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## Online Health Information Seeking Behavior: A Systematic Review of Experimental Research Content and Implications - Postprint

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### Abstract

[Purpose/Significance] To comprehensively review and comment on existing experimental research on online health information retrieval behavior, propose suggestions for expanded applications in future experimental studies, and provide a basis for the selection of subsequent experimental research. [Method/Process] Using qualitative analysis tools, content analysis was conducted on 41 sample literature documents, categorizing experimental research on online health information retrieval behavior into behavioral influencing factors, behavioral types, behavioral contexts, and behavioral group characteristics, with specific discussions on the experimental content of these four aspects and future expanded research directions. [Results/Conclusion] Experimental research on online health information retrieval behavior should, based on the deepening of behavioral influencing factors, integration of behavioral types, diversification of behavioral contexts, and multi-dimensionalization and refinement of behavioral group characteristics, focus on conducting experimental generalization in real and natural environments, comparative research on mobile health information retrieval and cross-screen retrieval, as well as differential analysis research on special contexts and special populations.

### Full Text

#### Preamble

#### A Review and Enlightenment of Experimental Research on Online Health Information Retrieval Behavior

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**Abstract:** [Purpose/Significance] This paper provides a comprehensive review and commentary on existing experimental studies of online health information retrieval behavior, proposes suggestions for future extended applications of experimental research, and offers a basis for subsequent study selection. [Method/Process] Using qualitative analysis tools, we conducted content analysis on 41 sample documents, categorizing experimental research on online health information retrieval behavior into four aspects: behavioral influencing factors, behavioral types, behavioral situations, and behavioral group characteristics. We specifically discuss the experimental content of these four dimensions and future research directions. [Result/Conclusion] Future experimental research on online health information retrieval behavior should focus on promoting experiments in real-world natural environments, comparative studies of mobile health information retrieval and cross-screen retrieval, and differentiated analysis of special situations and populations, while deepening behavioral influencing factors, synthesizing behavioral types, diversifying behavioral situations, and refining behavioral group characteristics in multiple dimensions.

**Keywords:** online health information; retrieval behavior; experimental study; grounded theory

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In 2018, China's State Council approved the "Opinions on Promoting the Development of 'Internet Plus Healthcare'," followed by supporting policies from the National Health Commission including the "Administrative Measures for Internet Diagnosis and Treatment (Trial)" and "Administrative Measures for Internet Hospitals (Trial)." With policy support, the "Internet Plus Healthcare" model has continuously developed, and the internet has gradually become an important channel for people to access medical and health resources. Meanwhile, public attention to health issues has expanded from disease treatment to disease prevention and self-care, increasing the demand for health information and making health information behaviors increasingly common [1]. According to data from the 2018 Toutiao Health Conference, health information searches on the Toutiao platform alone reached 33.6 billion views from October 2017 to October 2018, an increase of 10 billion from the previous year [2].

However, behind the prevalence of online health information retrieval behavior, many problems remain, such as difficulties in finding health information and uneven quality of health information [3]. As an intermediary between individual users and online health information, in-depth research on online health information retrieval behavior helps accurately identify user needs and provide information content that aligns with online health information retrieval pathways. In this context, an increasing number of scholars are studying online health information retrieval behavior.

Current research primarily employs methods such as model construction [4-5] and questionnaire surveys [6-7]. However, as research in the field of online health information retrieval deepens, some scholars have begun to use experimental research methods as an important approach to obtain behavioral data. These studies attempt to verify research hypotheses and draw conclusions through reasonable and effective experimental designs that artificially control or create variables. Compared with data analysis and perceptual descriptions using questionnaire surveys, experimental research methods can obtain more objective, continuous, real-time, and controllable data, enabling deeper analysis and discussion of complex research objects such as user behavior.

## 2 Related Overview

### 2.1 Online Health Information Retrieval Behavior

There is no unified and clear definition of online health information in academia, with most definitions focusing on health information itself. For example, B.J. Elliott et al. believe that health information refers to all information related to medical or health care, including medical knowledge, health knowledge, and patient health service information [8]. Based on this definition, this paper considers online health information as an extension of health information in internet contexts—all information related to medical or health care that relies on the internet and related applications.

T.D. Wilson's information-seeking behavior model posits that information-seeking behavior is the result of individual information needs; that is, users must retrieve formal and informal (such as interpersonal) information resources to obtain needed information [9]. As a subordinate concept of information-seeking behavior, this paper defines information retrieval behavior as a series of psychological and physical activities users engage in when interacting with formal information resources (such as various websites) to obtain needed information.

Online health information is the primary object of online health information retrieval. Online health information retrieval behavior is difficult to define clearly, with no dominant definition, and is typically defined according to the article's purpose or focus [10]. For example, Wang Ruoqia et al., in their study of query and click behavior in online health information retrieval, define online health information retrieval behavior as activities where people, driven by health information needs and motivations, use computer systems to retrieve, browse, select, evaluate, and utilize health-related knowledge or information [11]. C.G. Loiselle et al., in their study examining the impact of self-evaluation motivation on health information retrieval behavior, consider it a self-regulation strategy used to organize transactions between the self and health information to balance the benefits and subjective costs of information outcomes [12].

Based on domestic and international research findings and definitions of online health information and information retrieval behavior, this paper defines online

health information retrieval behavior as a series of psychological and physical activities that occur when users interact with internet-based health information resources driven by health information needs and motivations. Due to the importance of health status to individuals and families, anyone facing health issues inevitably experiences worry and fear [13]. The special attributes of health information make online health information retrieval behavior different from general online information retrieval behavior, such as its emphasis on meeting needs [14]. Experimental research methods can present the characteristics of online health information retrieval behavior more objectively, making a review of experimental research on this topic beneficial for deepening academic understanding of health information retrieval behavior characteristics and guiding the development of health information retrieval tools.

## 2.2 Experimental Research on Online Health Information Retrieval Behavior

The experimental research method studies changes in social behavior and phenomena by controlling situations and variables to establish causal relationships between variables [15], offering advantages such as control, rigor, time efficiency, and cost-effectiveness required for causal evidence [16]. Social sciences have widely applied experimental methods to study various concepts and construct relevant social theories through connections between these concepts [17]. NVivo is analysis software that helps researchers organize, analyze, and query unstructured or qualitative data, and research shows that using NVivo can improve research rigor and scientific validity [18]. Therefore, this paper adopts grounded theory methods, using NVivo 11 software to code and analyze literature obtained from databases. Based on a comprehensive review of experimental research content on online health information retrieval behavior, we summarize the research content and propose extended application suggestions for future experimental research.

## 3 Research Design

### 3.1 Research Methods and Tools

Grounded theory is a bottom-up approach to building substantive theory, which involves identifying core concepts reflecting social phenomena based on systematically collected data [19]. In formal coding, we focused on literature abstracts, research designs, and conclusions/discussions as primary coding areas, with other sections as secondary coding areas. Considering the small coding granularity and fuzzy boundaries between literature content codes, we used repeated coding for reliability control—after initial coding, we conducted group discussions and randomly re-coded samples to carefully analyze and review inconsistent nodes to improve coding reliability and consistency.

**First Stage: Open Coding.** By reading literature materials from top to bottom, we decomposed and analyzed the content, using labeling to assign concepts

to research content, forming 39 concepts such as task situation, education level, and cognition, marked as free nodes.

**Second Stage: Axial Coding.** The main task of axial coding is to discover and establish various relationships between concepts and summarize them into higher-level categories based on these relationships. We repeatedly compared and analyzed the 39 free nodes identified in open coding to find associations. For example, using user ability as an axis, we found that free nodes such as “retrieval experience,” “internet familiarity,” and “education level” all belonged to the same category, which we summarized as “user individual factors.” Ultimately, we formed 11 nodes marked as tree nodes.

**Third Stage: Selective Coding.** Through the above coding process, we further summarized four systematic core categories: behavioral influencing factors, behavioral types, behavioral situations, and behavioral group characteristics. Behavioral influencing factors refer to factors affecting online health information retrieval behavior, including user individual factors and information/information environmental factors. Behavioral types involve vertical exploration of online health information retrieval behavior, including retrieval entry selection behavior, query formulation behavior, retrieval result browsing behavior, and retrieval result selection behavior. Behavioral situations refer to explorations of online health information retrieval behavior in specific environments or platforms, including task situations, device situations, and problem situations. Behavioral group characteristics refer to behavioral features and patterns discovered through experimental research targeting specific groups, including specific group characteristics and general group characteristics.

We used Gephi 0.9.2 software to visualize sample literature content, obtaining the source and proportion of experimental research content on online health information retrieval behavior (see [Figure 3: see original paper]). Specific coded data summaries are shown in .

## 3.2 Research Process

**3.2.1 Data Sources** To obtain literature highly relevant to the research topic, we retrieved literature through three steps. First, we selected databases. Through preliminary investigation, we chose authoritative databases covering medicine and information management, ultimately selecting Web of Science, ScienceDirect, CNKI, and Wanfang as retrieval databases.

Second, we determined search formulas. For English databases, the search formula in Web of Science was: (online OR internet) health information AND (search\* OR retriev\* OR seek) AND behavior AND experiment. *Since ScienceDirect cannot directly recognize wildcards ()*, we transformed the search formula individually for searching. For Chinese databases, we used “health information,” “retrieval,” and “experiment” as search terms with logical “AND” relationships. Search fields were limited to “subject” for both Chinese and English databases. Subject retrieval is a method that directly uses words expressing

literature content as search entry points, offering good intuitiveness, strong universality, and high specificity compared with other retrieval methods [19]. The retrieval deadline was June 12, 2019.

Finally, we screened and supplemented literature. We read literature abstracts and keywords individually, removing duplicate database records and records with low relevance. We read full texts of highly relevant literature to determine final inclusion. Additionally, we discovered new subject terms during reading (such as “observe” mentioned in some literature in addition to the above retrieval terms) to supplement literature. Ultimately, we selected 27 English and 14 Chinese documents. The literature retrieval process is shown in [Figure 2: see original paper].

After these steps, we finalized 41 sample documents and created a literature list, using P01-P41 as corresponding file numbers.

**3.2.2 Literature Coding** Before formal coding, we designed a literature coding scheme, including data coding rules and presentation of coding results. We imported standardized literature into NVivo 11 software and checked each document for completeness and validity. We used grounded theory to conduct hierarchical coding on literature materials.

\*\* Summary of Literature Coding\*\*

Selective Coding	Axial Coding
Behavioral Influencing Factors	User Individual Factors; Information and Information Environmental Factors
Behavioral Types	Retrieval Entry Selection Behavior; Query Formulation Behavior; Retrieval Result Browsing Behavior; Retrieval Result Selection Behavior
Behavioral Situations	Task Situation; Device Situation; Problem Situation
Behavioral Group Characteristics	Specific Group Characteristics; General Group Characteristics

**3.2.3 Model Building** After three-stage coding, the logical relationships between nodes and sub-nodes were basically formed. We used NVivo’s modeling function to form a categorical relationship model of experimental research on online health information retrieval behavior, as shown in [Figure 4: see original paper].

## 4 Research Findings

### 4.1 Behavioral Influencing Factors

Online health information retrieval behavior is influenced by multiple factors. Behavioral influencing factors are one of the main contents of experimental research on online health information retrieval behavior, accounting for 38.1% of coding reference points. Deng Xiaozhao, based on Lewin's formula, divides network user information behavior influencing factors into user individual factors, information and information environmental factors, and social and natural environmental factors [20]. Social and natural environmental factors are rarely involved in online health information retrieval behavior experimental research. Accordingly, this paper divides online health information retrieval behavior influencing factors into user individual factors and information and information environmental factors.

**4.1.1 User Individual Factors** User individual factors are internal factors affecting user online health information retrieval behavior, mainly including user cognition and individual characteristics, such as cognitive need level, retrieval experience, and health information literacy. Cognitive need level has significant correlation with health information retrieval behavior [1] (P06), affecting overall user health information retrieval behavior, retrieval strategies, retrieval results, target webpage operations, and query modification operations [21] (P02). The combination of knowledge and key cognitive abilities is crucial for successful health information retrieval [22] (P32). Regarding other individual characteristic differences, proficient users can effectively filter information based on retrieval intentions and data sources, while users with lower technical levels are easily distracted by irrelevant information [23] (P20). Retrieval experience, health knowledge literacy, and health information retrieval literacy are closely related to the health information retrieval process and results, with interactive effects between health knowledge literacy and health information retrieval literacy on user retrieval result variables [24] (P04). Good health information literacy helps select professional retrieval tools and implement retrieval quickly and accurately [25] (P08).

Additionally, the health information users select aligns with their motivational orientation, and consistency effects stimulate higher user engagement, thereby affecting users' perceived information quality of online health information [26] (P19). Familiarity with health topics also affects users' retrieval behavior for health information [27] (P16).

**4.1.2 Information and Information Environmental Factors** Information, as the object of user behavior [4], is one of the external factors affecting online health information retrieval behavior. The information environment provides a venue for information transmission and has a "ship and cargo" relationship with information, constraining user behavior [28]. Under increasingly complex information systems, online health information retrieval behavior is in-

creasingly affected by external information environmental factors, with many users feeling at a loss when retrieving high-quality health information. Research shows that health opinions provided through expert networks may be more effective for users than those from public information sources [29] (P21). Studies based on classifications of online health information sources available to users found that users are more likely to act on health information from websites than from blogs or personal homepages [30] (P27). The organizational affiliation of other users who generate comments on health information webpages (such as affiliation with a pharmaceutical manufacturer) can increase user awareness of health information and affect user online health information retrieval behavior [31] (P14). Information type also affects online health information retrieval behavior; narrative information is a powerful means of promoting positive health behavior [32] (P23), while information uncertainty increases demand for online health information retrieval but also increases anxiety [33] (P29).

As complex behavioral individuals, users' online health information retrieval behavior is affected by factors at different levels. With deepening experimental research on health information retrieval behavior, academic exploration of behavioral influencing factors continues to deepen. Regarding user individual factors, research on cognitive factors has extended from comprehension and familiarity with health information to judgment and decision-making levels regarding retrieved health information. The influence of other individual characteristic factors (such as health information literacy) has expanded from tool selection before retrieval to filtering health information data sources during retrieval. Regarding information and information environment, research has evolved from initially exploring how basic information and information environment carrier characteristics affect behavior to increasingly focusing on their correlations, developing to examine webpage comments and resulting health information anxiety.

## 4.2 Behavioral Types

Behavioral types involve vertical exploration of online health information retrieval behavior. According to the general process of health information retrieval behavior, this paper divides experimental research on online health information retrieval behavior into retrieval entry selection behavior, query formulation behavior, retrieval result browsing behavior, and retrieval result selection behavior (see for details), accounting for 27.5% of coding reference points.

\*\* Behavioral Types and Descriptions\*\*

Behavioral Type	Description
Retrieval Entry Selection Behavior	Selecting initial retrieval entry; changing retrieval entry
Query Formulation Behavior	Selecting initial query; reformulating query

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Behavioral Type	Description
Retrieval Result Browsing Behavior	Browsing retrieval results; browsing webpage content; clicking webpage links
Retrieval Result Selection Behavior	Evaluating and selecting needed health information; sharing behavior

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**4.2.1 Retrieval Entry Selection Behavior** Retrieval entry selection behavior refers to users' series of behaviors in selecting retrieval tools during health information retrieval, mainly including initial retrieval entry selection and retrieval entry change. Research shows that users mostly choose search engines for retrieval, rarely using advanced search [34] (P03). Users generally first retrieve information through search engines, then enter professional medical consultation websites through search engine result pages [35] (P07). When task difficulty increases, most users supplement their retrieval with social applications like Zhihu and Weibo and vertical medical applications like Chunyu Doctor according to retrieval needs [36] (P36). Users more familiar with health information and more confident in their behavior will choose more professional health websites [37] (P22).

**4.2.2 Query Formulation Behavior** Query formulation behavior refers to users' behavior in initially constructing and reformulating queries during retrieval. Queries can indicate users' understanding and familiarity with health information, while query reformulation can reflect changes in users' cognition of health information during retrieval. Initial query selection generally has three situations: direct input and pasting, dropdown list selection, and using keywords provided by search engines [38] (P05). Few users add Boolean operators to queries [39] (P09), but inputting word combinations is often most effective [40] (P25). Regarding initial query selection, differences in information need types and cognitive styles lead to variations [21,34] (P02, P03). When reformulating queries, users tend to make queries more specific or iterate in different ways [41] (P18). The number of query reformulations positively correlates with search duration [42] (P17), and users unfamiliar with health information reformulate queries more frequently [27] (P16).

**4.2.3 Retrieval Result Browsing Behavior** Browsing refers to goal-directed or non-goal-directed semi-structured information-seeking behavior conducted to satisfy known or unknown information needs [43]. Online health information retrieval result browsing behavior mainly includes browsing pages, clicking to enter pages, and returning to previous pages. Research shows that most users only visit one of the first few search results during health information retrieval [44] (P28), then reorganize their search instead of turning to the second page to view further results [40] (P25). Users quickly decide

whether to further browse a website or visit another based on the first page [37] (P22). Once users select a website, they begin scanning text to determine the relevance of health information [23] (P20). Users eager to achieve goals care less about content details, instead browsing quickly and returning to webpage pages multiple times [26] (P19). Cognitive need level positively correlates with total webpages opened [1] (P06). Users bookmark content they consider valuable [35] (P07), and time spent on pages positively correlates with time spent analyzing retrieval results [45] (P10).

**4.2.4 Retrieval Result Selection Behavior** Retrieval result selection behavior refers to users' behavior in screening and discriminating large amounts of raw or processed information and materials, selecting needed content, and internalizing it into their knowledge structure. This behavior integrates judgment, evaluation, and decision-making [46]. Accordingly, this paper divides retrieval result selection behavior in experimental research on online health information retrieval behavior into evaluation behavior during selection and sharing behavior after selection.

Evaluation behavior refers to users' evaluation of retrieved health information. Research finds that during evaluation, users do not assess the quality of all links on the network to evaluate health information quality [40] (P25), but continuously evaluate information source credibility, information credibility, and design features at different points in the retrieval process [37] (P22). Users who trust retrieved health information develop a desire to share it. Sharing behavior refers to users recommending or disseminating retrieved health information. Research finds that disclosing organizational affiliations of health information commenters (such as affiliation with a pharmaceutical manufacturer) affects users' likelihood of spreading information and recommending it to family and friends throughout online and offline social networks [31] (P14). Users who retrieve narrative health information are more likely to recommend it than those retrieving non-narrative health information [32] (P23).

Overall, online health information retrieval behavior can be divided into different stages according to users' general retrieval process. Retrieval entry selection behavior is the initial stage of health information retrieval, determining the direction of health information retrieval behavior, and its selection may directly affect the accuracy and professionalism of retrieval results. Query formulation behavior is the development stage of health information retrieval; initial queries reflect users' understanding of health information, while query reformulation reflects changes in user cognition, demonstrating users' cognitive abilities and retrieval skills. Retrieval result browsing behavior is the climax stage of health information retrieval, where users conduct purposeful browsing of retrieval results to meet needs, accompanied by clicking and page-returning behaviors. Retrieval result selection behavior is the final stage, where users conduct comprehensive judgment, evaluation, and decision-making to select needed health information, further manifesting as sharing behavior. Compared with the first

three stages, current academic research on the final stage is relatively limited.

### 4.3 Behavioral Situations

The subject of online health information retrieval behavior is the user, and retrieval behavior must occur in certain situations. Behavioral situations are important components of experimental research on online health information retrieval behavior, accounting for 19.4% of coding reference points. Equivalent meanings of “situation” include place, environment, information world, and information field [47]. This paper divides online health information retrieval behavior situations into task situations, device situations, and problem situations.

**4.3.1 Task Situations** Many online health information retrieval behavior experiments set one or more retrieval tasks for users. Task situation settings mainly have two approaches: one involves creating states through imagination, and the other directly provides specific retrieval content.

Participants in imagination-based situations are generally instructed to “imagine you are experiencing this situation or have experienced it yourself or with family members.” Situations are mostly specific and vivid symptom descriptions to stimulate user imagination. For example, a hypothetical situation about a family member with angina (imagining mother with painful expression, symptoms of feeling chest compression, nausea, difficulty breathing, etc.) found that although retrieval skills improved efficiency, they did not eliminate difficulties caused by lack of domain knowledge that led users to retrieve information on irrelevant websites [48] (P34). Research on imagining clinical symptoms of different severity levels (fever, mild pain, dry cough, muscle pain and fever, pain, neck stiffness) found that users prefer simple and intuitive retrieval methods rather than inferring existing information as influenza and meningitis before retrieval [42] (P17).

Experiments with directly provided retrieval content mostly conceptualize health problems directly, such as diabetes, hypertension, and weight loss. Such experiments found that users’ online health information retrieval behavior has certain differences under different types of task situations [35] (P07), strategy application differs between work tasks and life tasks [49] (P37), and user retrieval behavior also shows significant differences in different demand-type task situations such as health care, medical seeking, and consultation [34] (P03). Through comparative settings of task clarity and ambiguity, research found behavioral performance differences between general retrieval tasks and exploratory retrieval tasks, with explorers more eager to learn new information on the internet [50] (P12). When facing special health information tasks, users store perceived information from the environment into short-term memory to supplement existing memory, storing selected, identified, collected, and verified useful health information into working memory and even long-term memory for subsequent working memory calls [1] (P06).

**4.3.2 Device Situations** Device situations refer to the physical devices and platforms users use to retrieve health information in experiments. In addition to browsers commonly used by users, some experimental research on online health information retrieval behavior is based on specialized or specific device situations. Biomedical literature retrieval research based on EHRs (Electronic Health Records) found that semantic-based query recommendation can help users construct effective retrieval queries [39] (P09). Using online controlled database systems and browsers, two independent experimental studies found that users easily accept Positive Hypothesis Testing when retrieving health information—that is, users tend to seek definitive evidence to test hypothesis validity [51] (P11). Comparative experiments on general search engines and emotion-based search result search engines found that making retrieval results suitable for users' emotional states stimulates positive attitudes toward search engines and affects health information retrieval behavior [52] (P13). An experiment retrieving health information in the health forum HealthBoards.com using eye-tracking analysis found that users' selection criteria for health information are not unique [53] (P15). An experiment based on MedlinePlus showed that system design should provide multiple modes to help users navigate to a health topic, and pages should be “natural” and conceptual [41] (P18).

**4.3.3 Problem Situations** Problem situations involve presenting users with health problems to retrieve answers, where users play the role of problem responders in the situation. Compared with imperative task situations, problem situation settings are more heuristic, mostly using interrogative tone. They account for fewer coding reference points, only 5.3% in behavioral situation coding. Researchers selected health questions asked by other users in the HEID-PAQ anonymous database, such as “If traveling to Australia, do I need malaria prevention?” to enable experimental participants to retrieve answers they were confident about, thereby exploring how users retrieve health information [40] (P25). Additionally, other experiments set up a series of problem situations such as “What should not be eaten with diabetes?” and “Will taking depression medication cause drowsiness?” to explore how adolescents use the internet to retrieve health information [54] (P24).

In experimental research on online health information retrieval behavior situations, behavioral situations can be seen as experimental stimulation processes. In experiments, task situations are mostly described using demanding, affirmative language; problem situations use heuristic, interrogative language; and device situations mainly provide carriers for experimental process stimulation. Researchers identify meaningful situational elements and complete experiments through stimulation of one or multiple situations to achieve experimental purposes. Meanwhile, the review found that existing research still has deficiencies in behavioral situation settings, such as single task and problem situations, mostly focusing on common and prevalent diseases while avoiding controversial issues.

## 4.4 Behavioral Group Characteristics

Due to differences in social class, age, education, and other aspects, user groups exhibit different online health information retrieval behaviors. Clarifying group behavioral characteristics helps improve information service quality and effectiveness. Behavioral group characteristics account for 15.0% of coding reference points. Different groups have both differences and commonalities in behavioral characteristics. Accordingly, this paper divides behavioral group characteristics in online health information retrieval behavior into two categories: specific group characteristics from refined research targeting specific groups, and general group characteristics without specific group targeting. Specific group behavioral characteristic research helps deeply analyze particular user behavioral habits and characteristics, while general group behavioral characteristic analysis has universal significance.

**4.4.1 Specific Group Characteristics** Existing experimental research on specific group characteristics in online health information retrieval behavior includes specific groups such as the elderly, adolescents, college students, and women.

**Elderly:** Home page/re-selection webpage mode, link-following mode, and query reformulation mode are high-frequency online health information retrieval behavior patterns for the elderly, who show obvious dependence and rigidity during retrieval. The elderly have positive emotions toward online health information retrieval, with lack of health knowledge and web retrieval knowledge being the main cognitive obstacles when retrieving health information [55] (P01). Health status, internet familiarity, and online health information credibility are the main factors the elderly consider when using online health information retrieval in daily life [38] (P05).

**Adolescents:** Adolescents are very comfortable and confident when retrieving health information online, not spending much time developing retrieval strategies and selecting search terms, browsing webpages very quickly, and rarely reading entire paragraphs. Spelling errors in search terms are common problems adolescents encounter during retrieval [54] (P24).

**College Students:** Familiarity with health websites and confidence in search strategies are the main factors causing differences in college students' search processes [37] (P22). For example, nursing students often cite other resources when retrieving, including personal digital assistants and electronic journals [56] (P33).

**Women:** As the main group retrieving online health information [57], women prefer direct input of short queries and show higher retrieval performance in task completion [34] (P03).

**4.4.2 General Group Characteristics** Analysis of general group characteristics in online health information retrieval behavior found that retrieving health

information is not only an information discovery process but also a learning process [41] (P18). Online health information retrieval behavior is divided into three stages: query stage, retrieval process stage, and retrieval result stage [34] (P03). Users allocate most of their time to the early stage of retrieval tasks, browsing, linking, and distinguishing health information after clarifying task themes [1] (P06). Users use multiple websites to retrieve health topics and rely on search engines. Except for users retrieving information for quick fact-finding, health information retrieval behavior is actually an exploratory behavior [50] (P12). Regardless of retrieval experience and skills, non-professionals may encounter difficulties when retrieving health information, and information retrievers' goals are affected by prior knowledge and assumptions [48] (P34). Users tend to seek definitive evidence to test hypothesis validity [51] (P11). User online health information retrieval behavior patterns present a process chain of "search engine search - click link - browse page - match with task goal - output result," with the first four links cycling repeatedly until search results are found [24] (P04).

The above overview of experimental content shows that different groups have different health information retrieval behavior characteristics, possibly due to group characteristics themselves, such as the elderly group's lack of web retrieval knowledge. Different groups also share common characteristics in health information retrieval behavior. Existing experimental research has achieved the purpose of analyzing group behavioral characteristics through control of experimental subject recruitment. However, existing research still has relatively single classification standards for analyzing specific group behavioral characteristics, mostly divided by demographic characteristics such as age and occupation. Analysis of general group behavioral characteristics does not have complete universality in experimental research subject selection.

## 5 Research Implications

Through content analysis of literature on experimental research on online health information retrieval behavior, this paper summarizes four research content areas: behavioral influencing factors, behavioral types, behavioral situations, and behavioral group characteristics. We also propose corresponding implications and suggestions for these four areas, hoping to provide valuable references for subsequent experimental research on online health information retrieval behavior. This study has some limitations; the subjectivity of qualitative analysis and limitations of individual thinking may lead to certain limitations in sample literature data analysis. Future research could consider combining more quantitative analysis methods for further exploration.

### 5.1 Deepening Behavioral Influencing Factors

Online health information retrieval behavior is a complex process affected by multiple factors. Research on behavioral influencing factors can provide theoretical support for better improving health information service quality. Literature analysis found that: Experimental research on individual factors mainly

focuses on cognitive and skill aspects such as education level and retrieval ability, with less attention to user psychological characteristics (such as emotions). Future experimental research on behavioral influencing factors could use intelligent technology to perceive user psychological changes and deeply study the impact of psychological factors on online health information retrieval behavior.

Existing experimental research samples are relatively small compared with other research methods, and whether a small number of samples has universality in real life remains to be verified, potentially limiting the identification of meaningful behavioral influencing factors at deeper levels. Therefore, in addition to expanding sample sizes to some extent, future experimental research on behavioral influencing factors could more carefully design grouped controlled experiments within limited samples for comparative analysis to extract more valuable behavioral influencing factors. In the information age, experiments as an intervention research method can be combined with other data-driven non-intervention research methods (such as log mining) [58] to analyze more subject factors based on large-scale user data.

## 5.2 Synthesizing Behavioral Types

Online health information retrieval behavior is a dynamic and continuous process. Research on behavioral types helps conduct in-depth vertical exploration of behavior, distinguishing it from general horizontal behavioral statistics and comparisons. Related scholars have studied sub-concepts according to the general process of information retrieval. Literature analysis found that: Existing experimental research has less studied retrieval result selection behavior in online health information retrieval. However, with the in-depth development of the internet and social media, online health information retrieval behavior increasingly focuses on user evaluation and sharing during the process. This content has strong practical significance, and experimental research urgently needs expansion. Future experimental research should not only focus on how users retrieve but also pay attention to retrieval result selection behavior during the retrieval process and the deep relationship between final retrieval result selection behavior and behavioral effects. Existing experiments assume retrieval behavior subjects are independent. However, with Web 2.0 and computer-supported collaborative work technology development, interaction and cooperation are important components of retrieval behavior in real life. Collaborative information retrieval has become a new research hotspot in information science, and collaborative retrieval in specific health information fields is likely to become the next experimental research direction.

## 5.3 Diversifying Behavioral Situations

Exploring user retrieval behavior under different situations more easily reveals behavioral characteristics and problems. Existing research on behavioral situations mainly sets different types or complexity levels of task situations or problem situations on different device situations for observation and simulation

experiments. Research found that: Experiments are often conducted in laboratories rather than natural real-world settings, but artificially created laboratory environments cause certain reliability and validity deviations in experimental results, and user behavior may change due to the presence of observers. Therefore, whether experimental results can be applied to real life remains to be verified. Future experimental research could examine user online health information retrieval behavior in natural, real-world environments, focusing on the ecological validity of experimental research methods. Task situations and problem situation settings are often few in number, with similar themes and content, usually some common and prevalent diseases, and avoiding controversial issues. In fact, health information has special attributes and various types. Therefore, future research could set more and more special situations, such as health preservation, beauty, safe sex, and even same-sex issues. In device situation selection, existing experimental research mostly relies on computers as carriers. With mobile internet development and users' personal mobile terminal devices (such as smartphones and wearable devices) becoming normalized, new online health information retrieval behavior situations and phenomena have emerged, which may be difficult to explain through traditional computer environment research. Therefore, only through smartphones or users' portable mobile devices can we more efficiently and intensively construct user online health information retrieval behavior data and understand their daily retrieval processes. Existing experimental research on online health information retrieval behavior rarely considers time and space situations, obtaining static, single-device data. Humans are essentially temporal beings, and user information behavior research that considers "time flow" is more complete [59]. Studying the dynamic changes of user online health information retrieval behavior under different time situations helps explore the complexity of retrieval behavior. On the other hand, space situation settings can make user behavior more complete and three-dimensional. Accordingly, future experimental research on online health information retrieval behavior could combine mobile experience sampling methods (mESM) for instantaneous sampling and dynamic assessment when setting time situations; when setting space situations, cross-screen retrieval behavior of health information across multiple devices could be studied.

#### **5.4 Multidimensionalizing and Refining Behavioral Group Characteristics**

Research on behavioral group characteristics helps conduct longitudinal observation and in-depth analysis of user behavioral features and patterns through experimental methods. Previous experimental research on online health information retrieval behavioral group characteristics has mainly focused on two aspects: behavioral characteristics of specific groups (such as the elderly and adolescents) and behavioral characteristics applicable to general groups. With online health information retrieval behavior becoming increasingly common, domestic and foreign scholars' experimental research on online health information retrieval behavioral group characteristics has continuously broadened in scope

and gradually refined in depth, forming a multidimensional development trend. However, literature analysis shows that: Experimental research on general group online health information retrieval behavioral characteristics does not have complete universality in research subject selection, lacking comparative analysis of differentiated behavioral characteristics across multiple groups. Existing experimental research has insufficiently detailed analysis of behavioral group characteristics, with relatively single classification standards, mostly divided by demographic characteristics such as age and occupation, still somewhat insufficient in depth. Specific groups have obvious behavioral characteristics, so experimental research on specific group behavioral characteristics could be further refined. Future research could also expand subject selection to special groups, such as people with disabilities, people in remote areas, certain ethnic groups, and people with certain traits (such as obsessive-compulsive disorder).

Most research groups in existing experimental research on specific or general group behavioral characteristics are isolated, ignoring groups' social connections. Human groups are diversified and multi-level comprehensive bodies. Open, connected groups show different group characteristics compared with "isolated" groups, especially when group characteristics precipitate into online interactive health information retrieval behavior. Future experimental research on behavioral group characteristics could try selecting people with obvious social connections as experimental subjects, such as parents and children, company superiors and subordinates, to analyze their group behavioral characteristics. Alternatively, researchers could apply field survey methods to deeply enter experimental subjects' lives or even communities, participating in observation and truly recording experimental subjects' online health information retrieval processes.

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## Author Contributions

**Wang Wentao:** Determined research topic and ideas, guided and revised the paper.

**Zhang Xingping:** Conducted literature research and content analysis, wrote and revised the paper.

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**Zhang Zhen:** Participated in paper revision.

**Yang Min:** Participated in paper revision.

**Xie Yangqun:** Guided and revised the paper.

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## The Review and Enlightenment of Online Health Information Seeking Behavior Experimental Research Contents

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**Abstract:** [Purpose/significance] This paper makes a sorting and review on the existing experimental study of online health information seeking behavior, and makes some specific proposal on future experiment research's extended ap-

plication, aiming to provide some references for the selection of follow-up study. [Method/process] This paper used qualitative data analysis software to analyze the content of the 41 research literatures on experimental study of online health information seeking behavior, and sorted out 4 aspects of behavior influence factor, behavior type, behavior situation and behavior group characteristics. Through the specific analysis, the experimental content and future extended application's research directions were discussed in detail. [Result/conclusion] On the basis of the totalization of behavior influence factor, the depth of behavior type, the diversification of behavior situation, the multi-dimension and detail of behavior group characteristics, the future research directions of online health information seeking behavior experiments should focus on those aspects: the applying method of experimental research in real environment, the comparative study of mobile and cross-screen search of health information, the differentiation analysis of special situation and group and so on.

**Keywords:** online health information; seeking behavior; experimental study; grounded theory

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

*Source: ChinaXiv — Machine translation. Verify with original.*