



Lec2: Cognitive Psychology and User Behavior

Welcome to Lecture 2 of our course on Human-Computer Interaction in Healthcare for the Department of Intelligent Medical Systems. Today, we'll explore the fascinating intersection of cognitive psychology and user behavior in healthcare technology design.

This lecture will delve into mental models, attention mechanisms, perception processes, and memory functions. We'll examine human information processing models and discuss how cognitive load impacts design decisions. Finally, we'll investigate the crucial role of emotions in shaping user experiences within healthcare systems.



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The Foundation: Mental Models in Healthcare HCI

Definition

Mental models are internal representations of how things work in the external world. They are shaped by our experiences, knowledge, and beliefs, influencing how we perceive and interact with digital interfaces. In healthcare, these models influence how patients and professionals interact with medical interfaces.

Importance

Understanding users' mental models helps designers create intuitive interfaces that align with expectations, reducing errors and improving efficiency in critical healthcare scenarios.

Designing for Mental Models

Successful UX design leverages common mental models to create interfaces that feel familiar and easy to navigate. This involves thorough user research and iterative design processes to ensure alignment between user expectations and system functionality. In healthcare, these models influence how patients and professionals interact with medical interfaces. For example, a patient portal should mirror how patients conceptualize their health journey, from appointment scheduling to viewing test results and managing medications.

Attention in Medical Interfaces

- **Selective Attention:** In busy hospital environments, interfaces must guide users to focus on critical information. Use of color, contrast, and motion can direct attention to urgent alerts or important patient data.
- **Sustained Attention:** For tasks requiring prolonged focus, like monitoring patient vitals, interfaces should minimize distractions and use techniques like progressive disclosure to maintain attention over time.
- **Divided Attention:** Healthcare professionals often multitask. Interfaces should support this by allowing easy switching between tasks and providing clear status indicators for ongoing processes.

Perception in Healthcare HCI



Visual Perception

Consider color blindness when designing interfaces. Use patterns and shapes in addition to colors for critical information. Ensure proper contrast for readability in various lighting conditions, from bright operating rooms to dimly lit patient rooms.



Auditory Perception

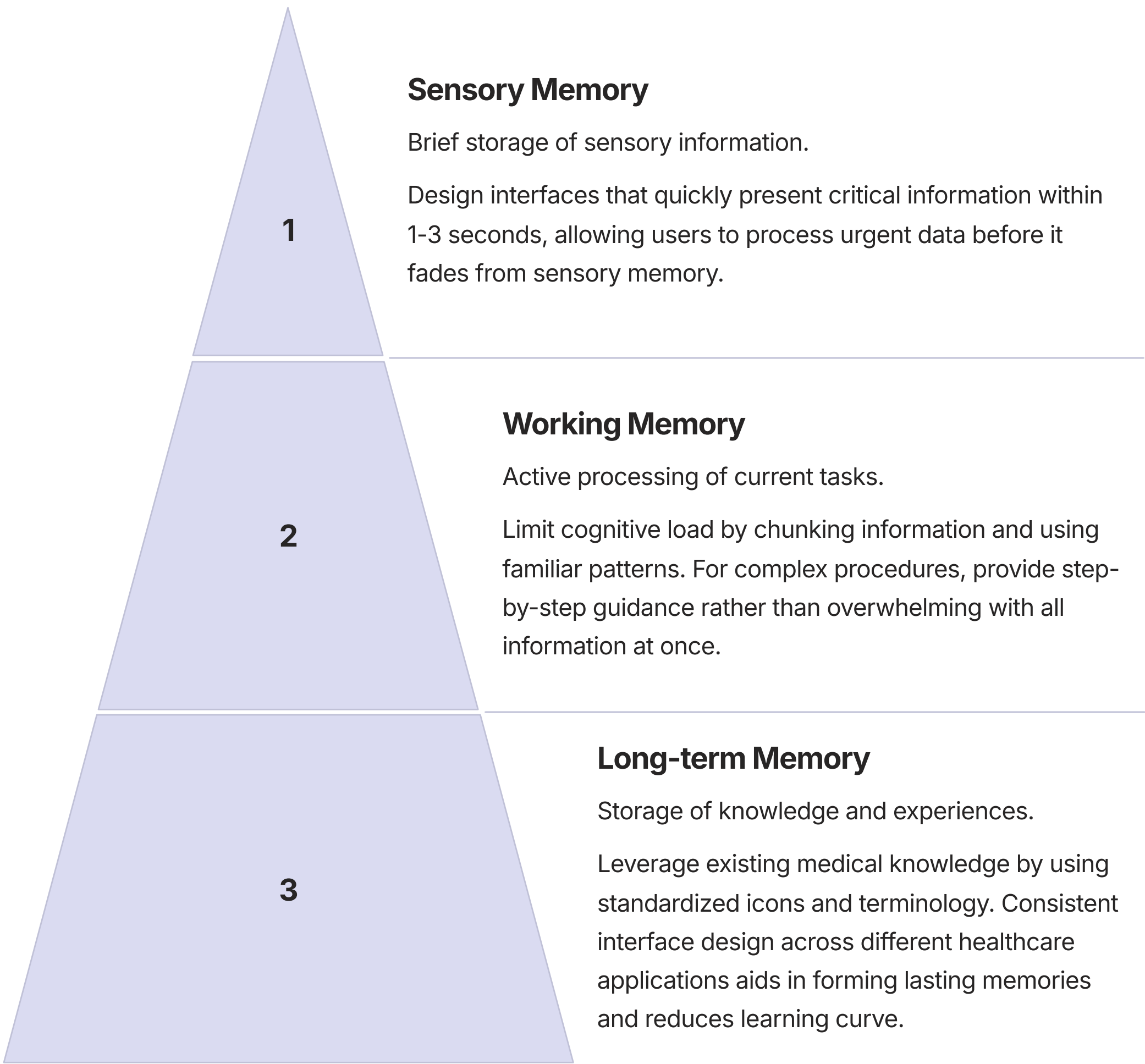
Design alarms and notifications with distinct tones and patterns to convey urgency levels. Consider background noise in healthcare settings when determining volume levels and frequency ranges for auditory feedback.



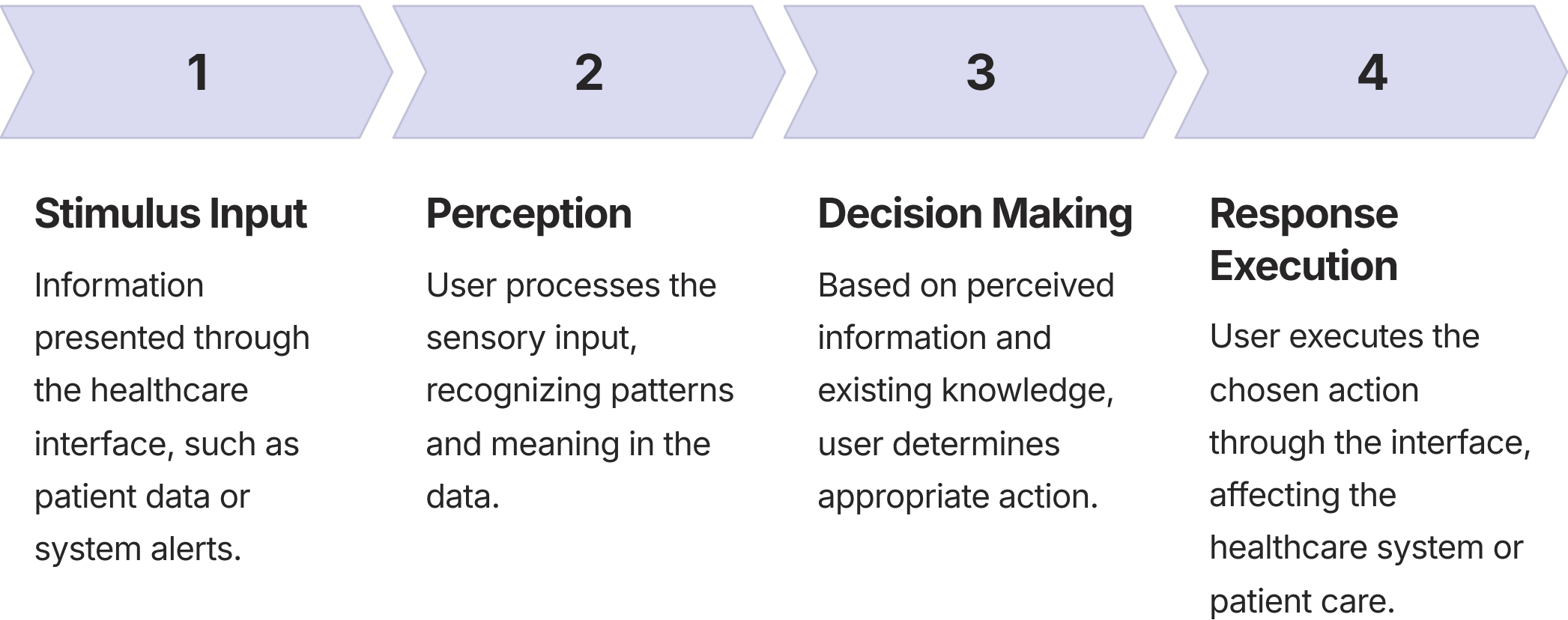
Haptic Perception

Incorporate tactile feedback in wearable medical devices or touchscreen interfaces to confirm actions without requiring visual attention, especially useful in sterile environments where touch input is preferable.

Memory: The Cornerstone of User Experience

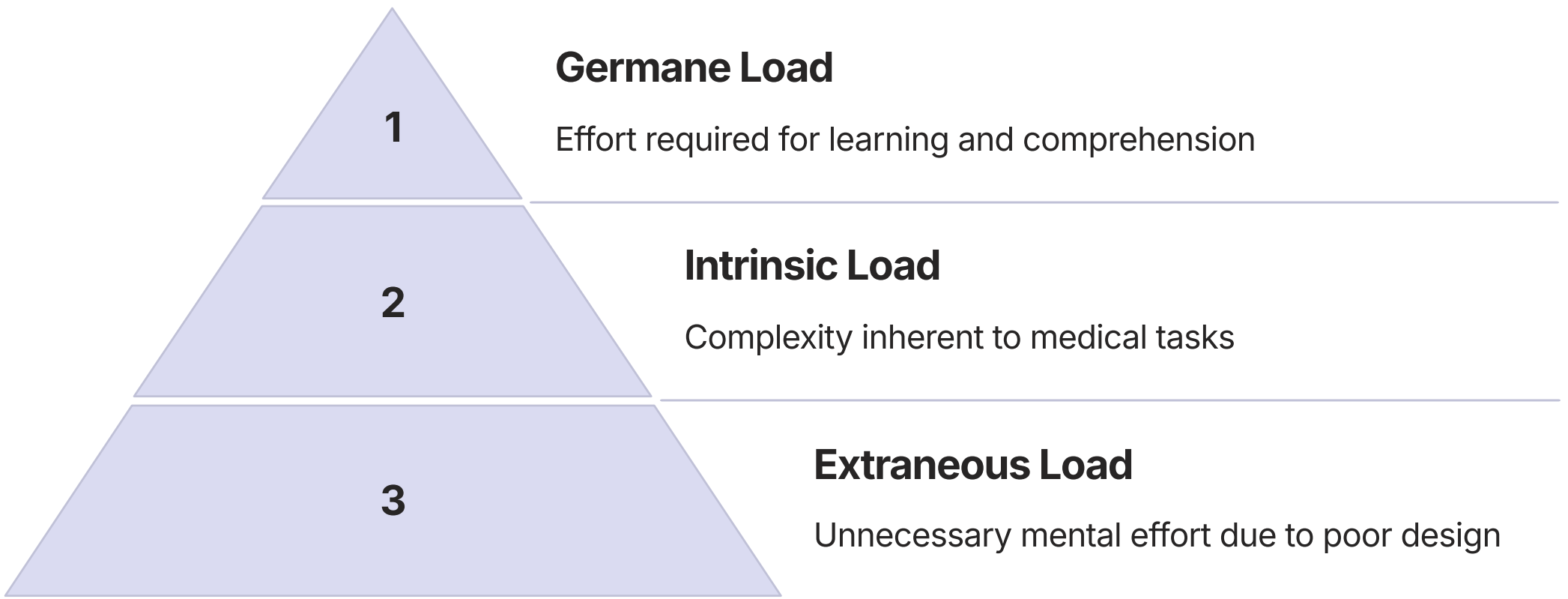


Human Information Processing Models



This model helps designers understand how users process information and make decisions when interacting with digital interfaces. By aligning design with these cognitive processes, we can create more intuitive and efficient user experiences.

Cognitive Load in Healthcare HCI



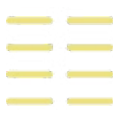
Understanding these types of cognitive load is crucial for designing effective healthcare interfaces. By minimizing extraneous load through intuitive design, we can free up cognitive resources for managing intrinsic load and promoting germane load, leading to better decision-making and learning in medical contexts.

Reducing Cognitive Load in Medical Interfaces



Simplify

Remove unnecessary elements and streamline workflows to focus on essential information and tasks.



Organize

Group related information logically and use consistent layouts to reduce mental effort in finding and interpreting data.



Automate

Implement intelligent features like autocomplete, smart defaults, and decision support systems to offload routine cognitive tasks.



Visualize

Use charts, graphs, and infographics to present complex medical data in easily digestible formats.

Emotions in Healthcare User Experience

1

Trust

Foundation for effective healthcare interactions

2

Empathy

Designing interfaces that acknowledge user's emotional state

3

Confidence

Providing clear feedback and support to boost user assurance

4

Satisfaction

Creating positive experiences that encourage continued engagement

Emotions play a crucial role in healthcare interactions. Interfaces that consider and respond to users' emotional states can significantly improve engagement, adherence to treatment plans, and overall healthcare outcomes.

Designing for Emotional Engagement in Healthcare

- 1. **Use Calming Colors and Imagery:** Incorporate soothing color schemes and nature-inspired imagery to reduce anxiety in patient-facing interfaces.
- 2. **Provide Emotional Support:** Integrate encouraging messages and progress indicators to motivate patients during long-term treatments or rehabilitation.
- 3. **Personalize the Experience:** Allow users to customize interfaces and set preferences, fostering a sense of control and personal connection.
- 4. **Offer Clear Communication:** Use plain language and provide context for medical terms to reduce confusion and frustration, especially in patient education materials.

Case Study: Redesigning a Patient Monitoring System

Before: Information Overload

The original interface displayed all patient vitals simultaneously, leading to cognitive overload for nurses managing multiple patients.



After: Prioritized Display

The redesigned interface uses color coding and progressive disclosure to highlight critical information, reducing cognitive load and improving response times.



User Testing Results

Cognitive load measurements showed a 30% reduction, while user satisfaction increased by 45%. Error rates in data interpretation decreased by 60%.



Key Takeaways and Future Directions

Cognitive-First Design

Prioritize understanding and accommodating human cognitive processes in healthcare interface design to improve usability and reduce errors.

Emotional Intelligence

Integrate emotional design principles to create more engaging and effective healthcare experiences for both patients and professionals.

Continuous Evaluation

Regularly assess cognitive load and emotional impact of healthcare interfaces through user testing and real-world data analysis.

Interdisciplinary Approach

Collaborate across fields of cognitive psychology, design, and healthcare to create innovative, user-centered medical technologies.

As we move forward, the integration of AI and machine learning in healthcare HCI presents new opportunities and challenges. Future research should explore how these technologies can further reduce cognitive load and enhance emotional engagement while maintaining the human touch in healthcare interactions.