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A Review of Affective Load Theory and Its Applications in Information Behavior Research: Postprint

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Abstract

[Purpose/Significance] Through analyzing and synthesizing the theoretical underpinnings, applications, and related research findings of affective load theory, this study provides reference and guidance for domestic peers to further develop research designs.

[Method/Process] Through literature review and analysis, this paper traces the background of the proposal of affective load theory and elaborates on its theoretical underpinnings. Moreover, it reviews related empirical studies across three stages: pre-theory formation, theory proposal, and subsequent applications, analyzes the formation and development trajectory of the theory, and identifies directions for future research.

[Results/Conclusions] Affective load theory integrates multidisciplinary perspectives from cognitive science, affective neuroscience, affective cybernetics, and affective computing, and systematically examines user emotions during information behavior processes from a socio-bioinformation technology framework perspective. Affective load is a negative affective state, primarily an uncertainty arising from four negative emotions—irritation, anxiety, frustration, and anger—under time pressure. The theory has been applied to research on user information behavior in contexts such as virtual libraries and social media. Finally, directions for future research are identified.

Full Text

A Review of Research on Affective Load Theory and Its Application in Information Behavior Studies

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Abstract

[**Purpose/Significance**] By analyzing and summarizing the connotation, application, and related research findings of affective load theory, this paper aims to provide references for domestic scholars to further develop research designs. [**Method/Process**] Through literature research and analysis, this paper traces the background of affective load theory, elaborates on its theoretical connotation, and reviews relevant empirical studies across three stages: pre-theory formation, theory proposition, and subsequent application. The formation and development process of the theory is analyzed, and future research directions are identified. [**Result/Conclusion**] Affective load theory integrates multidisciplinary perspectives from cognitive science, affective neuroscience, affective control theory, and affective computing, systematically examining user emotions during information behavior processes from a socio-biological information technology framework perspective. Affective load is a negative emotion, primarily an uncertainty arising from four negative emotions—irritation, anxiety, frustration, and rage—under time pressure. The theory has been applied to study user information behavior in contexts such as virtual libraries and social media. Finally, future research directions are discussed.

Keywords: affective load, information behavior, information seeking behavior, library and information science

2. Affective Load Theory

2.1 Theoretical Background

Since the 1950s and 1960s, scholars have gradually recognized the influence and role of emotion on society, organizations, and individuals. Early cognitive science advocated behavioral mechanism theory, viewing humans as mechanical individuals controlled by their environment. With the development of cognitive psychology, researchers argued that behavioral mechanism theory could not fully explain human behavior, pointing out that human society is governed by specific affective rules and norms. This sparked an "affective revolution" [13], initiating discussions on the role of human emotion in maintaining social systems and producing early achievements such as Z. Sadl's "emotiology," which identified affective rules and norms as important criteria for social evaluation [2], and N. M. Ashkanasy and C. S. Daus's "emotional intelligence theory," which posited emotional intelligence as an important individual difference variable in organizational behavior research [14]. Concurrently, neuroscience revealed the mechanisms of emotion's influence on behavior at the brain neural level. A. Damasio noted [15] that specific emotions manifest as neural objects in the

brain, and that brain activity is a prerequisite for emotional experience; failure of brain neural activity restricts emotional experience, thereby affecting external behavior. Researchers in affective neuroscience focused on exploring emotional mechanisms through neurological indicators such as brain activity and physiological responses, examining human emotional manifestations including physiological reactions, muscle tension, sensory acuity, blinking frequency, and behavioral execution levels. Around 1995, the rise of affective computing significantly advanced research on human emotion in information science and computer science. Affective computing researchers view emotion as a subroutine that regulates process behavior, controlling a series of behaviors by influencing sensorimotor and cognitive systems. For example, when people feel dissatisfied with search results and experience negative emotions, the emotion of "frustration" (an affective subroutine) may terminate their problem-solving behavior.

Emotion influences cognition and behavior in multiple ways, including evoking cognitive strategies for executing goal intentions, interfering with attention processes, and affecting information interpretation, judgment, and decision-making [2]. When people interact with information, they naturally generate affective evaluations that form a filtering function for information and behavior. Negative emotions tend to hinder objective evaluation, producing avoidance behaviors such as technophobia and affecting users' full utilization of information and technology. In response to these negative emotions, users experience affective load, which constrains their information behavior [2]. D. Nahl pointed out that emotion accompanies the entire information seeking process, during which people generate positive or negative emotions. Positive emotions motivate and facilitate users to explore and achieve their information seeking goals, while negative emotions tend to weaken user confidence, leading them to stop or abandon the search process.

Drawing on advances in emotion research across different fields, D. Nahl proposed affective load theory (ALT) in 2004 while studying emotional manifestations and measurement issues among web searchers [5]. She established indicators for measuring user emotional states during information retrieval, enhancing the operability of emotion research. The interpretation and measurement of these indicators constituted the main content of early affective load theory. In subsequent years, D. Nahl conducted a series of empirical studies to enrich and refine this theory. In 2007, D. Nahl argued for the need to construct a unified theoretical framework for the information environment to comprehensively study information behavior [16]. By integrating previous research on emotion, D. Nahl proposed the socio-biological information technology model. This model more macroscopically divides information behavior into information reception and information use processes, involving two types of emotions: affective evaluation that determines whether information is accepted or rejected, and affective intention that promotes full information utilization. The sensory, cognitive, and affective systems developed through biological evolution serve not only to receive information but also to utilize information to execute and achieve specific functions. Therefore, affective intention influences the utilization pro-

cess of received information, striving to promote full information utilization and value realization.

In this model, affective load serves as a measurement indicator for negative emotions toward uncertainty, represented by the product of uncertainty multiplied by time pressure [2]. Discussing affective load within the socio-biological information technology model framework enables more systematic explanation of the mechanism of emotion's role in human-information and human-technology interactions. Thus, affective load theory gradually clarified and was subsequently applied to research on information needs in virtual libraries [17], information retrieval behavior [18], analysis of information acquisition failure causes [19], and the impact of visual stimuli on user cognition [20].

2.2 Basic Connotation

Affective load theory defines affective load as an uncertainty emotion that intensifies as people perceive time pressure [16]. T. D. Wilson et al. mentioned uncertainty in 2000 [21]. According to affective control theory, emotion's filtering function in information reception affects users' information processing, influencing behaviors such as attention to information, selection of search strategies, information screening and clicking, and judgment about when to stop searching when browsing web information. People accumulate a series of behavioral choice strategies through practical experience. Although decision-making and choice behaviors are largely influenced by cognition, cognitive processes are accompanied by affective needs and changes that affect cognitive decision-making.

Affective load theory also introduces another concept: affective coping skills (ACS). D. Nahl [22] stated that human behavior results from the combined influence of the affective domain (A), cognitive domain (C), and sensorimotor domain (S), typically including three processes: need generation, solution seeking, and action selection. Emotion is primarily reflected at the information need level because needs are often associated with emotion, influenced by individual interests, values, motivations, purposes, and goals. Cognition includes various information processing behaviors related to cognition, such as knowledge, comprehension, problem solutions, and critical interpretation. Sensorimotor mainly involves observable behavioral elements such as visual perception, speech, or navigation. The characteristics of affective load causing a series of negative information behaviors require users to take corresponding actions to eliminate the influence of negative emotions. This ability to dissolve and balance emotions is called affective coping skills.

Users with high affective coping ability can better self-control and avoid overt extreme behaviors. Users with low affective coping ability are more susceptible to negative emotions, which interfere with cognitive strategies, often leading to premature cognitive behaviors or more severe affective load. These typically manifest as uncertainty, anxiety, frustration, low expectations, pessimism, low self-efficacy, low motivation to complete tasks, low satisfaction, low system

acceptance, and other disruptive forms that interfere with positive outcomes. Affective coping ability varies among individuals due to differences in motivation, experience, cultural literacy, and cognitive characteristics. Measurement of affective coping ability is generally conducted through self-efficacy scales and optimism scales. Self-efficacy is considered the ability to effectively resist self-criticism and self-doubt caused by uncertainty and temporary failure, while optimism helps drive users to continue trying when encountering setbacks and obstacles. D. Nahl noted that higher self-efficacy and more optimistic attitudes make it easier to find methods to reduce negative emotions (anxiety and frustration) and increase success in information seeking [2].

Affective load theory identifies the characteristics of affective load changes. When users' cognitive behavioral outcomes are unsatisfactory, their affective load increases. When the increase is not significant, users are less susceptible to the negative effects of uncertainty emotions. However, when the increase is substantial, users are prone to cognitive confusion, generating negative emotions such as self-doubt and self-denial. At this point, affective coping ability needs to be applied for regulation to prevent users from abandoning or terminating tasks and reducing feelings of failure.

2.3 Measurement Methods

Affective load accompanies uncertainty during information reception and utilization. D. Nahl stated that affective load results from affective uncertainty increasing with time pressure. Affective load theory proposes several measurement methods for affective load and affective coping skills. Uncertainty is represented by four negative emotions, ranging from low to high negativity: irritation, anxiety, frustration, and rage. Uncertainty affective factors multiply with time pressure, and the result is the measurement of affective load. Specifically, the affective load measurement value equals the sum of the four emotion measurement results multiplied by the time pressure measurement value, expressed by the following formula:

$$AL = U[irritation + anxiety + frustration + rage] \times TP$$

D. Nahl also provided measurement recommendations for U and TP in the formula at the operational level [5]:

(1) **U (uncertainty)** represents uncertainty in information retrieval. The stronger the uncertainty, the higher the degree of negative emotion. To collect users' perception of uncertainty during information retrieval, D. Nahl proposed four questions, as shown in .

(2) **TP (time pressure)** refers to time pressure. D. Nahl borrowed the concept of time pressure from the Information Systems Association [5], defining it in information retrieval as the difference between users' expected time length before the retrieval task and their perceived time length after

task completion. As users invest more time in retrieval, they increasingly feel time pressure, especially when considerable time has passed with less progress than expected. Regardless of whether there is an explicit deadline, users feel pressure from time. This pressure may come from task time limits or from personal expectation gaps. When time pressure is low, users may only experience mild restlessness or anxiety in terms of affective uncertainty, but when time pressure is high, users may experience more intense emotions such as frustration and rage. Evaluation of time pressure typically involves asking users before they perform retrieval tasks, "How long do you think it will take to complete today's information retrieval task?" and then asking again after task completion about their perception of the time spent. D. Nahl recommended comparative statements with a 10-point scale for responses, where 1 indicates "much less time than others" and 10 indicates "much more time than others," with users selecting a level based on their own feelings.

(3) **Measurement of affective coping skills** includes two aspects: self-efficacy and optimism about the retrieval process. D. Nahl defined ACS as the sum of these two, typically collected before users perform information retrieval tasks, as shown in .

3. Theory Development and Application

During the formation, development, and application of affective load theory, D. Nahl and related researchers conducted a series of empirical studies. This study divides these research works into three stages according to their different characteristics during theory formation, maturation, and application, as listed in , and identifies representative studies.

3.1 Incubation Stage

Before the proposition of affective load theory, D. Nahl conducted extensive preliminary exploratory work. These studies drew on and integrated many existing emotion research theories and achievements, examining from multiple angles—including self-efficacy, satisfaction, task difficulty, and user expectations—their influence on user retrieval behavior, laying the foundation for later establishing emotional measurement indicators using these factors and exploring related influencing factors.

In 1993, D. Nahl [23] analyzed novice users' behavior with CD-ROM retrieval systems, comparing the effects of user-centered, affectively elaborated instructions versus system-centered instructions on user retrieval behavior. The study also examined the relationship between retrieval satisfaction, success, self-efficacy, and user emotion. The emotions involved mainly included users' retrieval uncertainty and retrieval anxiety. D. Nahl recruited 62 students from the University of Hawaii, randomly divided them into two groups, and had them use a CD-ROM information retrieval system (CD-ROM information retrieval

system) under different types of instructions to complete four retrieval tasks. Results showed that affective instructions were more helpful to users, leading to higher retrieval satisfaction, though they did not significantly affect retrieval success. However, affective instructions were more likely to guide students with high self-efficacy to achieve retrieval success, obtain higher retrieval satisfaction, and spend less retrieval time. Therefore, D. Nahl suggested that instruction manual writers or help providers should compile affective instructions to guide and advise users and help them improve their usage abilities and establish positive retrieval attitudes. Subsequently, D. Nahl and C. Tenopir [25] further examined the relationship between user emotion, cognition, and database retrieval behavior among novice users. This study recruited seven teachers and students from different majors who freely chose to complete three or four retrieval tasks, thinking aloud about their retrieval process including search questions, purposes, motivations, strategies, and satisfaction with results. Findings revealed that nearly half of the users' selected retrieval tasks involved emotional aspects. For novice users, emotional factors were more prominent, and they were more susceptible to negative emotions when encountering frustration, often prematurely stopping or abandoning retrieval even when simple adjustments could lead to success. Therefore, it was recommended that retrieval systems provide support and encouraging feedback for novice users' retrieval processes, which would likely motivate them to continue.

In 1996, D. Nahl [24] further examined the relationship between self-efficacy, emotion, and learning outcomes among internet learners. This study recruited 18 undergraduate students enrolled in a social psychology course with weekly online learning tasks. Students' self-efficacy was measured before the experiment, and each week they were asked to self-report negative emotions, task difficulty perception, importance of retrieval skills, satisfaction with computer and internet systems, and effort required for completion. Final course grades reflected learning outcomes. Results showed that as learning time progressed, students' negative emotions and difficulty perception increased, peaking before declining. Students with low self-efficacy had poorer final grades and some even dropped out mid-course, while those with high self-efficacy persisted and achieved better grades. This suggested that measuring self-efficacy could help predict student performance, and that information managers and instructors should consider how to improve teaching environments and scope to enhance students' self-efficacy and ultimately improve learning outcomes.

In 1997, D. Nahl and M. P. Meer [26] compared user cognition and emotion during the use of two web browsers from a more macroscopic systems perspective. The study recruited 21 students who used Netscape 3 and IE 3 to complete identical retrieval tasks, categorized as simple (e.g., jumping links, adding bookmarks) and complex (e.g., sending web files). Self-efficacy data were collected before task execution, and after task completion, information about browser familiarity, confidence levels, and skill levels was gathered. Results showed higher task completion success rates in IE 3 than in Navigator. Additionally, students with higher confidence levels achieved retrieval success more easily. The top 10%

of subjects in self-efficacy expectations performed smoothly on both browsers, while those with lower self-efficacy expectations only performed smoothly on one browser. The study also indicated that affective factors (e.g., self-efficacy expectations, satisfaction) influenced students' information cognitive behaviors such as sorting tasks, understanding screen menus, and interpreting labels and instructions, demonstrating the value of adding user-centered affective analysis.

In this stage of affective load theory formation, D. Nahl primarily used college students, graduate students, and teachers as research subjects, employing experimental methods, questionnaires, think-aloud protocols, and content analysis to explore the impact of self-efficacy, retrieval expectations, effort levels, optimism, and negative emotions on user retrieval behavior. This work laid the foundation for systematically establishing emotional measurement methods later on. In this initial stage, D. Nahl emphasized the impact of emotion on information behavior, revealed the relationship among emotion-cognition-sensorimotor domains, and mentioned affective coping skills, all of which laid the groundwork for D. Nahl's formal proposition of ALT.

3.2 Formation Stage

D. Nahl's research published in 2004 and 2005 has become the most cited source literature for introducing ALT theory. D. Nahl [5] explicitly proposed the concept of affective load and related measurement indicators when examining web users' information retrieval behavior and measuring the affective information environment. In this study, she recruited 73 senior undergraduate students from a psychology seminar, assigned them ten topics such as noise, spirituality, and the film "Nikita," and required them to complete research reports within one semester. During the process, the study collected various emotional measurement indicators mentioned in affective load theory through questionnaires. Data analysis depicted subjects' affective load changes during task completion, confirming that users' affective load significantly decreased when retrieval proceeded smoothly, and vice versa. The study also found significant correlations among the four negative emotions (irritation, anxiety, frustration, and rage), and a negative correlation between affective coping skills and affective load. D. Nahl divided subjects into high and low ACS groups based on ACS scores, finding that students with lower self-efficacy and optimism had weaker motivation to complete tasks. When students had higher self-efficacy and maintained optimistic attitudes toward retrieval results—indicating stronger affective coping ability—they were more motivated to continue retrieval tasks, further validating affective load theory. Additionally, users who attributed task completion to internal factors (e.g., retrieval skills) had lower affective load and uncertainty than those who attributed retrieval success or failure to external factors (e.g., retrieval systems, task difficulty). Thus, D. Nahl further clarified the feasibility of affective environment monitoring.

The following year, D. Nahl further examined the relationship between emotion and common online information behaviors [8]. Compared with the 2004

study, this research added task difficulty attributes. The study recruited 55 students who completed eight tasks over half a semester, including registering at designated websites, emailing instructors, finding specified procurement objects and completing research reports, and creating personal homepages linked to research reports. The study used the same questionnaire from 2004 to collect students' emotional states starting from the second week of the experiment. Findings revealed that users with high affective coping skills had stronger self-efficacy, higher optimism, lower uncertainty, and lower affective load, along with higher system acceptance. Greater task difficulty led to more uncertainty emotions and increased negative emotional experiences. Affective coping skills, self-emotion control, and optimistic emotions positively influenced retrieval effectiveness, with higher affective skills compensating for insufficient cognitive abilities. Compared with early experimental settings for specific retrieval tasks, this study increased task difficulty and environmental complexity, reaffirming the important influence of affective factors on user behavior, validating affective load theory hypotheses, revealing dynamic interaction effects between affective load and cognitive information behavior, and testing the impact of affective variables on information behavior.

Compared with the initial formation period of affective load theory, the theoretical framework was basically formed during this period, providing a relatively complete research approach for studying user affective behavior. D. Nahl's discussion of affective issues became more systematic. While emphasizing the important role of emotion, D. Nahl also began exploring more complex interaction mechanisms between emotion and behavior, laying the foundation for later construction of the unified socio-biological information technology model. Moreover, the affective load measurement questionnaire and calculation methods designed by D. Nahl provided a quantitative analysis approach for emotion research.

3.3 Application Stage

After the proposition of affective load theory, D. Nahl herself applied the theory in follow-up research, and related scholars have also used it as a theoretical basis or discussion support for research findings.

In 2010, D. Nahl [17] applied ALT theory to examine information need characteristics and affective load changes among users in "Second Life" (SL), a virtual social networking world. Second Life is a real-time communication system where users can custom-create buildings, clothing, animations, scripts, events, etc. in a 3D immersive environment. The study recruited 11 students enrolled in a Second Life experience course. Over a 16-week learning period, students were required to complete related tasks in SL and record each completion process. Using the emotional measurement methods from affective load theory, the study collected students' self-evaluations of optimism, self-efficacy, and uncertainty through structured questionnaires. Data analysis revealed that in SL, different types of information need satisfaction processes generate different intensities

of affective load. When urgent information needs are not met, users may experience the highest intensity of affective load. In contrast, when long-term or persistent information needs are temporarily unmet, users experience relatively lower affective load. However, overall, accumulated affective load shows a strengthening trend over time.

Affective load indicators have also been used as elements for measuring subjective factors in some information behavior studies. For example, in 2009, J. Gwizdka et al. [18] relied on ALT theory and incorporated affective load indicators when exploring the relationship between user subjective factors and retrieval behavior. Other subjective factors examined included satisfaction, happiness level, confidence, retrieval frustration, interest in retrieval topics, familiarity, and task difficulty perception. The study recruited 48 subjects who completed 12 tasks on Google and ALVIS, including fact-finding tasks and information gathering tasks. Before and after each task, questionnaires were used to solicit subjects' attitudes and feelings regarding the subjective factors. Results showed that higher happiness levels before and during retrieval led to better feelings after retrieval, accompanied by poorer behavioral performance and lower satisfaction. The longer the task completion time, the more difficult people tended to perceive the retrieval task. The more webpages users visited, the fewer pages they browsed and revisited, and the fewer bookmarks they marked, the lower their satisfaction. The more singular the task structure and the more familiar the search engine used, the less difficult people tended to perceive the retrieval task. Users who were unhappy before retrieval often achieved better task results, and good task results induced users to experience better positive emotions. This study used affective load theory's emotional measurement methods to reveal relationships among subjective factors, retrieval behavior, retrieval results, retrieval tasks, and retrieval systems, constructing an information behavior research model using CCA statistical analysis techniques to provide better solutions for analyzing multivariate models.

Some researchers have also used affective load theory as a supporting theory when examining fundamental theoretical issues affecting user cognitive behavior. For instance, in 2016, Y. Cetin et al. [20] explored the impact of affective visual stimuli on people's retrieval of target vocabulary. The study recruited 59 university freshmen aged 17-25, divided into two groups. Before the experiment, both groups learned 21 Spanish vocabulary words. They were then given two different visual stimuli: one group watched neutral nature documentaries, while the other viewed stimulating images containing sex and violence. Subsequently, both groups underwent vocabulary recall tests. Results showed that subjects who viewed affectively stimulating images remembered fewer vocabulary words than those who watched documentaries, possibly because the emotional images caused greater emotional fluctuation and attention distraction, making some subjects unable to calm down and complete the experiment. Using affective load theory, this study indicated that users' information behavior has certain affective orientations. Subjects' emotions were distracted by visual stimuli, making the affective filtering effect prominent and reducing information capacity,

thereby limiting students' cognitive abilities. These findings tested the existence of affective load's impact on cognitive behavior, indicating that intense affective visual stimuli easily have negative effects on cognitive behavior. Consequently, the study suggested that in multimedia-assisted learning environments such as video and internet, inappropriate visual stimuli should be prevented from distracting students' attention to avoid students' affective load leading to cognitive impairment.

Additionally, some researchers have combined affective load theory to study information behavior in specific contexts. For example, regarding information seeking behavior in online Q&A systems, L. Westbrook [27] in 2015 examined intimate partner violence (IPV) help-seeking phenomena on Q&A websites. Using grounded theory, the study collected 239 questions and 1,002 related answers from five websites. Through content analysis, the study constructed question types including advice-seeking, explanation-seeking, and fact-seeking, as well as five answer types. Coding and data analysis revealed that when help-seeking questioners completed fact-seeking tasks such as finding relevant legal litigation information, they often experienced anxiety and fear. This emotional experience intensified with difficulties encountered during legal information acquisition, thereby constraining questioners' reception and use of legal information. When responders provided encouraging answers, although they did not directly answer the questions, they offered emotional support, which also helped reduce questioners' affective load and promoted them to continue completing information search tasks. Thus, this study proposed suggestions for information service design and implementation based on affective load theory.

Other researchers have examined information behavior in crisis events from a news reporting perspective. For example, A. Thatcher et al. [19] in 2015 analyzed four news reports on the Fukushima nuclear accident using content analysis and discourse analysis. According to affective load theory, the analysis indicated that the Japanese nuclear industry's emphasis on safety had formed a social affective norm in Japan regarding nuclear safety, creating strong public confidence in nuclear safety. When the nuclear accident was reported, it easily caused public confidence in the nuclear industry to collapse, increasing industrial and financial risks. However, to maintain the previously established affective norm and avoid potential negative impacts from accident reporting, the Fukushima nuclear power plant incorrectly adopted a non-response attitude, lowered nuclear safety inspection standards, and avoided safety engineering improvements—information avoidance behaviors. When the nuclear leak occurred, managers failed to make timely and effective safety deployments, causing the public to develop stronger feelings of doubt and distrust, leading to public opinion incidents such as protests after the Fukushima nuclear accident. Therefore, this study proposed affective perspective-based public opinion guidance strategies and ideas for effective information management by organizations in crisis situations.

In summary, D. Nahl's affective load theory views the widely existing informa-

tion environment as an affective information environment because the generation of people's information needs, the query and processing conducted to satisfy these needs, and the usage behaviors after obtaining information are all accompanied by emotional experiences. D. Nahl focused on information reception and use, establishing a more systematic socio-biological information technology model to analyze the relationship between emotion and information behavior, and proposed affective load theory. This theory integrates ideas from cognitive science, affective neuroscience, affective control theory, and affective computing. Affective load theory posits that people's emotional states and cognitive processes constitute the internal order of information behavior, structured by social values and people's understanding of the information environment [4]. To better detect emotional changes during information behavior processes, affective load theory proposed the components of affective load and affective coping skills and designed a series of measurement indicators, enhancing the feasibility and operability of measuring affective load and coping skills. Subsequently, the theory was applied to different contexts such as virtual libraries, social media, and daily information behavior, comprehensively employing experimental methods, questionnaires, content analysis, discourse analysis, grounded theory, and other methods, which further enriched and refined affective load theory.

Compared with other information behavior theories [28-29], affective load theory has not been proposed for long, but it has played a positive role in promoting and supporting information behavior research from an affective perspective. However, the theory still needs further improvement and development: (1) Further reveal the relationship between emotion and cognitive behavior, especially in diverse information environments. This includes both purposeful, active information retrieval processes—examining user emotion generation and changes at different retrieval stages and under different retrieval tasks and their relationship with cognitive behavior—as well as non-purposeful information interaction processes such as browsing and reading, examining user affective load and its influences. (2) Further strengthen the objectivity of emotion acquisition and measurement. Although emotion is people's subjective experience of things, the emotional measurement mentioned in ALT mostly adopts self-report scales. Combining modern neuroscience and brain science research achievements, physiological detection methods such as eye tracking, galvanic skin response, and secretion or excretion of neurochemical substances in the body [30-31] can be used to more finely capture users' emotional changes and explore their relationships with cognitive behavior. (3) Further strengthen theoretical discussion to guide practice. While exploring and revealing these internal laws, attention should be paid to how to combine these research findings with real-world information environments to promote the arrangement of physical environments and improve the humanized design of information systems, thereby creating environments that not only help reduce user affective load but also support users in improving affective coping skills and enhancing their ability to obtain information. (4) Further expand the range of research participant populations. In addition to using college students as research subjects, more attention should

be paid to examining the emotional needs and satisfaction of vulnerable groups such as children, adolescents, the elderly, and people with disabilities during information acquisition processes.

Domestically, a series of studies examining the relationship between information behavior and emotion have emerged, such as investigating emotional issues in adolescents' information queries [32], emotional issues in collaborative information retrieval behavior [33], and emotional influence mechanisms in Weibo users' original information sharing behavior [34]. These studies primarily use anxiety emotion scales, cognitive emotion theories, and other tools to establish measurements of user emotional factors, with limited reliance on and reference to specialized theories such as affective load. Therefore, future research could discuss the applicability and feasibility of affective load theory for domestic user information behavior studies, explore and test the influence of cultural differences on the relationship between emotion and information behavior through empirical research, and promote exploration of emotional issues in information behavior.

References

[1] Mischel W, Shoda Y. A cognitive-affective system theory of personality: reconceptualizing situations, dispositions, dynamics, and invariance in personality structure[J]. Psychological review, 1995, 102(2): 246-268.

[2] Nahl D, Bilal D. Information and emotion: the emergent affective paradigm in information behavior research and theory[M]. Medford: Information Today, 2007.

[3] Lopatovska I. Searching for good mood: examining relationships between search task and mood[C]//Proceedings of the American Society for Information Science and Technology. Silver Spring: ASIS, 2009, 46(1): 1-13.

[4] Qiao Huan. Information Behavior[M]. Beijing: Beijing Normal University Press, 2010.

[5] Nahl D. Measuring the affective information environment of Web searchers[J]. Proceedings of the Association for Information Science and Technology, 2004, 41(1): 191-197.

[6] University of Hawaii[EB/OL]. [2016-12-30]. http://www2.hawaii.edu/~nahl/.

[7] University of Kentucky Libraries. Library faculty publications[EB/OL]. [2016-12-30]. http://uknowledge.uky.edu/libraries_{facpub}/17/?utm_{source}=uknowledge.uky.edu%2Flibr

[8] Nahl D. Affective and cognitive information behavior: interaction effects in Internet use[J]. Proceedings of the Association for Information Science and Technology, 2005, 42(1): 246-268.

[9] Buntrock R E. Information and emotion: the emergent affective paradigm in information behavior research and theory[J]. Journal of documentation, 2008, 64(3): 1137-1142.

[10] Fisher K E, Erdelez S, McKechnie L. Theories of information behavior[M]. New Jersey: Information Today, 2005.

[11] Zhang Min, Xia Yu, Liu Xiaotong. Analysis of influencing factors of scientific citation behavior[J]. Information Studies: Theory & Application, 2017, 40(4): 72-77.

[12] Xu Jie, Zhou Ning. The effect of need for cognition on individual information processing tendency[J]. Advances in Psychological Science, 2010, 18(4): 685-690.

[13] Sadl Z. The "affective" revolution: cognitive turn in contemporary social sciences: emotiology in Slovenia[J]. The European legacy, 1996, 1(3): 958-963.

[14] Ashkanasy N M, Daus C S. Rumors of the death of emotional intelligence in organizational behavior are vastly exaggerated[J]. Journal of organizational behavior, 2005, 26(4): 441-452.

[15] Damasio A. The feeling of what happens: body and emotion in the making of consciousness[M]. New York: Harcourt, 1999.

[16] Nahl D. Social-biological information technology: an integrated conceptual framework[J]. Journal of the association for information science and technology, 2007, 58(13): 2021-2046.

[17] Nahl D. Affective load and engagement in second life: experiencing urgent, persistent, and long-term information needs[J]. International journal of virtual & personal learning environments, 2010, 1(3): 1-16.

[18] Gwizdka J, Lopatovska I. The role of subjective factors in the information search process[J]. Journal of the Association for Information Science and Technology, 2009, 60(12): 2452-2464.

[19] Thatcher A, Vasconcelos A C, Ellis D. An investigation into the impact of information behaviour on information failure: the Fukushima Daiichi nuclear power disaster[J]. International journal of information management, 2015, 35(1): 57-63.

[20] Cetin Y, Griffiths C, Ozel Z E, et al. Affective overload: the effect of emotive visual stimuli on target vocabulary retrieval[J]. Journal of psycholinguistic research, 2016, 45(2): 1-11.

[21] Wilson T D, Ford N J, Ellis D, et al. Information seeking and mediated searching: part 2. Uncertainty and its correlates[J]. Journal of the Association for Information Science and Technology, 2002, 53(9): 704-715.

[22] Nahl D. Information counseling inventory of affective and cognitive reactions while learning the Internet[J]. Internet reference services quarterly, 1997, 2(2/3):

11-33.

[23] Nahl D. CD-ROM point-of-use instructions for novice searchers: a comparison of user-centered affectively elaborated and system-centered unelaborated text[D]. Hawaii: University of Hawaii, 1993.

[24] Nahl D. Affective monitoring of Internet learners: perceived self-efficacy and success[C]//Proceedings of the ASIS annual meeting. Silver Spring: ASIS, 1996: 100-109.

[25] Nahl D, Tenopir C. Affective and cognitive searching behavior of novice end-users of a full-text database[J]. Journal of the American society for information science, 1996, 47(4): 276-286.

[26] Nahl D, Meer M P. User-centered assessment of two Web browsers: errors, perceived self-efficacy, and success[C]//Proceedings of the ASIS annual meeting. Silver Spring: ASIS, 1997: 89-97.

[27] Westbrook L. Intimate partner violence online: expectations and agency in question and answer Websites[J]. Journal of the association for information science and technology, 2015, 66(3): 599-615.

[28] Kuhlthau C C. Inside the search process: information seeking from the user's perspective[J]. Journal of the American society for information science, 1991, 42(5): 361-371.

[29] Wilson T D. Models in information behaviour research[J]. Journal of documentation, 1999, 55(3): 249-270.

[30] Wu D, Li Y. Online health information seeking behaviors among Chinese elderly[J]. Library & information science research, 2016, 38(3): 272-279.

[31] Li Jiayuan. Research status and cognitive dilemmas of affective computing[J]. Journal of Dialectics of Nature, 2012(2): 23-28.

[32] Li Fufeng. The relationship among internet self-efficacy, search strategy and information anxiety of adolescents[D]. Beijing: Capital Normal University, 2009.

[33] Qiu Jin, Wu Dan. Research on emotion in collaborative information retrieval behavior[J]. Library and Information, 2013, 150(2): 105-110.

[34] Jin Xiaoling, Fang Yuan, Zhou Zhongyun. Exploring Weibo users' original information sharing behavior: based on impulsive behavior perspective[J]. Journal of the China Society for Scientific and Technical Information, 2016, 35(7): 739-748.

Author Contributions:

Huang Kun: Designed the research framework and structure, organized literature, and polished the manuscript.

Li Jingjin: Collected and organized literature, drafted the manuscript, and revised the paper.
Wu Yingmei: Participated in research design and manuscript polishing.

Note: Figure translations are in progress. See original paper for figures.

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