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Long Seconds: How AI Text-Loading Design Affects the Subjective Feeling of Waiting for Users

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ABSTRACT

An AI doctor agent is an intelligent medical tool that interacts with users through text-based dialogues to provide convenient health consultations and preliminary diagnostic services. However, during the interaction process, users inevitably encounter loading delays, making the design of appropriate text-based loading indicators particularly crucial. These loading indicators not only provide visual feedback but also help alleviate user anxiety, enhance trust in the system, and improve the overall user experience (UX). This study primarily explores the impact of different loading indicator designs—specifically, animation, gradient, and loop—on users' perceived waiting times and preferences. We conducted an experimental analysis with 30 participants recruited through convenience sampling. The results indicate that (1) loading indicators with gradient effects can effectively reduce users' subjective perception of loading duration, making the wait seem shorter; (2) animated and gradient loading methods can effectively reduce user boredom during waiting periods, helping to maintain a positive experiential state; (3) in practical use, users generally prefer animated loading presentations, finding them more engaging and visually appealing; and (4) compared to loop and gradient methods, the animated loading method received higher scores on the System Usability Scale (SUS), further validating its design advantages. The findings of this study provide important references for the practice and design of medical conversational agents and offer valuable insights for application development in other fields, enriching the theoretical foundation of generative AI within the domain of Human-Computer Interaction (HCI).

Keywords: AI doctor, Text loading icon, Personal preference, Waiting to be perceived

INTRODUCTION

With the deep integration of healthcare and technology, AI doctor agents are rapidly evolving into a crucial tool for enhancing the quality of medical services, improving diagnostic efficiency, and bridging disparities in medical resources (Fan et al., 2025; Xu et al., 2024). At present, an increasing number of hospitals and technology companies are investing heavily in research and development, driven not only by advancements in artificial intelligence technology but also by the growing demand for convenient, precise, and personalized healthcare services (Milne-Ives et al., 2020). Compared to traditional medical consultation methods, AI doctor agents leverage vast clinical datasets and deep learning algorithms to provide round-the-clock intelligent consultations and diagnoses, assisting patients in promptly assessing their health conditions and obtaining personalized treatment recommendations (Borkowski & Ben-Ari, 2024). Additionally, these agents support doctors in disease prediction and treatment optimization. Their application not only improves the efficiency of medical resource utilization but also facilitates access to high-quality healthcare for populations in remote or resource-limited areas (Rueda et al., 2024). Looking ahead, AI doctor agents are expected to complement human doctors, further refining medical workflows, optimizing hospital management, and driving the overall healthcare system toward greater intelligence, efficiency, and sustainability.

However, despite the many benefits brought by AI doctor agents, challenges remain in ensuring a satisfactory user experience, particularly in interface design. For instance, when interacting with AI doctor agents, users often need to wait for the system to generate responses, and this waiting period directly impacts their overall experience and perceptions of AI usability (Li et al., 2023). Excessive waiting times or a lack of clear feedback can lead to user anxiety and impatience (Chen & Li, 2020). Conversely, well-designed visual feedback mechanisms—such as loading animations, progress indicators, or gradually revealed content—can enhance user expectations and make the waiting process more tolerable (Lee et al., 2019; Chen & Li, 2020; Li et al., 2022). Nevertheless, there is currently no unified standard for optimizing visual feedback design in AI doctor agents, and the effectiveness of different feedback modalities in enhancing user experience has yet to be systematically studied (Luo et al., 2015; Lee et al., 2017). Therefore, this research adopts an interface design perspective to explore the role of various visual feedback elements in AI doctor agents during text generation wait times. It seeks to analyze how these elements influence users' time perception, preferences, and perceptions of AI usability, with the aim of providing design recommendations and optimization strategies for future intelligent medical interaction interfaces.

Therefore, this study aims to examine the impact of different types of visual feedback (Loop, Gradient, and Animation) on users' waiting experience, specifically focusing on waiting time perception, perceived boredom, personal preference, and system usability scale. The specific research questions are as follows:

RQ1: How do different types of visual feedback (Loop, Gradient, and Animation) affect users' waiting time perception?

RQ2: Do these visual feedback types lead to significant differences in users' perceived boredom?

RQ3: Do users exhibit different personal preferences depending on the type of visual feedback presented?

RQ4: Do different visual feedback types influence users' evaluation of system usability?

This study systematically examines the main effects of different types of visual feedback in the text generation process of AI doctor agents, addressing a research gap in the interaction experience of intelligent medical AI agents. The findings contribute to a deeper understanding of the relationship between waiting experience and visual feedback design, providing valuable insights for optimizing the interface design of intelligent medical systems. Furthermore, the study offers scientific guidance for refining visual feedback strategies, enhancing the overall user experience in medical interactions, and improving the usability and experiential quality of AI doctor agents in practical applications.

METHODS

Participants and Materials

This study employed convenience sampling to recruit a total of 30 participants for the experiment, among whom 18 were male and 12 were female. The participants' ages were primarily concentrated between 21 and 39 years, accounting for 76.7% of the sample, and 43.3% of them indicated that they had previously used mobile healthcare applications mediated by artificial intelligence. All participants were randomly assigned to one of three experimental groups and participated in the experiment in a noise-free environment, with each session lasting approximately 15 minutes.

The experimental design process of this study involved the integrated application of multiple software tools: first, Illustrator was used for flat interface design; next, Flash was employed to create dynamic effects for AI text generation; and finally, Figma was utilized for developing the application prototype, which is a mobile healthcare application mediated by an AI agent. In terms of hardware, the experiment made use of an iPhone 15 Plus smartphone running the iOS 17.1.1 operating system. This device is equipped with a 160.9 × 77.8 mm screen, a resolution of 2796 × 1290 pixels, and a pixel density of 460 ppi. The primary purpose of selecting this device was to ensure that the display effects of different versions of the application prototype remained stable and consistent throughout the experiment, thereby avoiding any influence caused by device variations.

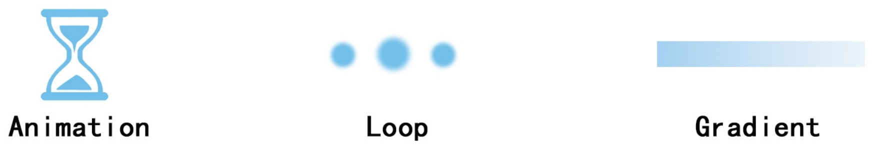

Figure 1: Experimental stimulus.

Experimental Design and Procedure

This study employed a one-factor experimental design with the visual feedback type of AI agent text dialogue as the independent variable, which included three feedback modes: Loop, Gradient, and Animation (Figure 1). A between-subjects design was adopted, and all participants were randomly assigned to one of three groups (n = 10 per group). During the experiment, each participant was required to use the assigned AI agent text dialogue application prototype to complete four operational tasks. Upon task completion, the participants filled out a questionnaire to evaluate their waiting time sensation, perceived boredom, personal preference, and system usability as measured by the System Usability Scale (SUS), in order to assess the impact of different visual feedback types on user experience.

RESULTS

This study used the visual feedback types of AI agent text dialogue (Loop, Gradient, and Animation) as the independent variable, and employed a one-way analysis of variance (ANOVA) to examine their subjective effects on waiting time sensation, perceived boredom, personal preference, and the System Usability Scale (SUS). Data analysis was conducted using SPSS statistical software, and an LSD post hoc test was further applied to explore the significant differences in the main effects among the different visual feedback types.

Table 1: The mixed two-way ANOVA.

Source	SS	DF	MS	F	p	η^2	Post Hoc
Waiting Time Sensation	5.60	2	2.80	10.50	$< 0.001^{***}$	0.44	Loop = Animation < Gradient
Perceived Boredom	4.87	2	2.43	5.05	0.014^{*}	0.27	Loop < Gradient = Animation
Personal Preference	3.80	2	1.90	5.46	0.010^{*}	0.29	Loop = Gradient < Animation
System Usability Scale	1665.42	2	832.71	7.44	$< 0.01^{**}$	0.36	Loop = Gradient < Animation

Significantly different at $\alpha = 0.05$ level ($^{*}p < 0.05$); Significantly different at $\alpha = 0.01$ level ($^{**}p < 0.01$); Significantly different at $\alpha = 0.001$ level ($^{***}p < 0.001$).

Waiting Time Sensation: Three types of visual feedback in AI agent text dialogues exhibited a significant main effect on Waiting Time Sensation ($F = 10.50, p < 0.001; \eta^2 = 0.44$). According to the LSD post hoc test results presented in Table 1, compared with the Loop ($M = 4.80$, $SD = 0.42$) and Animation ($M = 5.00$, $SD = 0.66$) feedback modes, the Gradient ($M = 5.80$, $SD = 0.47$) visual feedback mode effectively reduced participants' perception of waiting time in text interactions.

Perceived Boredom: Three types of visual feedback in AI agent text dialogues demonstrated a significant main effect on Perceived Boredom ($F = 5.05$, $p = 0.014 < 0.05$; $\eta^2 = 0.27$). According to the LSD post hoc test results presented in Table 1, compared with the Loop feedback mode ($M = 4.50$, $SD = 0.71$), the Gradient ($M = 5.30$, $SD = 0.82$) and Animation ($M = 5.40$, $SD = 0.52$) visual feedback modes effectively reduced users' perceived boredom while waiting for text responses.

Personal Preference: Three types of visual feedback in AI agent text dialogues exhibited a significant main effect on Personal Preference ($F = 5.46$, $p = 0.010 < 0.05$; $\eta^2 = 0.29$). According to the LSD post hoc test results presented in Table 1, compared with the Loop ($M = 5.40$, $SD = 0.52$) and Gradient ($M = 5.30$, $SD = 0.82$) feedback modes, participants showed a higher preference for the Animation ($M = 6.10$, $SD = 0.68$) visual feedback type.

System Usability Scale: Three types of visual feedback in AI agent text dialogues exhibited a significant main effect on the System Usability Scale ($F = 7.44$, $p < 0.01$; $\eta^2 = 0.36$). According to the LSD post hoc test results presented in Table 1, compared with the system usability scores for the Loop ($M = 60.50$, $SD = 10.98$) and Gradient ($M = 63.25$, $SD = 5.53$) feedback modes, participants considered the Animation ($M = 77.50$, $SD = 13.59$) visual feedback type to yield a higher system usability.

CONCLUSION

The focus of this study is on the influence of the visual feedback types in AI agent text dialogues (i.e., Loop, Gradient, and Animation) on users' waiting time sensation, perceived boredom, personal preference, and the System Usability Scale (SUS). The results indicate that: (1) loading indicators with gradient effects can effectively reduce users' subjective perception of loading duration, making the wait seem shorter; (2) animated and gradient loading methods can effectively reduce user boredom during waiting periods, helping to maintain a positive experiential state; (3) in practical use, users generally prefer animated loading presentations, finding them more engaging and visually appealing; and (4) compared to loop and gradient methods, the animated loading method received higher scores on the System Usability Scale (SUS), further validating its design advantages.

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