see Figures 2 and 3) showed that when filtering ability was low (-1 SD), the positive effect of information overload on information anxiety was significantly strengthened (simple slope=0.59, p<.001). When filtering ability was high (+1 SD), this effect was significantly weakened (simple slope=0.26, p<.01). Similarly, when critical evaluation ability was low, the effect of information overload on information anxiety was stronger (simple slope=0.57, p<.001). When critical evaluation ability was high, this effect was weakened (simple slope=0.23, p<.01).

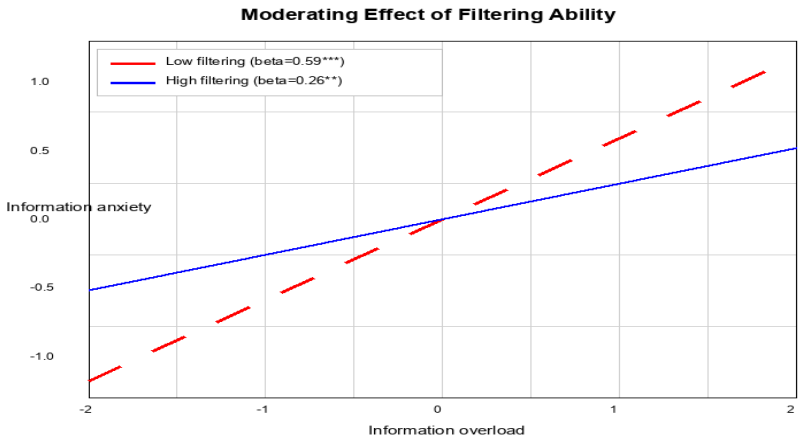


Fig. 2. Moderating effect of information filtering ability

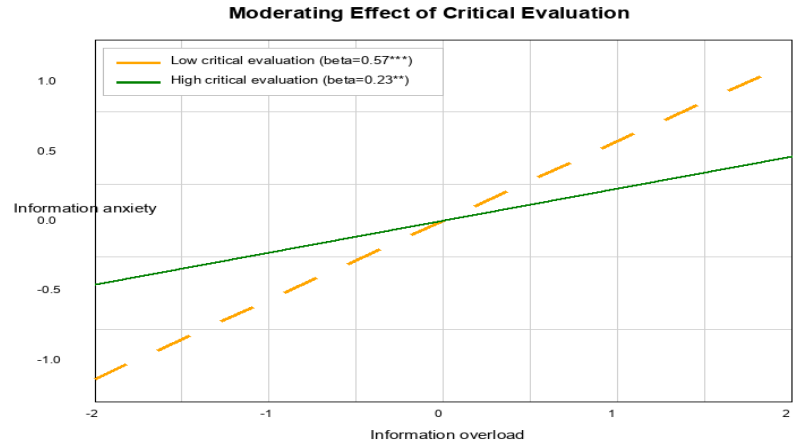


Fig. 3. Moderating effect of critical evaluation

These results support H2a and H2b, indicating that filtering ability and critical evaluation ability can negatively moderate the effect of information overload on information anxiety. H2c is not supported, because the moderating effect of ethical awareness is not significant.

5.1.5 Group Comparison by Disciplinary Background

The group analysis showed that the moderating effect of critical evaluation among students in natural science disciplines (beta=-.218, p<.01) was significantly stronger than that among students in social science and humanities disciplines (beta=-.127, p<.05), and the difference reached statistical significance (z=2.15, p<.05). In terms of ethical awareness, students in social science and humanities disciplines showed a significant moderating effect (beta=-.096, p<.05),

whereas students in natural science disciplines did not (beta=-.058, p>.05). These results support H3, indicating that disciplinary background has a significant influence on the moderating effects of information literacy.

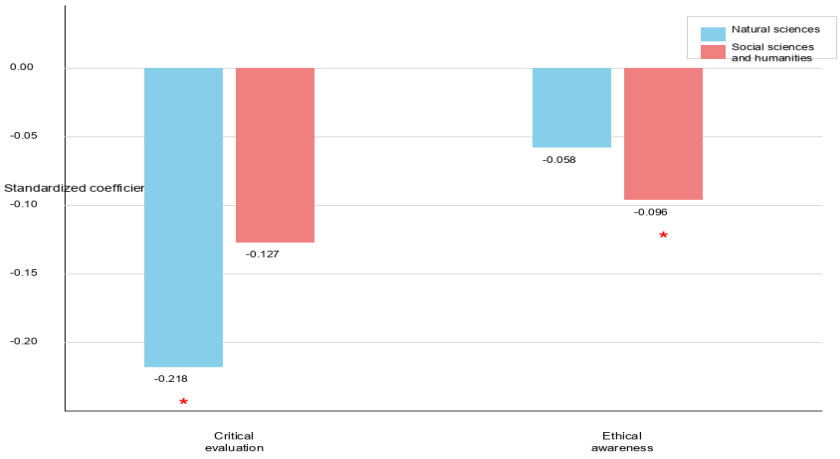


Fig. 4. Bar chart comparing the moderating effects of information literacy across disciplinary backgrounds

5.2 Qualitative Results

5.2.1 Thematic Framework of Interviews

Based on semi-structured interviews with eight respondents, including four with high information literacy and four with low information literacy, thematic analysis identified three core themes and corresponding subthemes (Table 4).

Table 4. Thematic framework of interview data

Core theme	Subtheme	Typical statement
Information overload experience	Attention distraction and fatigue	"After scrolling Douyin for more than ten minutes, my brain feels tired, but I still cannot stop scrolling" (S02, low literacy)
	Information anxiety and sleep effects	"When lying in bed at night, I often worry about missing important information, so I keep scrolling until very late" (S05, low literacy)
	Decision difficulty	"When facing a large amount of mutually contradictory information, I often cannot make a decision" (S08, low literacy)
Information literacy coping strategies	Active screening and filtering	"I regularly clean up my follow list and keep only accounts that are truly valuable" (S01, high literacy)
	Critical verification	"When I see important information, I cross-check it and confirm it with at least three sources" (S03, high literacy)
	Information restraint	"I use a time-management app to limit my social media use to no more than two hours per day" (S07, high literacy)
Differences in moderating mechanisms	Cognitive load management	"I am used to filtering out important information first and then processing it in batches, so I do not feel overwhelmed" (S04, high literacy)
	Self-efficacy enhancement	"As my ability to evaluate information improved, my anxiety about social media content decreased significantly" (S06, high literacy)
	Disciplinary cognitive characteristics	"My natural science background makes me used to processing information with systems thinking, so I can identify logical flaws more easily" (S03, natural science discipline)

5.2.2 Differences Between High and Low Information Literacy Groups

The interview analysis found three major differences between the high and low information literacy groups in coping with information overload:

(1) Differences in information reception strategies: The high-literacy group showed active information reception and effective filtering mechanisms. One high-literacy respondent (S01) stated, 'I strictly filter information according to the principle of need to know rather than want to know, which helps me deal effectively with information flows.' In contrast, the low-literacy group tended to receive information passively. As S05 said, 'Basically, I watch whatever the algorithm recommends, and I rarely filter actively, so I often feel overloaded with information.'

(2) Differences in cognitive processing: The high-literacy group tended to adopt deep-processing strategies. For example, S03 stated, 'I classify and integrate information, look for connections, and build knowledge networks, rather than simply memorizing information fragments.' The low-literacy group tended to use surface-level processing. S02 said, 'When I see interesting information, I save it directly, but I rarely go back to organize it, so my favorites folder piles up but is seldom used.'

(3) Differences in emotional regulation: The high-literacy group showed stronger emotional regulation ability. S06 shared, 'I regularly do a digital decluttering and turn off some platform notifications, which greatly reduces my information anxiety.' The low-literacy group often felt powerless to cope. S08 mentioned, 'When facing a large amount of information, I often feel anxious and helpless, not knowing how to deal with it, and it even affects my learning state.'

5.2.3 Qualitative Explanation of the Influence of Disciplinary Background

The interviews further revealed mechanisms underlying differences in how students from different disciplinary backgrounds apply information literacy:

(1) Systems-thinking advantage among students in natural science disciplines: High-literacy students from natural science backgrounds showed structured information processing. S03, a computer science major, stated, 'I am used to classifying information by reliability level and building a decision-tree-like mental model, which helps me quickly identify false information.' This systems thinking strengthened the effect of critical evaluation.

(2) Ethical sensitivity among students in social science and humanities disciplines: High-literacy students from social science and humanities backgrounds showed stronger information ethical awareness. S06, a journalism and communication major, said, 'I attach great importance to the social responsibility of information dissemination. Before reposting, I think about the possible social impact of the information, which also reduces my exposure to and dissemination of low-quality information.'

5.3 Integration of Quantitative and Qualitative Results

Through triangulation of quantitative and qualitative data, the following key findings were formed:

(1) Dimensional heterogeneity of moderating effects: The quantitative data showed that filtering ability and critical evaluation ability had significant moderating effects, whereas ethical awareness did not. The qualitative interviews explained this phenomenon: filtering and evaluation directly reduce cognitive load, whereas ethical awareness mainly affects information dissemination behavior and has a relatively indirect influence on individually perceived anxiety. As S07 stated, 'Information filtering ability reduced my exposure to invalid information by 75%, which directly lowered my cognitive burden and anxiety.'

(2) Moderating mechanism of disciplinary background: Quantitative analysis found that the moderating effect of critical evaluation was stronger among students in natural science disciplines, whereas students in social science and humanities disciplines performed better in

ethical awareness. The qualitative interviews showed that this difference stems from different disciplinary training. Natural science education strengthens logical analysis and evidence evaluation abilities, whereas social science and humanities education cultivates sensitivity to the social influence of information. S03 explained, 'Engineering training makes me used to looking for logical flaws and missing evidence chains in information,' while S06 said, 'A sociological perspective makes me pay more attention to the ethical consequences of information dissemination.'

(3) Dual paths of the moderating mechanism: Integrating the two types of data, this study identified two paths through which information literacy moderates the effect of information overload. The first is the cognitive resource optimization path, through which effective information filtering and critical evaluation reduce cognitive resource consumption. The second is the self-efficacy enhancement path, through which improved information literacy strengthens the sense of control over the information environment and reduces perceived uncertainty. As S04 stated, 'After mastering information filtering skills, I am no longer afraid of missing important information, because I believe I can find what I need.'

6 Discussion and Conclusion

6.1 Moderating Effects of College Students' Information Literacy on Social Media Information Overload

6.1.1 Main-effect Mechanism of Information Overload

Based on the empirical analysis above, this study verifies the differentiated moderating role of information literacy in the relationship between college students' social media information overload and information anxiety. The findings confirm the significant positive effect of social media information overload on college students' information anxiety (beta for information quantity overload=.367, p<.001; beta for information quality overload=.294, p<.001), which is consistent with the core assumptions of limited-capacity theory. The effect of information quantity overload on information anxiety is slightly stronger than that of information quality overload. This indicates that in the social media environment, the quantity of information has a more pronounced impact on cognitive load than the diversity or disorder of information quality. The qualitative interviews further revealed that anxiety caused by overload mainly appears through three paths: attention distraction and fatigue, such as 'feeling mentally tired after scrolling Douyin for just over ten minutes'; sleep-quality decline, such as 'often scrolling until very late'; and decision delay, such as 'often being unable to make a decision when facing a large amount of contradictory information.' These findings are consistent with those of Xu Ruichao et al. (2017) [**Error! Reference source not found.**] and Cheng Huiping et al. (2023) [**Error! Reference source not found.**], further confirming that social media information overload, as a technostress source, damages college students' mental health through cognitive resource depletion and emotional stress amplification [**Error! Reference source not found.**]. From a stress perspective, information and communication technology overload itself is a stressor, and long-term exposure may lead to more serious consequences such as social networking service fatigue [**Error! Reference source not found.**].

6.1.2 Differential Moderating Effects of Information Literacy

The study finds significant dimensional heterogeneity in the moderating role of information literacy. Information filtering ability (beta=-.159, p<.01) and critical evaluation (beta=-.176, p<.01) showed significant negative moderating effects on the information overload-anxiety relationship, whereas ethical awareness did not reach significance (beta=-.072, p>.05). This indicates that not all dimensions of information literacy can effectively moderate the negative effects of information overload, and that each dimension has distinct moderation paths and effect strengths.

Filtering ability significantly reduces cognitive load by actively filtering information and optimizing information processing strategies. As a high-literacy interviewee stated, 'I strictly

filter information according to the principle of need to know rather than want to know, which helps me deal effectively with information flows.' This echoes the strategic information searching dimension emphasized by the ACRL framework [Error! Reference source not found.], and is also consistent with the findings of Zhu et al. (2021) [Error! Reference source not found.] on the relationship between college students' information literacy and social media competence. Simple slope analysis further confirms that high filtering ability significantly weakens the effect of information overload on anxiety (simple slope=0.26, $p<.01$), whereas the effect is strengthened under low filtering ability (simple slope=0.59, $p<.001$).

Critical evaluation helps individuals judge information reliability and build information verification strategies, thereby strengthening their ability to cope with low-quality information, especially when facing information quality overload. The qualitative interviews showed that highly literate respondents often used cross-verification strategies: 'When I see important information, I cross-check it and confirm it with at least three sources.' This deep-processing strategy can effectively reduce information uncertainty and is highly consistent with Wen Zhonglin et al. (2005) [Error! Reference source not found.] on critical thinking and the reduction of confirmation bias.

The nonsignificant moderating effect of ethical awareness was also explained by the qualitative interviews. Ethical awareness mainly affects information dissemination behavior and has a relatively indirect effect on individually perceived anxiety. Compared with filtering and evaluation abilities, which directly reduce cognitive load, ethical awareness usually operates at the level of social interaction. Its buffering effect on information anxiety is more likely to appear as a long-term effect rather than an immediate moderating effect.

6.1.3 Boundary Conditions of Disciplinary Background

The study confirms that disciplinary background significantly influences the moderating effects of information literacy. The moderating effect of critical evaluation among students in natural science disciplines (beta=-.218, $p<.01$) was significantly stronger than that among students in social science and humanities disciplines (beta=-.127, $p<.05$). In contrast, the latter showed a more prominent moderating effect of ethical awareness (beta=-.096, $p<.05$ vs. beta=-.058, $p>.05$). This finding reveals group heterogeneity in the moderating effects of information literacy and shows that disciplinary training backgrounds shape information literacy in systematically different ways.

The qualitative interviews provide deeper explanations for these differences. Natural science education strengthens systems thinking and logical reasoning, cultivating the habit of classifying information by reliability level and building decision-tree-like mental models, thereby enhancing the effectiveness of critical evaluation. Social science and humanities education cultivates sensitivity to the social influence of information, making students pay more attention to social responsibility in information dissemination and the possible social consequences of information. These differences in disciplinary cognitive characteristics lead students from different backgrounds to adopt different information literacy strategies when coping with information overload.

6.1.4 Theoretical Integration of the Moderating Mechanism

Based on triangulation of quantitative and qualitative data, this study identifies two core paths through which information literacy moderates information overload. The first is the cognitive resource optimization path: effective information filtering and classification reduce exposure to invalid information and lower cognitive resource consumption. The second is the self-efficacy enhancement path: improved information literacy strengthens individuals' sense of control and confidence in the information environment and reduces anxiety related to information uncertainty. Information literacy is closely related to individuals' ICT self-efficacy [Error! Reference source not found.], and higher self-efficacy makes individuals more resilient when facing technostress. This finding engages well with social cognitive theory [Error! Reference source

not found.] and conservation of resources theory [Error! Reference source not found.], confirming that individual differences, represented by information literacy, serve as a key internal resource that can effectively moderate the effect of environmental stressors, represented by information overload, on psychological states. It thus provides new empirical support for the individual differences-technostress interaction model [Error! Reference source not found.].

6.2 Implications, Limitations, and Future Directions

Theoretically, this study extends research on the relationship between information overload and information literacy, verifies the moderating role of information literacy as an individual-difference variable in the negative effects of social media information overload, and enriches the empirical foundation of information behavior theory. Practically, this study provides evidence for information literacy education in universities. The results show that college students' information literacy dimensions are unevenly developed. Filtering ability is relatively weak (M=3.24), yet this dimension has a significant moderating role in alleviating information overload (beta=-.159, p<.01). Therefore, university information literacy education should focus on cultivating students' information filtering ability, for example by offering special courses on social media information filtering techniques. In addition, differentiated education strategies should be adopted according to disciplinary differences: students in natural science disciplines should strengthen ethical awareness, whereas students in social science and humanities disciplines should enhance critical evaluation ability, so as to achieve a balanced information literacy competence structure. For individuals, the findings suggest three strategies for coping with information overload: first, establish a personal information classification and processing mechanism, using batch processing rather than real-time response; second, use information filtering tools reasonably to reduce exposure to ineffective information; and third, regularly conduct digital decluttering and set a time budget for social media use. For social media platform designers, the concept of cognitive friendliness should be incorporated, including adjustable information density, intelligent information filtering tools, and information rest zones to help users reduce cognitive load. This study also has several limitations. First, sample representativeness is limited because the sample mainly came from universities in the author's region and may not fully represent the national population of college students. Second, the cross-sectional research design cannot rule out reverse causality, such as the possibility that information anxiety affects individuals' perception of information overload. Third, information literacy was measured mainly through self-report scales, which may involve social desirability bias. Finally, the two moderating paths proposed in this study, cognitive resource optimization and self-efficacy enhancement, were mainly derived from qualitative interviews and were not directly tested as mediating variables at the quantitative level. Future research may focus on the following aspects. First, the moderation model can be improved by exploring the interaction between information literacy and other individual-difference variables, such as cognitive style, to reveal the conditions under which the moderating effect of information literacy is stronger. Second, dynamic relationship research can be conducted using experience sampling or diary methods to track daily changes in information literacy, perceived information overload, and information anxiety, thereby revealing cyclical interactions among variables. Third, intervention experiments can be designed to test the practical effects of targeted information literacy improvement on alleviating information overload. Fourth, cross-group comparative research can expand the scope of participants and compare information literacy characteristics and moderating effects among college students of different educational levels and regions, thereby improving the generalizability of the conclusions. In summary, future research should continue to explore the interaction between information literacy and information overload and provide theoretical and practical support for cultivating high-quality talents suited to digital environments.

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