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# Comparative Analysis of User Interface Design in Cognitive Behavioral Therapy (CBT) Mobile Applications for Pre-Elderly Users

Hanna Sofia Napitupulu[1)*], Irfansyah[2)]

[1)] Master of Design, Faculty of Art and Design, Institut Teknologi Bandung, Indonesia
[2)] Visual Communication and Multimedia Research Group, Faculty of Art and Design, Institut Teknologi Bandung, Indonesia
*Corresponding Author
Email : hannasofia.works@gmail.com

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**ABSTRACT**

User Interface design plays a crucial role in supporting the effectiveness of digital Cognitive Behavioral Therapy (CBT) interventions based on mobile applications, especially for pre-elderly users who might have cognitive, visual, and motor limitations. This study aims to analyze and specifically compare the interface design of two popular CBT mobile applications, namely CBT Companion and Unstuck, based on Graphical User Interface (GUI) principles that focus on aspects of readability, consistency, navigation, and visual clarity. The method used was visual observation and descriptive analysis of GUI elements, including layout, color and contrast, typography, icons and symbols, as well as animation and transition. The analysis was conducted by considering the needs and characteristics of pre-elderly users based on related literature. The results showed that the Unstuck app was superior in visual consistency, typographic legibility, and linear navigation structure, making it more friendly to the limitations of pre-elderly users. In contrast, CBT Companion has a therapeutic visual approach but faces barriers in readability, layout inconsistency, and low colour contrast for readability. This study confirms that the effectiveness of digital CBT interventions is not only determined by the interventions' content delivered but also by the interface design that can support the overall user experience. The implications of these findings emphasise the importance of applying inclusive design principles in the development of digital mental health applications for pre-elderly users.
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KEYWORDS

Cognitive Behavioral Therapy
Mental Health App
User Interface Design
Pre-Elderly Users
Inclusive Design



## INTRODUCTION

Mental health is an important aspect in supporting the quality of life of individuals, including pre-elderly people (aged 45-64) who are in the transition phase to old age. However, attention to the mental health of pre-elderly individuals remains relatively low, both in intervention programs and in scientific literature, despite the fact that this age group exhibits significant psychosocial vulnerability to stress, anxiety, and emotional disorders (ADB, 2023). The prevalence of depression among pre-elderly individuals reaches 18.4%, the highest compared to other adult age groups (Villarroel & Terlizzi, 2020). This condition also contributes to a significant global disease burden, particularly long-term disability and the risk of premature death (GBD, 2019).

One psychological intervention proven effective in addressing anxiety and depression is

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Cognitive Behavioral Therapy (CBT). CBT focuses on restructuring negative and maladaptive thought patterns and strengthening more rational and adaptive coping strategies. The effectiveness of CBT has been demonstrated through various cross-age studies, including among the pre-elderly adults (Hofmann et al., 2012).

With the advancement of digital technology, CBT has been widely adopted into mobile applications, enabling interventions to be conducted independently, flexibly, and more affordably. Research shows that digital-based CBT interventions are as effective as conventional face-to-face therapy in reducing symptoms of anxiety and depression (Firth et al., 2017; Andersson et al., 2019). Digital CBT applications are also considered relevant for reaching the pre-elderly population, who have not been optimally served by conventional mental health services.

However, the effectiveness of digital interventions depends not only on the psychotherapy content provided, but also on the quality of the user interface (UI/UX) design. User interface design plays a crucial role in determining how well pre-elderly adults can understand, access, and utilize available features without barriers. Especially since pre-elderly adults have certain limitations, such as reduced visual, motor, and cognitive abilities, which can affect their visual perception of text, icons, colors, and their ability to navigate the interface independently (Charness & Boot, 2009). Previous research has emphasized that non-inclusive design is one of the factors contributing to the failure of digital technology adoption among older adults, including pre-elderly adults.

Various mobile CBT applications currently available offer diverse visual approaches and CBT intervention structures. However, there have been few studies directly comparing the effectiveness of mobile-based CBT application interface approaches, particularly those relevant to the needs of pre-elderly adults. This creates a research gap, namely a lack of studies highlighting how variations in interface design (UI/UX) in CBT applications can affect the engagement and experience of pre-elderly adults specifically.

To that end, this study aims to conduct a comparative analysis of two popular mobile CBT applications, namely CBT Companion and Unstuck, which demonstrate different structural and visual approaches in implementing CBT interventions in interface design. CBT Companion features a professional and clinically structured design, while Unstuck uses an affirmative narrative approach with lighter and more reflective visuals. This study will examine the extent to which these two approaches are effective in supporting usability, visual accessibility, and the potential for emotional engagement among pre-elderly adults, while considering principles of inclusive design.

## METHOD

This study uses a qualitative descriptive approach with a visual comparative study method focused on analyzing the user interface (UI) design of two Cognitive Behavior Therapy (CBT) mobile applications, namely CBT Companion and Unstuck. Both applications were selected because they have significant differences in their visual approaches to presenting CBT interventions visualy. Data was collected through direct observation of the interface display, particularly on main CBT features such as the thought journal and mood tracker, with documentation via screenshots.

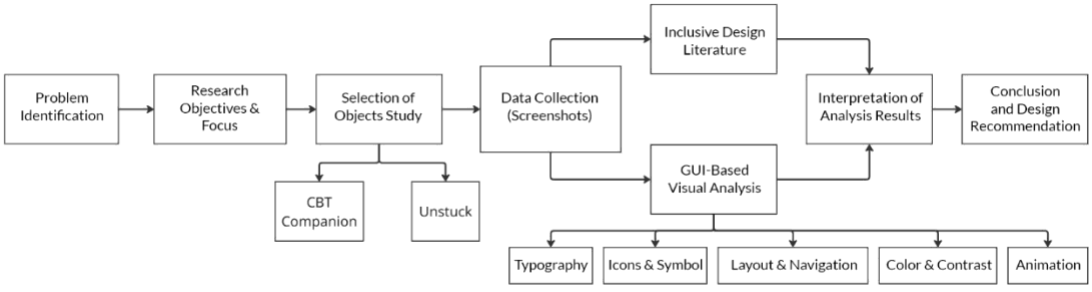


**Figure 1**. Research Method Flowchart (Source: Napitupulu, 2025)

The analytical framework in this study is based on Graphical User Interface (GUI) design principles, which encompass seven main visual aspects: (1) layout, (2) color, (3) typography, (4)

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icons and symbols, (5) animation, (6) visual hierarchy, and (7) navigation flow. The analysis is further supported by various literature related to inclusive interface design for pre-elderly adults, particularly highlighting the needs and challenges posed by visual, cognitive, and motor limitations commonly experienced by pre-elderly adults. With these considerations in mind, this analysis aims to identify the strengths, weaknesses, and visual potential of each application in relation to the effectiveness of CBT interventions.

## RESULT AND DISCUSSION

CBT Companion and Unstuck are two Cognitive Behavioral Therapy (CBT) based applications that feature different visual interface approaches in delivering their intervention content. CBT Companion has a more formal and systematic interface, resembling the structure of professional clinical therapy. The app interface is dominated by functional elements with a vertical layout that tends to be dense and uses relatively neutral and calm colors, such as white, gray, blue, and green, which reinforce the professional and therapeutic feel. Meanwhile, Unstuck features a lighter and more reflective interface. The application interface is dominated by narrative elements that tend to be spacious with high-contrast colors and simple illustrations. The difference in visual approach between the two applications is an important foundation for understanding how interface design influences perception, comfort, and visual accessibility, directly impacting the effectiveness of CBT interventions for older adults, especially pre-elderly adults.

The visual analysis of the interface in this study refers to the principles of Graphical User Interface (GUI), covering aspects of layout, color, typography, icons, animation, and navigation. In the context of pre-elderly users, GUI principles not only serve an aesthetic function, but must also accommodate visual, motor, and cognitive limitations. Therefore, the visual comparison analysis focuses on five main aspects: (1) layout and navigation, (2) color and contrast, (3) typography, (4) icons and symbols, and (5) animation and transitions.

### 1. Accessibility: Structure and Navigation Flow

Layout greatly affects user focus and comfort. CBT Companion implements a two-column grid-based layout, which is effective in guiding user focus in presenting various information in the interface without complex gestures (Neil, 2014; Tidwell, 2010). Age-related vision loss (tunnel vision) causes pre-elderly adults to pay less attention to elements on the edges of the screen (Etcheverry et al., 2012). However, the dense spacing of grids can reduce pre-elderly adults visual comfort, potentially increasing touch errors and visual fatigue. Additionally, the CBT Companion layout exhibits inconsistencies, with each page using different visual structures, ranging from a two-column grid, two horizontal cards, to a three-row grid. These differences can disrupt the expectations of pre-elderly adults, who tend to rely on repetitive visual patterns to understand the flow of an application (Li & Luximon, 2019). A consistent interface design can enhance user understanding, making consistent layout across pages crucial (Tajudeen et al., 2022).

In addition, CBT Companion does not provide implicit or explicit instructions regarding the order in which features should be used. Although there is a Take Tour option on the sidebar, this feature is not immediately visible and risks being overlooked. As a result, users must guess for themselves which module to access first. The absence of a navigation hierarchy and structured flow guidance has the potential to increase cognitive load, especially for pre-elderly adults who require visual assistance or step-by-step guidance when exploring digital content.

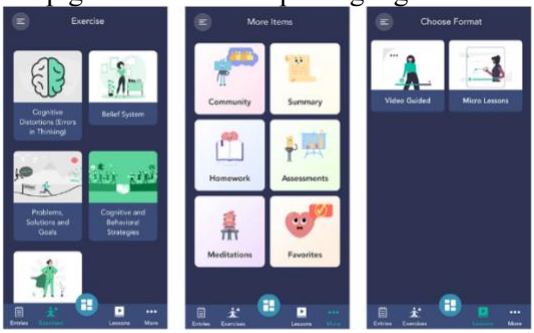


**Figure 2**. Visual Layout of CBT Companion Application *(Source: Napitupulu, 2025)*

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Meanwhile, Unstuck implements a simple linear list-based single column layout. Research shows that list formats are more efficient than cards, grids, or galleries because they can display a lot of content on one screen without complex gestures, which are often a motor obstacle for pre-elderly users (Harley, 2014; Salman et al., 2018). The spacious spacing between elements and clean layout make it easier for users to scan information sequentially and clearly, thereby reducing the risk of touch errors. This layout aligns with the preferences of pre-elderly adults, who tend to explore content in a linear manner (Etcheverry et al., 2012).

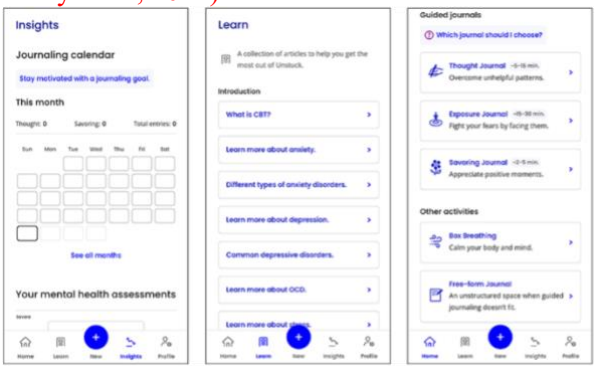


**Figure 3**. Visual Layout of Unstuck Application (Source: Napitupulu, 2025)

The app's navigation is also explicitly organized, such as the main Thought Journal feature with the supporting Box Breathing feature separated by a sufficient visual distance, and supported by informational text labels, such as the Guided Journal feature that provides estimated durations and brief descriptions of each feature, thereby clarifying their functions and helping pre-elderly adults make decisions independently and with greater confidence when exploring the app. Additionally, links like “Which journal should I choose?” serve as explicit assistance for pre-elderly adults who need guidance in selecting features. Visual consistency and clear navigation direction reduce cognitive load and support the user experience, particularly for those with visual, motor, or mild cognitive limitations.

## 2. Visual Comfort: Color and Contrast

Color is one of the first elements that users notice before other visual elements, and it plays a role in shaping users' subjective perceptions of an application (Sari, 2023). Color selection can influence perception, emotions, and information readability, especially for pre-elderly adults with declining vision. CBT Companion is dominated by blue, blue-green, and white colors, creating a therapeutic and professional atmosphere. Blue-green is often associated with calmness, loyalty, and trust (Maswar et al., 2022), making it suitable for use in digital therapy contexts. However, the relatively low color contrast between text and background in some elements, such as menu labels, can reduce visibility. This can pose a challenge for pre-elderly adults with presbyopia, a common age-related decline in visual acuity. Studies show that people with presbyopia tend to experience a significant decline in reading performance with low-contrast text at normal reading distances (Teramoto et al., 2012).

In addition, CBT Companion also uses a dark blue background with light text. Although visually soothing, it is not optimal in bright lighting. A study by Sethi and Ziat (2023) shows that negative displays (dark mode) cause pre-elderly adults to experience higher visual fatigue and longer information search times. The combination of a dense display and low color contrast can increase cognitive load and the risk of interaction errors, especially for pre-elderly adults with impaired visual perception. A study by Boll and Brune (2015) confirms that a light background such as white or light gray with dark text is the most suitable contrast combination for pre-elderly adults, offering good readability and minimal visual barriers.

Meanwhile, Unstuck adopts a more visually friendly color approach, with a white background and dark text (dark blue or black) that creates high contrast. The use of accent colors like purple and bright blue (electric blue) is applied selectively to icons and active buttons, ensuring that important

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elements remain easily recognizable without overwhelming the visual experience. Boll and Brune's (2015) qualitative study emphasizes the importance of maintaining a balance between high contrast and a light background to enhance readability and reduce visual strain for pre-elderly adults.


**Figure 4**. Comparison of Color Contrast and Readability in Applications (Source: Napitupulu, 2025)

### 3. Information Readability: Typography

Typography is a key element in conveying the main information of the application, in this context, CBT intervention. The choice of typography is related to the ease of reading, and the font size used is related to readability (Siburian et al., 2020). Both applications, CBT Companion and Unstuck, use modern sans-serif fonts with high readability. Studies show that sans-serif fonts are easier to read, and most pre-elderly users do not have difficulty reading text using this font type (Boll & Brune, 2015). However, the typography implementation in the two applications shows significant differences. CBT Companion features a wide range of text sizes, such as in the navigation menu, and most text sizes are still too small. Additionally, the line spacing and text margins are often too narrow and close to icons or card borders. Small text sizes and dense spacing can reduce readability and cause visual fatigue for pre-elderly adults.

Meanwhile, Unstuck displays consistent and relatively large text sizes that are easy to read. There is a clear visual hierarchy between the title text, subtitles, and content. Contrast in text size can indicate the direction of the user's eye movement (Siburian et al., 2020). Although some secondary text is still small in size, the contrast between the text color and background can improve readability. The spacious spacing between text and other visual elements, such as icons, also makes it easier for users to read and understand the content. A study by Hou et al. (2022) shows that the ideal text size for older adults is between 10.5 and 15 pt, depending on the context of use. The study also shows that older adults read intensively, such as long articles or instructions, more quickly and do not experience fatigue at a text size of 18pt (Chatrangsan and Petrie, 2019). This size range is considered optimal in terms of readability and information processing efficiency for pre-elderly adults.

### 4. Navigational Support: Icons and Symbols

Icons and symbols play an important role in interface navigation, especially for pre-elderly adults who have cognitive and visual perception limitations. In the CBT Companion app, the icons used tend to be minimalist and simple, but they lack visual consistency. Some icons are displayed in a filled style, while others use an outlined style with varying thicknesses. This inconsistency affects the consistency of the interface's appearance and confuses users in distinguishing functions, especially for pre-elderly adults who heavily rely on consistent and repetitive visual patterns (Li & Luximon, 2019).

Some icons also have unfamiliar shapes, such as the home button on the bottom navigation bar, which resembles a layout box. Without text labels, these icons can lead to differing perceptions among pre-elderly adults. According to Gomez-Hernandez et al. (2023), icons should be concrete, familiar, and closely related to the functions they represent. Icons should represent real objects to make them easily recognizable. Textual support for icons is also important to enhance understanding and reduce interaction errors in the interface. Icons not only have aesthetic value but also functional and effective meaning (Sumema et al., 2023).

Meanwhile, the Unstuck app uses minimalist icons, but with high color contrast and always

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accompanied by clear text labels. The icons are consistently placed at the bottom of the navigation bar, with a visual separation between primary and secondary functions, reinforcing the hierarchical structure of the interface. The icon style used is also consistent, employing an outlined style without any other styles like filled, creating a consistent visual pattern. Additionally, icon sizes are adjusted according to hierarchical levels, with main feature icons appearing more prominent than secondary feature icons, helping users intuitively recognize priorities.

**5. Visual Response: Animation and Transition**

Animations and transitions in applications play a role in providing visual feedback to inform users that an action has been successfully performed, given that there is no physical response as when using a mouse or keyboard (Babich, 2017). For pre-elderly adults, clear and consistent transitions can reduce cognitive load and improve understanding of the interface. If possible, multisensory feedback can improve response delivery, especially for pre-elderly adults with visual impairments (Gomez-Hernandez et al., 2023).

In the CBT Compansion app, transitions applied to navigation buttons, sidebars, and card views involve changes in color and opacity. Thus, when an interactive button is pressed, the color changes from blue to green accompanied by a fading effect. Although the animation appears dynamic, transitions that are too subtle tend to go unnoticed by pre-elderly adults with visual perception limitations. Feedback should be provided explicitly and clearly every time an interaction occurs, so users are aware of the action they have performed. Pre-elderly users are at risk of not recognizing subtle color changes and are more prone to tapping outside the target area, so they require a clear visual response to avoid errors (Gomez-Hernandez et al., 2023).

Meanwhile, the Unstuck app implements simpler visual feedback through high-contrast solid color transitions, such as changing from gray to dark blue on the navigation buttons. Although this is clear enough for navigation elements, there are no transition effects or visual feedback on main elements such as feature lists (list view). This lack of response can cause confusion, especially for pre-elderly users who rely on visual cues to recognize interactive elements, and increases the risk of accidental taps on areas with unclear functions. Neither apps includes multisensory feedback such as sound or vibration, even though this approach has been proven to help pre-elderly users with sensory limitations.

Based on the analysis of the five aspects of the Graphical User Interface (GUI), Unstuck is generally superior in terms of usability, visual comfort, and visual accessibility for pre-elderly adults. The application demonstrates visual consistency, guided navigation, high color contrast, and text sizes appropriate for the needs of pre-elderly adults, particularly those with cognitive, visual, or motor impairments. On the other hand, CBT Companion, despite adopting a visual approach with therapeutic colors and a professional structure, has not fully implemented inclusive design principles for pre-elderly adults. Inconsistent layout, visually unfriendly typography sizes, and low color contrast may increase cognitive load and hinder interaction comfort in CBT interventions, especially for pre-elderly adults with visual impairments and visual perception limitations.

These findings reinforce that the success of digital CBT interventions is not only determined by the quality of psychotherapy content but is also significantly influenced by an inclusive and user-friendly interface. Applications with interface designs that are not senior-friendly risk reducing engagement and effectiveness of use

## CONCLUSION

This study shows that interface design plays an important role in supporting the effectiveness of Cognitive Behavioral Therapy (CBT)-based digital interventions, especially for pre-elderly adults with visual, cognitive, and motor impairments. Through a visual comparison analysis of two CBT mobile apps, CBT Companion and Unstuck, it was found that user-friendly interface design for pre-elderly adults should prioritize simple layouts, visual consistency, high readability, and navigation accompanied by explicit guidance.

Based on the analysis results, Unstuck demonstrates a more inclusive and user-friendly visual approach for pre-elderly adults. The app features a structured navigation system, clean visuals,

appropriate text sizes, and high color contrast, making it easier for users to explore independently. Meanwhile, CBT Companion stands out in terms of its professional therapy structure and therapeutic color combinations, but still faces challenges in terms of layout consistency, readability, and navigation clarity, which can be visually and cognitively burdensome for pre-elderly adults.

However, this study has several limitations that should be noted. First, the analysis was based on interface observations through screenshots and limited functional exploration, without direct involvement from pre-elderly users. Second, aspects of the overall user experience, such as cognitive load, task completion time, or user satisfaction, have not been explored in depth. Therefore, further research should involve direct usability testing with the participation of pre-elderly adults, using evaluative approaches such as the System Usability Scale (SUS) or User Experience Questionnaire (UEQ). It is hoped that further analysis can consider emotional engagement and the effectiveness of psychological interventions.

Overall, this study emphasizes that the success of digital CBT interventions for pre-elderly adults does not only depend on the quality of the CBT intervention content but is also significantly influenced by the quality of functional and inclusive interface design. Interface design is not merely about aesthetics but is key to bridging access, engagement, and user comfort, especially for vulnerable age groups. Therefore, interface design must integrate inclusive design principles from the early stages of application development to ensure that digital interventions can effectively and humanely reach and support pre-elderly adults in addressing emotional challenges as they age.

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