AI-ASSISTED CAUSAL PATHWAY DIAGRAM FOR HUMAN-CENTERED DESIGN

A COMP 3603 LITERATURE REVIEW BY

SABRINA KASSIE

GROUP : METROID

BACKGROUND

AUTHORS:

- Ruican Zhong
- Donghoon Shin
- Rosemary Meza
- Predrag Klasnja
- Lucas Colusso
- Gary Hsieh

These authors are affiliated with leading institutions in the field of HCI, contributing significantly to research on AI, design processes, and human-centered approaches. Their collaborative work reflects advancements in integrating AI tools into design processes, making a notable impact on creative and evidence-based design practices.

BACKGROUND

Publication Information

Title: AI-Assisted Causal Pathway Diagram for Human-Centered Design

Conference: CHI '24: Proceedings of the CHI Conference on Human Factors in Computing Systems

Article No.: 2, Pages 1 - 19

Published: May 11, 2024

ABSTRACT

1. Investigates the integration of Causal Pathway Diagrams (CPD) into Human-Centered Design (HCD)

2. Focuses on the early stages of the design process

3. Developed a CPD plugin for the Miro platform
   - Facilitates diagram creation
   - Provides real-time AI-driven support

4. User study conducted with 20 designers

ABSTRACT

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Key findings:

1. CPD’s branching structure and causal connections support both divergent and convergent thinking
2. Enhances communication among stakeholders
3. Significantly reduces cognitive workload for designers
4. Increases creativity during brainstorming

- Highlights the potential of AI-assisted tools in fostering creative and evidence-based design practices

METHODOLOGY

Plugin Design:

- Drag-and-drop functionality
- Wizard
- AI-driven suggestions
- Brainstorming
- Checking mechanism
- Glossary

User Study:

- Within-subjects study with 20 participants
- Participants completed two 10-minute design sprints using a design prompt, user persona, and scenario. Sprint 1 used the CPD plugin and Sprint 2 did not use the CPD plugin.
- Post-task questionnaires and interviews.
- Analyzed using thematic analysis.
- Time spent on tasks and the number of CPD pathways generated.
- Paired sample t-tests were used to analyze quantitative data.

METHODOLOGY

Data Collection

1. Self-reported ratings collected on:

- Ease of use
- Brainstorming difficulty
- Confidence in structural correctness
- Usefulness of CPD content

2. Tracked data:

- Time spent on each design sprint
- Number of CPD pathways generated

RESULTS

1. Use of CPD in Human-Centered Design (RQ1)
- Establishing an Effective Design Process
- Ideation
- Strategic Prioritization
- Concerns of Misuse

2. Use of Plugin in Generating CPDs (RQ2)
- Quantitative Results
- Alleviated Cognitive Workload
- Increased Creativity with AI Support
- Challenges with AI Recommendations

RESULTS

Ease of Use	Without Plugin	With Plugin	P-VALUE
Ease of Creating Components	Lower	Higher	$p < .05$
Ease of Designing	Lower	Higher	$p < .01$
Ease of Brainstorming Component Content	Lower	Higher	$p < .05$

DISCUSSION

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Contribution to HCI:

1. Demonstrates how CPDs from implementation science can integrate into HCD processes.
2. Supports both divergent (ideation) and convergent (decision-making) thinking in design.
3. Enhances efficiency and creativity in the early design phases.

Limitation

the use of stylized design sprints, while effective for controlled testing, limited the scope of the study. These sprints focused on early-stage design processes and did not capture the full spectrum of design activities, such as prototyping, testing, and iteration. This restricts the ability to generalize findings to other phases of design work, where CPD might play different roles.

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CONCLUSION

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The study shows that CPD is beneficial in early HCD phases, helping designers focus on root causes for brainstorming and strategic prioritization.

The research highlights the potential and responsibilities of incorporating AI in design practices, offering insights valuable to both HCD and implementation science communities.

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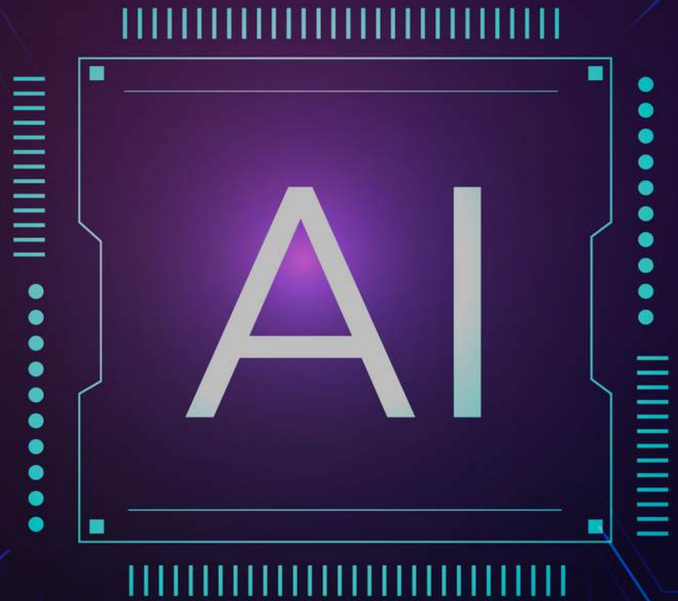
Dealing with Uncertainty: Understanding the Impact of Prognostic Versus Diagnostic Tasks on Trust and Reliance in Human-AI Decision Making



A COMP 3603 Literature Review By
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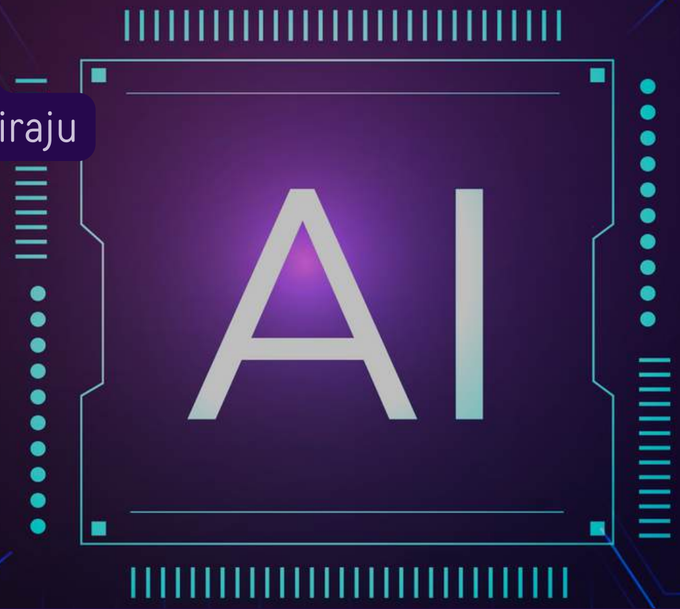
Background

Authors

- Sara Salimzadeh
- Gaole He
- Ujwal Gadiraju



These authors are all graduates of the Delft University of Technology in the Netherlands. They all have multiple published papers on AI, some of which are collaborations with each other or other top HCI researchers. Their work showcases their deep understanding of AI and that their work is trustworthy.

Background

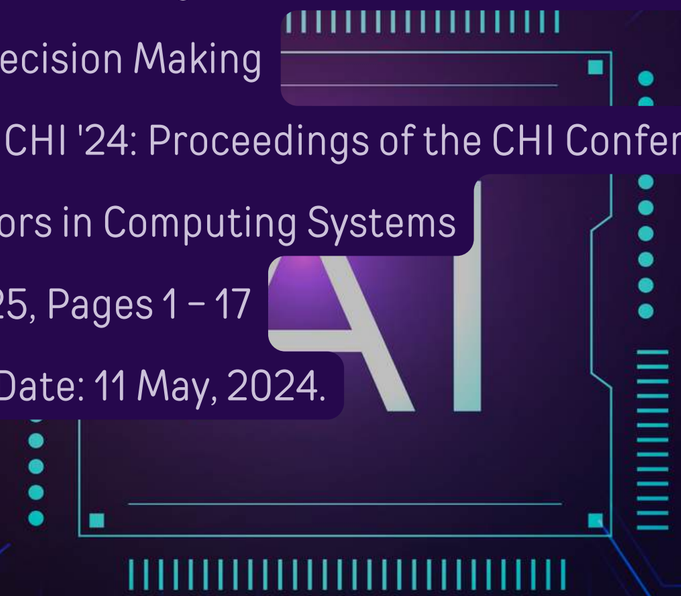
Publication Information

Title: Dealing with Uncertainty: Understanding the Impact of Prognostic Versus Diagnostic Tasks on Trust and Reliance in Human-AI Decision Making

Conference: CHI '24: Proceedings of the CHI Conference on Human Factors in Computing Systems

Article No.: 25, Pages 1 – 17

Publication Date: 11 May, 2024.



Abstract

This paper showcases how the difficulty and uncertainty of tasks influence human reliance on AI to aid with their decision-making. Its main objective is to better understand the conditions in which humans rely on AI. Given a sample size of 258 humans, tasks of varying difficulties were given, and it was found that humans tend to rely on AI for the seemingly harder tasks. This reliance showcased a blind trust some users had in the AI which did not lead to necessarily better decision accuracy as the AI was made to be imperfect (with a 66.7% accuracy rate).

Methodology

- The researchers conducted a controlled experiment with 258 participants to explore how task complexity and uncertainty affect human reliance on AI during decision-making. Participants were asked to plan a trip using AI across 6 conditions with varying degrees of difficulty and uncertainty.
- Each participant went through a two-stage decision process. First, they made an initial decision without any AI input. Then, they were shown AI-generated advice and asked to make a final decision, allowing the researchers to track how often participants changed their choices based on the AI's recommendations and this was called the Switch Fraction.

Methodology

- The study collected data on both the participants' behaviour and their task performance. This included how often they relied on AI advice, their overall accuracy in decision-making, and their trust in the AI. The experiment also measured how engaged participants were, using interaction data from the trip-planning interface such as the usage of route control buttons.

Results

- The study uncovered several important insights into how people rely on AI during decision-making:

1. **More Reliance on AI in Complex and Uncertain Tasks:** Participants were more likely to trust and follow AI recommendations in tasks that were highly complex or uncertain. They often switched their initial decisions to match the AI's advice, showing a higher rate of Switch Fraction.
2. **Accuracy and Appropriate Reliance:** While people relied more on AI for complex tasks, they weren't always relying appropriately. In medium-complexity tasks, decision accuracy was lower because users didn't gauge when to trust the AI correctly. In highly uncertain tasks, their ability to rely on AI appropriately also dropped, affecting overall performance.
3. **Engagement with the Task:** Participants engaged more with the system in uncertain tasks, clicking on options more often, especially in tasks where they were predicting future outcomes (prognostic).
4. **Trust vs. Over-Reliance:** Trust in the AI was consistent across tasks, but users often over-relied on the AI in complex scenarios, sometimes making quick decisions without fully considering the AI's advice. Visual and textual explanations helped but were not enough to stop this over-reliance in the more challenging tasks.

Results

Condition	Task Complexity	Task Uncertainty	Description
Condition 1 (LowDiag)	Low	Diagnostic	Tasks involve simple decision-making with few variables and no future uncertainty.
Condition 2 (LowProg)	Low	Prognostic	Simple tasks with future uncertainties that need prediction (such as traffic).
Condition 3 (MedDiag)	Medium	Diagnostic	Moderately complex tasks with currently known conditions.
Condition 4 (MedProg)	Medium	Prognostic	Moderately complex tasks where future uncertainties play a significant role in decisions.
Condition 5 (HighDiag)	High	Diagnostic	Highly complex tasks with multiple variables, but conditions are known and fixed.
Condition (HighProg)	High	Prognostic	Complex tasks with many variables and future uncertainties that must be predicted.

Discussion

- The study shows that as tasks get more complex or uncertain, people tend to rely more on AI, sometimes even too much. This suggests AI can be really useful in tough situations but also highlights the risk of over-reliance. For HCI, it's important to design AI systems that help users find the right balance between trusting AI and using their own judgment.
- However, the study has limits. The task chosen (trip-planning) might not fully represent real-world scenarios, and user biases could have affected the results. Future research should explore different tasks to build on these findings.

Conclusion

- The study shows that as tasks get more complex or uncertain, people rely more on AI, sometimes too much. This highlights the need for AI systems that help users make balanced decisions, rather than just following AI suggestions blindly.
- The findings are important for HCI because they emphasize the need for better AI design that supports users in making thoughtful choices, especially in challenging scenarios.

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“I Don’t Even Remember What I Read”: How Design Influences Dissociation on Social Media

COMP 3603 LITERATURE REVIEW BY
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Background

Authors

- **Amanda Baughan** - University of Washington, School of Computer Science & Engineering.
- **Mingrui "Ray" Zhang** - University of Washington, Information School.
- **Raveena Rao** - University of Washington, Information School.
- **Kai Lukoff** - University of Washington, Human Centered Design & Engineering.
- **Anastasia Schaadhardt** - University of Washington, Information School.
- **Lisa Butler** - University of Buffalo, School of Social Work.
- **Alexis Hiniker** - University of Washington, Information School.

These researchers are affiliated with major institutions and contribute to advancing human-computer interaction (HCI) and social media research, particularly focusing on user well-being, cognitive behavior, and the impact of design.

Background - Continued

Publication Information

Title: “I Don’t Even Remember What I Read”: How Design Influences Dissociation on Social Media

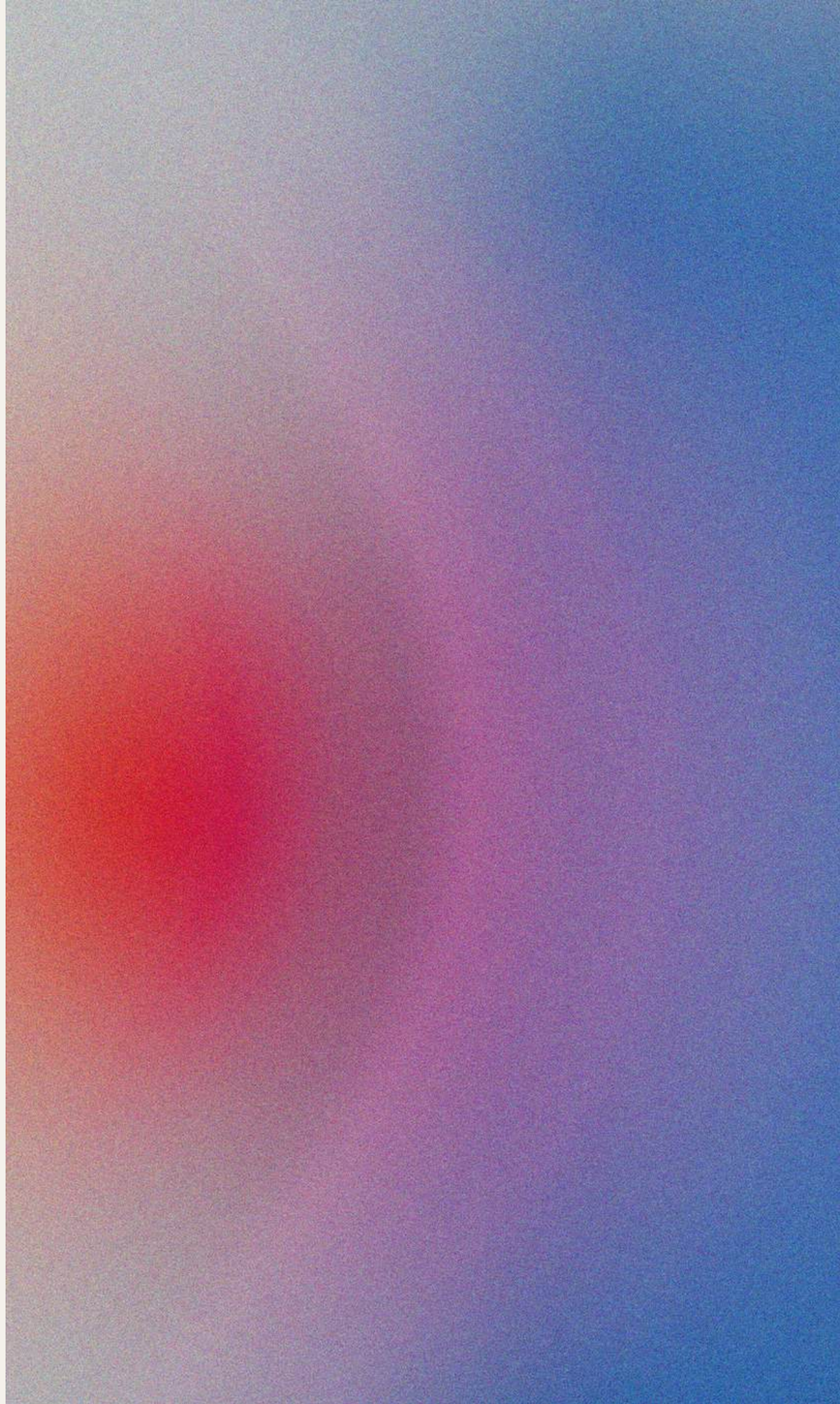
Conference: CHI ‘22: Proceedings of the 2022 CHI conference on human factors in computer systems

Article No.: 18, Pages 1 - 13

Published.: April 28, 2022

Abstract

- The study investigates normative dissociation on social media—cognitive absorption where users lose self-awareness.
- A custom Twitter client (Chirp) was deployed to 43 U.S. participants.
- **Findings:**
  - Dissociation could be both beneficial (breaks) and negative (time-wasting).
  - Design interventions (lists, usage stats, time limits) helped reduce dissociative behavior.
- Contribution: Suggests that normative dissociation, rather than addiction, is a more constructive framing for social media overuse.



Methodology

Chirp Twitter Client

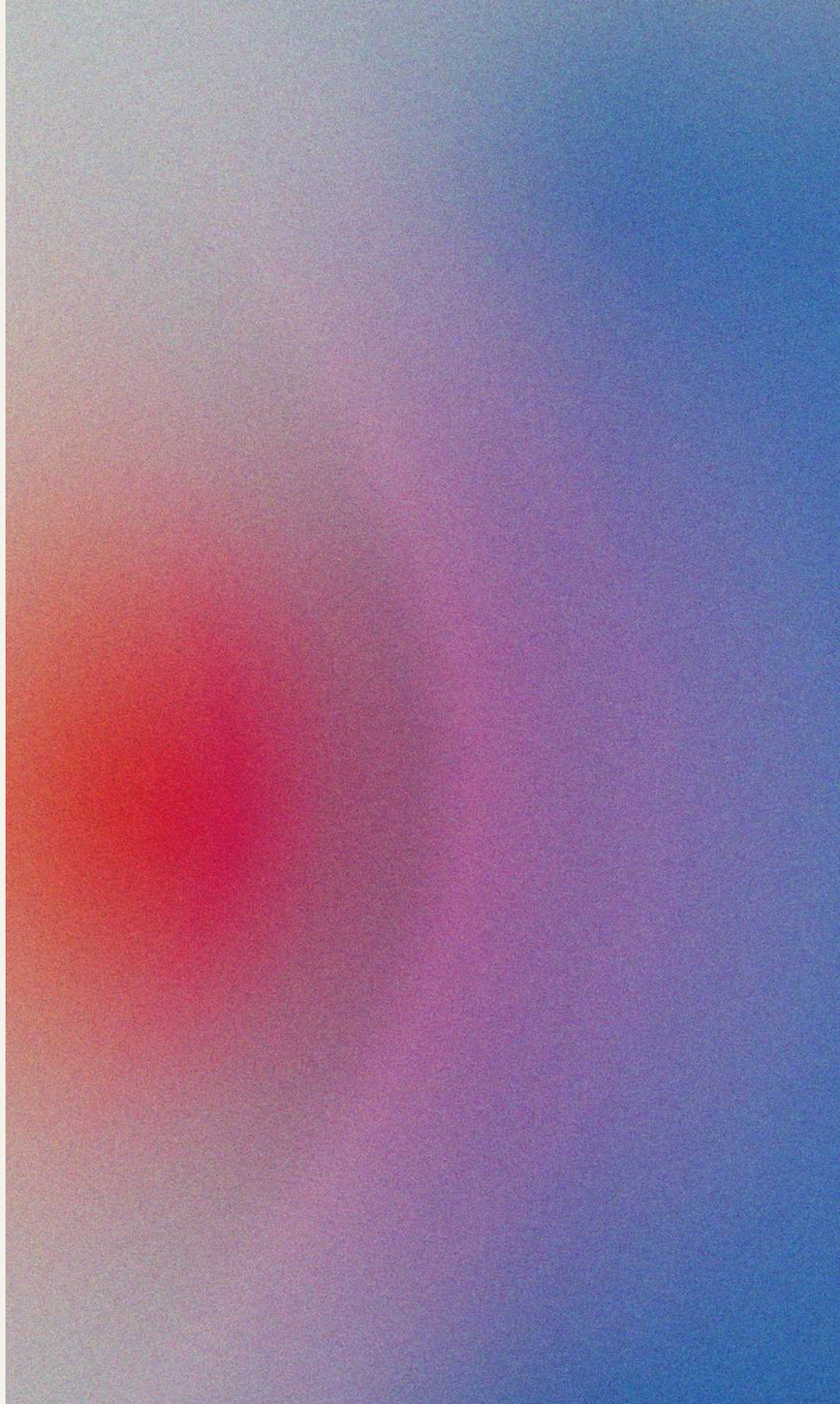
- Four versions Created
- 43 participants
- Each participant uses each version for one week before switching

Design Interventions

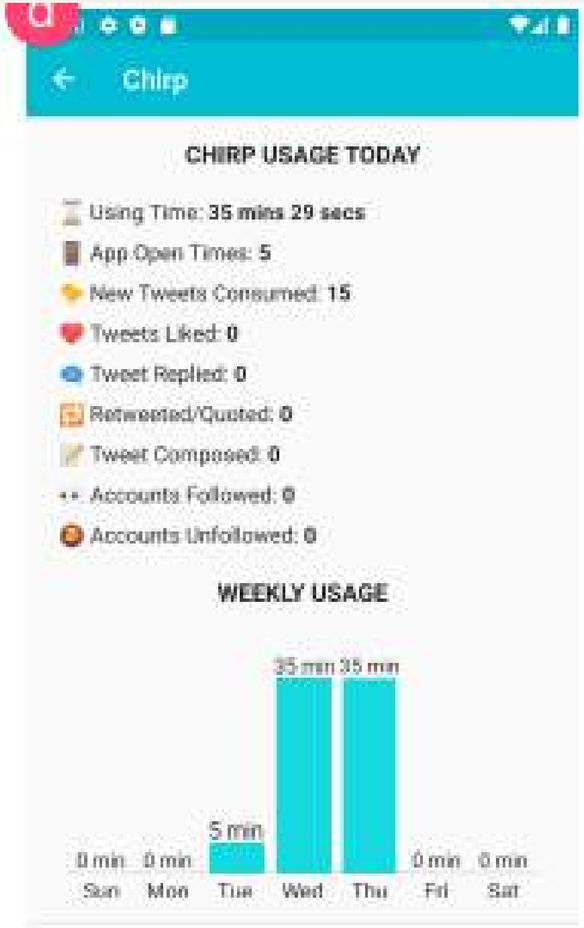
- Internal (reading history, custom lists) and external (usage stats, time limits)

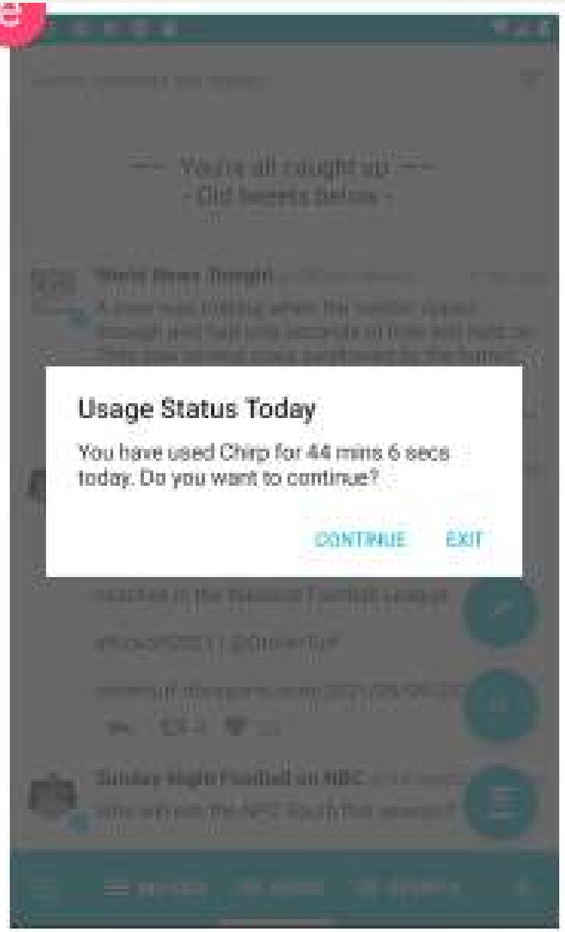
Data Collection

- Mixed methods, including experience sampling, user activity logs, behavior logging, and post-deployment interviews with participants.



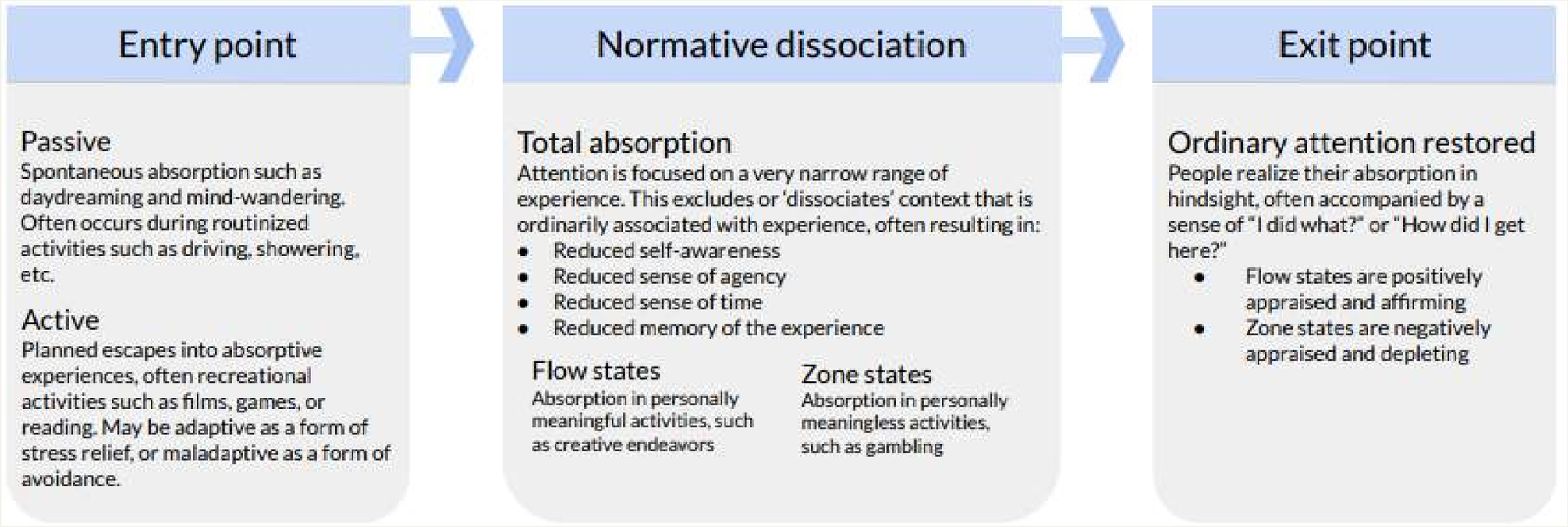
Methodology - Continued





Results

- 7 of 11 interviewees experienced dissociation.
- 18 participants reported experiencing dissociation during the study, confirming passive and active dissociative experiences.
- Participants often felt “lost”, “tuned out” or “Zombie.”
- Features like reading history labels, time limits, and usage stats helped reduce instances of dissociation.



Results

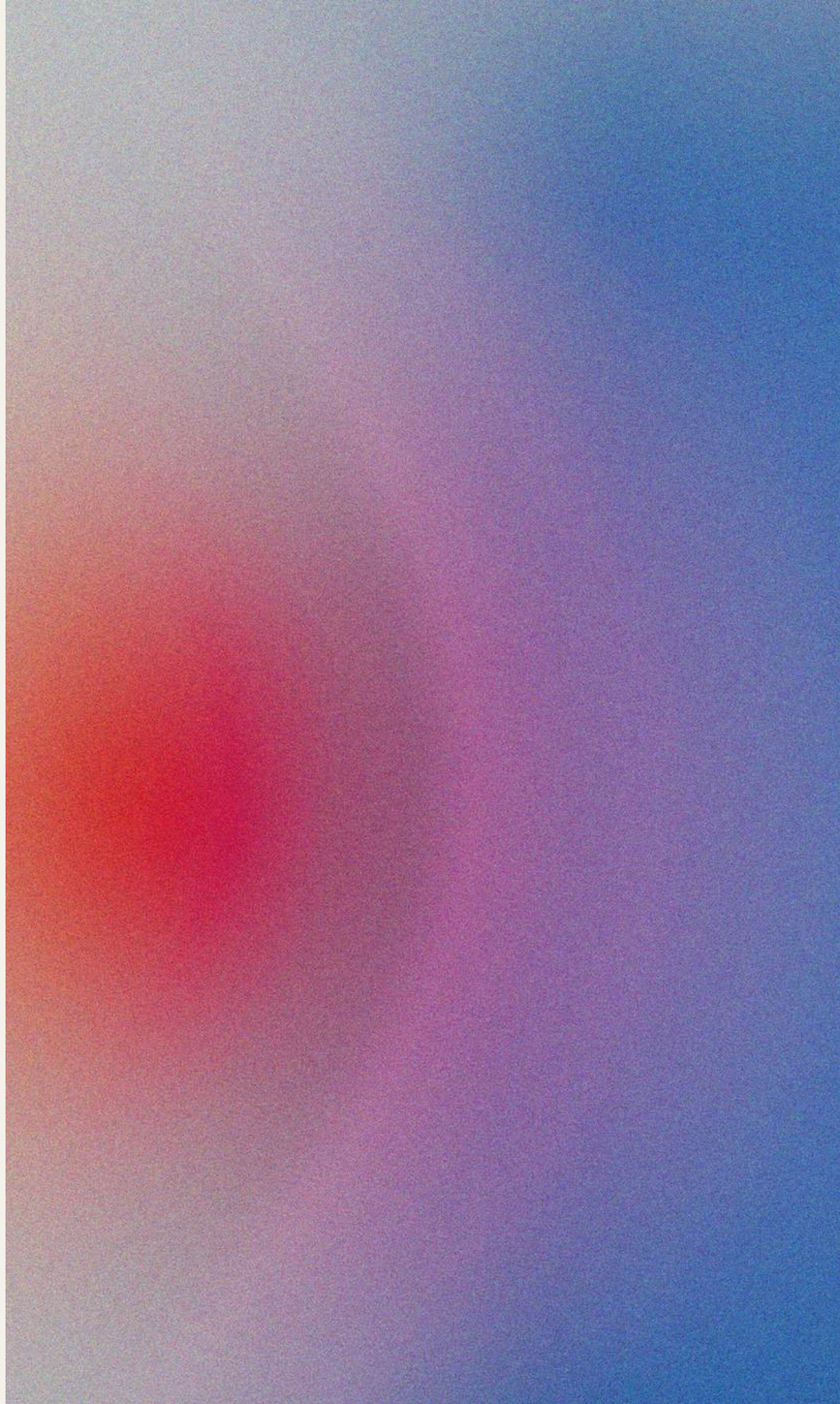
- Participants said they regularly had moments where they “lost track of time” (P30), became “all-consumed”
- One participant said, “Well, you know when you do that thing where you’re driving, and you forget you’re driving and then you snap back? But you’re still on the road, you know? It’s like that kind of thing, where you don’t realize you’re doing something”
- Others claimed it would sometimes affect their relationships
- “endless battle of my self-regulation and self-control”
- “Auto-pilot” or “Tunnel vision”
- Emotional responses vary: some users are content with their use, some feel it's inevitable, and others feel guilt or frustration over wasted time.

Discussion

- Users frequently lose track of time and sense of agency due to automatic scrolling.
- Some users find dissociative experiences valuable for escape or relaxation.
- Social media design creates both positive engagement and feelings of time waste.
- Intentional design

Limitations

- Small research sample size.
- Participant Bias.
- Only one social media platform used.



Conclusion

- Study highlights the importance of normative dissociation in social media use
- Emphasizing its dual nature as both a beneficial and problematic experience
- Emphasizes relevance in today's digital landscape and implications for social media designers and HCI researchers.
- Calls for creating empowering environments to enhance user self-awareness and agency, inspiring new design strategies for user well-being.
- The findings could inspire new design strategies aimed at improving user well-being on digital platforms.

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