Information Behavior under Time Constraints and Time Pressure: A Review (Postprint)

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Date: 2023-04-01T15:51:26+00:00

Abstract

[Purpose/Significance] Time is a ubiquitous contextual factor in information behavior; however, research that treats time as a scarce resource and explores its impact on information behavior remains fragmented. This study reviews relevant research on the effects of time constraints and time pressure in the field of information behavior, summarizing the roles and impacts of time constraints and time pressure on information behavior to deepen the understanding of temporal factors and call for greater attention to time within the information behavior domain.

[Method/Process] Based on reading and screening studies from relevant fields over the past decade, this study systematically synthesizes and summarizes the effects of time constraints and time pressure on information behavior, with a focus on examining the roles of time constraints and time pressure across different types of information behavior processes.

[Results/Conclusion] The findings reveal that time constraints and time pressure affect information behavior during task completion (including searching, browsing, and writing behaviors), information encountering behavior without explicit tasks, and information decision-making behavior. Future researchers should clarify the boundaries between time constraints, time pressure, and related concepts, establish clear measurement standards for time pressure, and also attend to the positive effects of time pressure.

Full Text

A Review of Information Behavior Studies Under Time Constraints and Time Pressure

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Abstract:
[Purpose/Significance] Time is a ubiquitous contextual factor in information behavior, yet research examining time as a scarce resource and its impact on information behavior remains fragmented. This study systematically reviews relevant research on the effects of time constraints and time pressure in the information behavior domain, summarizing their roles and influences to deepen understanding of temporal factors and call for greater attention to time in information behavior research. [Method/Process] Based on a comprehensive reading and screening of recent literature from the past decade, this study systematically synthesizes the impacts of time constraints and time pressure on information behavior, with particular emphasis on their roles across different types of information behavior processes. [Result/Conclusion] The findings reveal that time constraints and time pressure influence information behaviors during task completion (including searching, browsing, and writing), information encountering without explicit tasks, and information decision-making. Future researchers should clarify the conceptual boundaries between time constraints, time pressure, and related constructs, establish clear measurement standards for time pressure, and explore the positive effects of time pressure.

Keywords: time pressure; time constraints; information behavior; information searching; information browsing; information encountering; information decision-making

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2 Research Process and Overall Description

2.1 Literature Search and Inclusion

To effectively capture recent domestic and international research, we conducted searches in major databases including CNKI, Wanfang, Baidu Scholar, Web of Science, and Google Scholar. The search terms comprised two components: temporal terms ("time constraint," "time pressure," "time restriction," "时间限制," "时间压力," "时间约束") and information behavior terms ("information behavior," "information seeking," "information searching," "information browsing," "信息行为," "信息搜寻," "信息搜索," "信息浏览"). We limited the timeframe to January 1, 2012–June 30, 2021 (the past decade), focusing on journal articles, conference papers, and dissertations while excluding abstracts, posters, and brief introductions. Following initial screening, we supplemented the literature through snowballing over three weeks. Since this review serves the library and information science field, we excluded studies on information processing in decision experiments, visual search in sports, and online shopping/cybersecurity. The final corpus comprised 45 studies: 21 in Chinese and 24 in English.

2.2 Overall Research Situation

Analysis of the past decade's research trajectory (see [Figure 1: see original paper]) shows rapid growth from 2012–2014, with studies focusing primarily

on task-related factors. 2015–2016 marked a peak period, after which research development stabilized with broader research subjects and contexts. The field still offers substantial room for development.

Key research teams over the past decade include Liu Chang's group (Peking University, 9 publications), A. Crescenzi's team (including R. Capra and J. Arguello, University of North Carolina at Chapel Hill, 6 publications), and Wu Dan's group (Wuhan University, 2 publications). As shown in [Figure 2: see original paper], domestic research appears primarily as dissertations or journal articles in *Library and Information Service* [9], *Library Science Research* [10], and *Data Analysis and Knowledge Discovery* [11]. International research predominantly takes the form of conference papers presented at ASIS&T Annual Meetings [12], CHIIR [13], SIGIR [14], and articles in *JASIST* [15].

In terms of research content, scholars have examined time pressure's impact on information behavior across contexts such as social media [16], map navigation [17], scientific research [18], and healthcare [19]. Studies have investigated user behavior and experience when utilizing digital libraries [20–21] and integrated time pressure with task types [22–23]. Most treat time pressure or constraints as independent variables affecting information behavior, though some position time pressure as a moderator—for instance, amplifying the effect of social network fatigue on information avoidance [16] or influencing how source accessibility and quality affect users' likelihood of accessing information sources [24]. Frequently co-investigated factors include task type [22], task difficulty [25], environmental factors [26], attitudes [27], and emotions [21].

Methodologically, studies primarily employ laboratory-based user experiments, though some utilize crowdsourcing [25], grounded theory [28], and simulation analysis [18]. Research subjects focus mainly on university students and researchers, with limited attention to professionals (e.g., finance) [24] and vulnerable groups (e.g., older adults) [21].

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3 Information Behavior Under Time Constraints and Time Pressure

This review examines user behavior under time pressure and constraints. Our selection of specific information behaviors is based on the following definitions: T.D. Wilson defines information behavior as encompassing both active and passive information seeking and use [29]; Hu Changping conceptualizes it as behaviors including acquiring, querying, exchanging, disseminating, absorbing, processing, and utilizing information [30]; Jiang Tingting et al. categorize information seeking into browsing and searching while incorporating information encountering [31]; and Li Yuelin defines work tasks broadly as any activity driving user information seeking and retrieval [32], implying that all active information seeking serves task completion. Additionally, users engage in task-free information behavior, primarily information encountering. Under time constraints

and pressure, researchers also emphasize information-based decision-making, which we term information decision behavior. Accordingly, we discuss three information behaviors: (1) information behavior during task completion, (2) information encountering without explicit tasks, and (3) information decision behavior. The first category further decomposes into information searching, browsing, and writing. For each, we examine interaction, strategy, and experience dimensions—where interaction refers to specific user actions, strategy to methods and patterns adopted, and experience to self-assessed perceptions such as emotions and satisfaction.

Current information behavior research often treats time constraints and time pressure as identical variables [33], using "time constraint" in experimental design but discussing "time pressure" in analysis, with only a few studies distinguishing them [17, 34]. In cognitive science and decision-making research, time constraint (or restriction) refers to the existence of a temporal boundary in decision processes, independent of whether individuals can complete tasks within it. Time pressure refers to the stress induced by such constraints [35]—from a task completion perspective, it arises when available time is less than normally required [36]. Time pressure also represents an emotional or affective response at the individual level, potentially causing anxiety and affecting work effectiveness and efficiency. It may be triggered by limited time for task completion (e.g., urgent information needs, system delays, task interruptions) or workload (e.g., task complexity, familiarity) [37]. Perceived time pressure can be categorized as acute (short-term) or chronic (long-term) [34]. Acute pressure is an adaptive response to environmental factors like time limits and task characteristics, while chronic pressure persists over time as a constant, measurable individual trait [34]. Since most studies do not clearly differentiate these concepts, we do not separate them when reviewing their conclusions.

3.1 Time Constraints and Time Pressure

3.1.1 Defining Time Constraints, Time Pressure, and Related Contextual Factors Time represents a crucial dimension connecting past, present, and future in human life and work, with network development and information resource proliferation amplifying the importance of temporal rationality. From the perspective of time as a scarce resource, we must conceptually distinguish time constraints from time pressure. Time constraints are objective, external temporal boundaries imposed on task completion, whereas time pressure is the subjective experience of temporal urgency—personal and affective. The same constraint may generate different pressure levels across individuals, making this distinction critical for understanding behavioral impacts. Beyond time constraints, other contextual factors may induce time pressure, warranting further investigation.

3.1.2 Controlling Time Constraints and Measuring Time Pressure Researchers typically set different time constraints based on task types. Most

coherent, exploratory search tasks are brief, requiring completion within 5–15 minutes. In no-pressure conditions, researchers provide time frames through suggested durations or visible clocks. In experiments, time constraints are often controlled based on average completion times from pilot studies [39]. Time pressure is primarily measured through subjective reporting, typically using pre- or post-experiment Likert scales (e.g., "How much time pressure did you feel during the task?") [6, 25, 34].

3.1.3 Generation, Impact, and Coping with Time Pressure (1) Generation of Time Pressure. Stress arises when stressors act on susceptible individuals with inadequate protective or resource factors, representing dynamic physiological, psychological, and behavioral changes during resistance to stressors [40]. In information behavior, time pressure constitutes a cognitive and behavioral experience combining time constraints as stressors and behavioral changes as stress responses. Its impact depends on individual characteristics and task types, with reactions varying by personality and sensitivity to unexpected events.

(2) Impacts of Time Pressure. Time constraints and pressure negatively affect psychological load, cognition, health, and decision-making [40]. Time-limited tasks increase psychological load, as measured by subjective ratings and pupil diameter [41]. However, time pressure has a "double-edged sword effect." Yerkes-Dodson Law indicates that physiological or psychological arousal improves performance up to an optimal point, beyond which performance declines [42]. Activation theory similarly posits that only moderate time pressure yields optimal performance [43]. Recent positive perspectives suggest acceptable time pressure can enhance motivation [44] and efficiency [45].

Under high time pressure, individuals process information less effectively and develop poorer strategies, possibly due to information processing modes. The Elaboration Likelihood Model suggests information receivers either centrally process content deeply or peripherally focus on superficial cues [46]. Under high pressure, users may engage in peripheral processing, relying on personally important cues. Psychological regulation mechanisms also explain time pressure's emotional effects—individuals adaptively regulate emotions when facing stimuli. Thus, if users correctly perceive or positively appraise time pressure, their emotional experiences may be more positive; maladaptive responses yield more negative fluctuations.

(3) Coping with Time Pressure. Research shows high time pressure impairs information processing and optimal strategy formulation. Users adapt by selectively lowering expectations and seeking local optima. Depending on perceived constraints, they may employ different strategies across search stages [23]. Time pressure also affects emotional experiences—longer search times trigger negative emotions like frustration [58] and greater stress [57], though no-pressure conditions yield more positive emotions [54]. However, well-organized information under time pressure can reduce anxiety [59]. Studies on older adults show

appropriate time pressure can enhance positive emotional experiences [21], suggesting it may empower vulnerable groups. Perceived time pressure and task difficulty predict search strategy satisfaction [53], with high difficulty and time pressure correlating with stronger dissatisfaction [33] and lower self-recognition of retrieval results. When deciding without time limits, more choices increase satisfaction; under constraints, smaller choice sets yield higher satisfaction [60]. Thus, time pressure's effects are context-dependent and vary by task type and population.

3.2 Information Behavior During Task Completion

Researchers initially defined tasks as work tasks [47–48] before expanding to everyday activities like shopping and travel. Most information seeking models describe task-completion behaviors, with time playing a crucial role (e.g., in the ELIS model [3]). Task completion spans from search initiation to information sufficiency, including searching, reading, and writing [49]. Recent user experiments analyze information behaviors across different stages under time constraints and pressure.

3.2.1 Information Searching Behavior We examine searching through interaction behaviors and strategies/experience (see [Figure 3: see original paper]).

(1) Searching Interaction. Under time pressure, users prioritize source accessibility over perceived quality [24]. Query-related research shows time constraints affect query typing speed [50] and query rate [33], with users issuing more specific queries to find answers faster [50]. When feeling time-pressured, users reduce information querying [28] and significantly decrease search duration [51] or terminate searches prematurely [52]. Time pressure also affects average task completion time. While constraints don't impact difficulty assessments, users perceive their search effectiveness as worse under time limits [54]. High time pressure yields non-significant accuracy improvements and higher perceived difficulty [19]. From a metacognitive monitoring perspective, time-constrained users may allocate more attentional resources to regulate tasks, showing higher monitoring of progress and available time [57]. However, a study on self-guided tourists found time pressure significantly reduced search effort [27], likely due to task type differences. For tasks without specified outcomes, effort decreases; for mandatory tasks, users self-regulate actively to complete within limits.

Unlike fact-finding tasks, information understanding tasks under time constraints involve longer queries with minor modifications for rapid reformulation [50]. Without time limits, chronically pressured searchers remain more active and spend longer searching [34].

(2) Searching Strategy and Experience. Facing time constraints, users modify strategies based on available resources and environmental conditions, seeking local optima. They selectively lower expectations and target partial

information. Depending on constraint perception, different strategies may be used across search stages [23]. Time constraints significantly affect experience, including pre-search confidence, post-search performance evaluation, knowledge exchange, and emotional states. Under time limits, users expect shorter completion times [54] and exhibit significantly lower pre-search confidence [19, 39, 54], acquiring less new knowledge [54]. For understanding tasks versus fact tasks, users gather more information but perceive less knowledge gain under constraints [51]. Collaborative search studies show time pressure yields incomplete cognitive structures and less knowledge acquisition [56].

3.2.2 Information Browsing Behavior M.J. Bates defines browsing as intentional visual scanning involving complex processes of glancing, selecting, examining, and acquiring or abandoning information [61]. We categorize browsing as post-query behavior on search result pages (SERPs) and content pages, examining interaction and strategy.

(1) Browsing Interaction. Time pressure affects view counts, dwell time, etc. (see [Figure 4: see original paper]). Under pressure, users view fewer documents per query, with reduced hover depth and viewing depth, spending less time on documents and SERPs [33]. In map navigation [17], time-limited outdoor navigation users show shorter task duration and page dwell time with fewer scrolls; indoor navigation users exhibit more zooming but fewer scrolls. Higher pressure correlates with slower reading/scanning speeds [34] and fewer pages accessed [33]. Constrained by time, users spend more time reading easier texts [62], browse more shallowly, and bookmark more freely [63]. To cope, they reduce unnecessary mouse clicks and use keystrokes to locate specific information [22].

Time constraints affect complex tasks more significantly [17] and show stage-based effects. In the first query stage, time-limited users exhibit significantly longer initial/average SERP dwell time than unlimited users, though whole-session differences are non-significant [23].

(2) Browsing Strategy. Under time pressure, users allocate more time to important document sections, adaptively distributing time across and within documents based on ability and need [62], and select easier-to-read results. When browsing resumes on computers, the middle screen position is optimal, with time pressure amplifying spatial position effects on attention [64]. Without time limits, users initially employ economical strategies—brief SERP focus, attention to top results, multiple content page clicks, and mid-document query reformulation. Under constraints, they become more selective and cautious, first scanning over half of SERP results and only clicking when confident of relevance [23]. In walking navigation, pressure more strongly affects initial route planning, making users more attentive to estimated times [65].

3.2.3 Information Writing Behavior Information writing refers to document creation during search to organize information and knowledge [49], emerg-

ing from "search as learning" research [66]. Time constraints accelerate information organization [51]. Researchers categorize writing strategies by completion progress timing: early, average, and late recording. Without time limits, average-recording sessions show fewer interactions, clicks, and scrolls; under constraints, no behavioral differences emerge across strategies [66], indicating convergent behavior under high pressure. For understanding versus fact tasks, required information volume is similar, but constrained users tend to store more information for understanding tasks [51].

3.3 Impact on Information Encountering

Information encountering involves acquiring interesting or useful information without purposeful, high-expectation searching [67]. Time constraints affect encountering likelihood—time availability is necessary for encountering in digital environments [68], with ample time facilitating it [67]. Without time pressure, encountering may occur continuously [69]. In digital libraries, time pressure reduces encountering frequency among users with explicit needs compared to casual browsers [20]. Among researchers, greater time pressure decreases encountering likelihood [18]. In social media and short video browsing, time scarcity creates tension, causing rapid or reduced browsing that overlooks valuable information [70]. Regarding user characteristics, men are more likely than women to browse in task contexts, possibly due to higher time pressure limiting encountering [71].

3.4 Impact on Information Decision-Making

Information decision-making involves collecting, comparing, analyzing, and selecting optimal solutions [72], emphasizing choices rather than task completion effects or information acquisition processes. While Li Yuelin et al. proposed decision-making tasks [73], discussion remains limited. We separately address decision-making to highlight selection and judgment processes.

Time pressure affects decision speed and quality. Wilson's information-seeking model posits that information needs generate motivations, with time pressure influencing processing and decision-making through mediating variables [2]. During decision-making, cognitive biases may emerge, such as anchoring effects (over-reliance on initial information) [74]. In tax information searching, increased time pressure causes confirmation bias, affecting decisions [75].

Studies have examined time constraints' impact on decision-making in simulated daily scenarios where users recommend options to friends without time limits, deciding when "enough" information is obtained [76]. Results show time constraints affect recommendation scope, with decision speed and their interaction influencing specificity, argument strength, and attributes considered. Under constraints, users decide faster and adapt to pressure by focusing on macro-level information, preparing decisions more quickly—likely because high pressure leads to decisions based on partially important attributes [77].

Time pressure increases need for cognitive closure, causing rapid decisions under uncertainty and impairing optimal strategy formulation [78]. Like other behaviors, time pressure effects vary individually. Perceived pressure negatively correlates with decision quality [79], and emotion plus time pressure can alter conventional information behavior in high-stakes decision-makers [80].

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4 Summary and Outlook

4.1 Research Summary

This review synthesizes decade-long research on time pressure and constraints as independent variables affecting information behavior interaction, strategy, and experience. These studies also suggest potential moderators (see [Figure 5: see original paper]) influencing relationships among pressure, constraints, and behavior. Moderators include task characteristics and individual features.

Generally, time pressure induces tension, accelerating behavior while increasing caution. However, tension also reduces self-assessment and may cause important information to be overlooked. Time constraints and pressure affect operation speed, frequency, count, duration, and scope, as well as strategies and cognitive/emotional experiences. For instance, they influence search duration, pre-/post-search confidence, emotional experience, satisfaction, and knowledge assessment. They affect browsing speed and strategy adoption. In encountering, they constrain perceived available time, reducing frequency.

Notably, most studies inadequately distinguish time constraints from pressure. Constraints are objective temporal boundaries, while pressure is subjective stress experience. The same constraint generates different pressure across individuals. Moreover, task and personal characteristics moderate pressure's effects. Under identical constraints, different users experience varying pressure. However, users may self-regulate, adapting to pressure and employing different strategies based on estimated available time, such as focusing on simpler, more intuitive information.

4.2 Existing Research Gaps

4.2.1 Unclear Conceptualization and Weak Theoretical Foundation Most studies conflate "time constraint" and "time pressure," complicating citation and tracing. No unified standards exist for controlling constraints or measuring pressure, with unclear distinctions between high/low or presence/absence of pressure. Theoretically, research remains weak. While the ELIS model provides theoretical grounding for treating time as a scarce resource [3], most studies build on prior findings rather than 挖掘 ing time's positive functions.

4.2.2 Single Research Designs and Poor Variable Control Studies predominantly use laboratory experiments without real-world validation. Limited

recruitment leads to within-subject designs, rarely examining how information behavior reciprocally affects time pressure. Current research combines pressure with other contextual factors but seldom explores different pressure types. Liu Chang et al. found that time limits in search experiments affect interaction and experience [39], yet most search experiments treat time constraints as design elements without analyzing them as primary variables [82].

4.2.3 Limited Research Subjects and Topics Time pressure exists across populations and tasks, but most research treats it incidentally rather than as a central focus. Studies predominantly examine students, neglecting vulnerable groups and limiting generalizability. Research focuses heavily on searching and browsing, with encountering and decision-making understudied.

4.3 Research Outlook

4.3.1 Distinguishing Time Constraint and Time Pressure Effects First, clarify conceptual boundaries. Time constraint is an objective, externally imposed condition; time pressure is a subjective, personal experience. Distinguishing their differential impacts helps users cope with difficulties. Second, investigate other contextual factors inducing pressure and explore emotional experiences under pressure and their behavioral impacts.

4.3.2 Exploring Positive Effects of Time Pressure Current research frames time constraints and pressure as negative contexts, emphasizing adverse experiences. From positive psychology perspectives, they may also benefit users. Moderate constraints might enhance search efficiency. System designers should consider users' needs and behaviors under pressure, potentially reducing information quantity to aid efficiency. When no time constraints exist, must systems always respond quickly? "Slow search" concepts propose delaying feedback to provide more curated content [83]. With growing interest in "search as learning," complex learning may require extended reading and thinking time, raising questions about whether AI and HCI should accelerate or decelerate feedback to create thinking space. Helping users mitigate pressure when constrained and enjoyably acquire information when unconstrained are valuable future directions.

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Author Contributions: Wang Xinyue: paper drafting and revision; Liu Chang: conceptual guidance and paper revision.

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