5   Results and Evaluation

This section will assess the prototype using an HCI metric, in addition to examining its alignment with the functional and non-functional requirements.

5.4   Heuristic Evaluation

In order to meet the Non-Functional Requirement NFR01, which states the importance of following Jakob Nielsen's Usability Heuristics, this section will assess the graphical user interface (GUI) of the final product in light of Neilson's Usability Heuristics [8]. This comparison is essential to ensure that the application aligns with established HCI standards.

5.1.1   Visibility of System Status

The design should always keep users informed about what is going on, through appropriate feedback within a reasonable amount of time [8]*.*

The principle of visibility of system status states that users should be continuously informed about what is happening within a reasonable time frame through feedback. In order to fulfil these criteria, certain design decisions were taken into account during development.
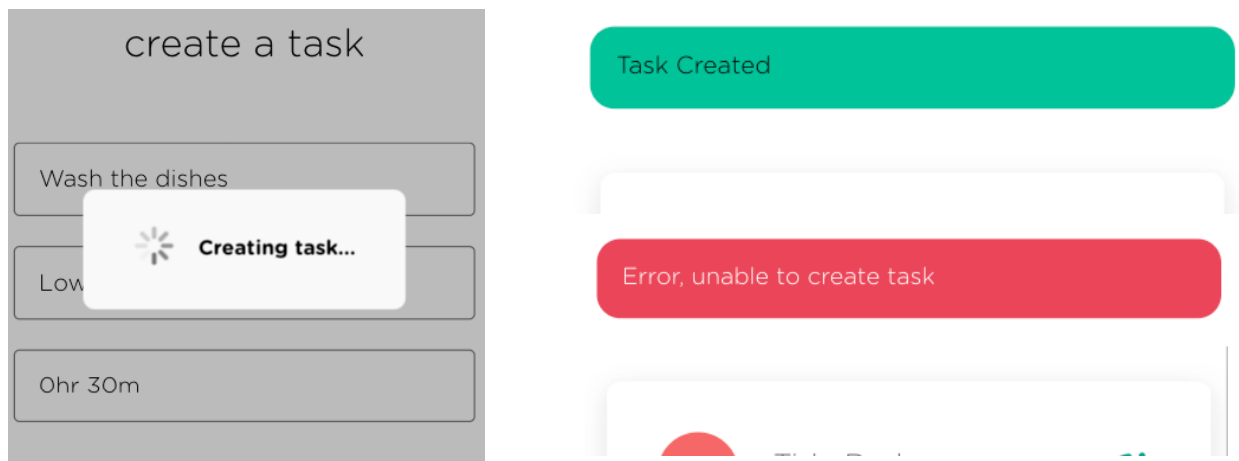

Figure 60: Loading Animations and Success/Error Toasts

Firstly, every time a user performs a major action, they are provided with clear feedback in the form of loading animations and success/error toasts (Figure 60). This immediate response to any action reduces the ambiguity surrounding the result of the action and aligns with user expectations.
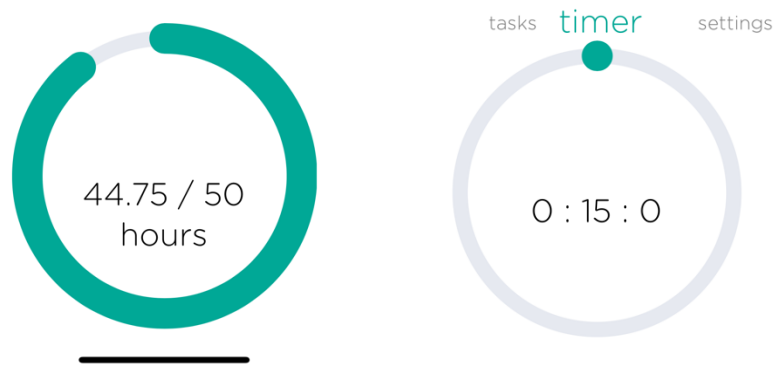
Figure 61: Progress Circles For Tracking Hours and Focus Timer

The application also employs progress circles in two key features - tracking hours spent on tasks and the focus timer (Figure 61). These visual indicators keep the user informed about their progress in real-time, helping them manage their tasks and time effectively.

Further, when the focus timer concludes, an alert is triggered, informing the user that their focus period has ended. This proactive communication prevents overwork and encourages breaks, which is especially helpful for students diagnosed with ADHD.

Haptic feedback is another crucial element of the application's design that ensures the user is aware of their interactions with the system using vibrations.
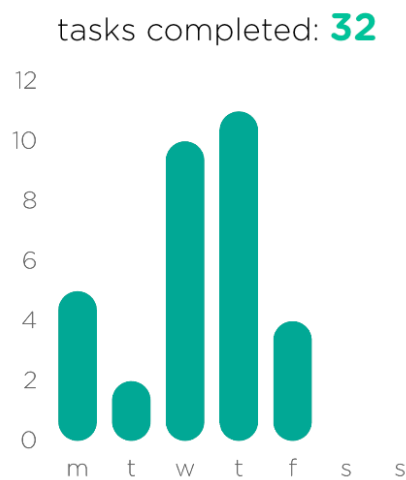

Figure 62: Weekly Task Completion Chart

Lastly, the weekly task completion chart (Figure 62) offers a visual representation of the user's productivity, keeping them aware of their performance trend. This feature allows users to evaluate their productivity over time, thereby motivating them to improve.

All these design elements align with the visibility of system status principle, ensuring the user is consistently informed about the application's status and their interaction results.

5.1.2 Match between System and the Real World

The design should speak the users' language. Use words, phrases, and concepts familiar to the user, rather than internal jargon. Follow real-world conventions, making information appear in a natural and logical order [8].

Adherence to the principle of matching the system with the real world is evident in the application's design, ensuring that the interface communicates with the user in a familiar and clear manner.
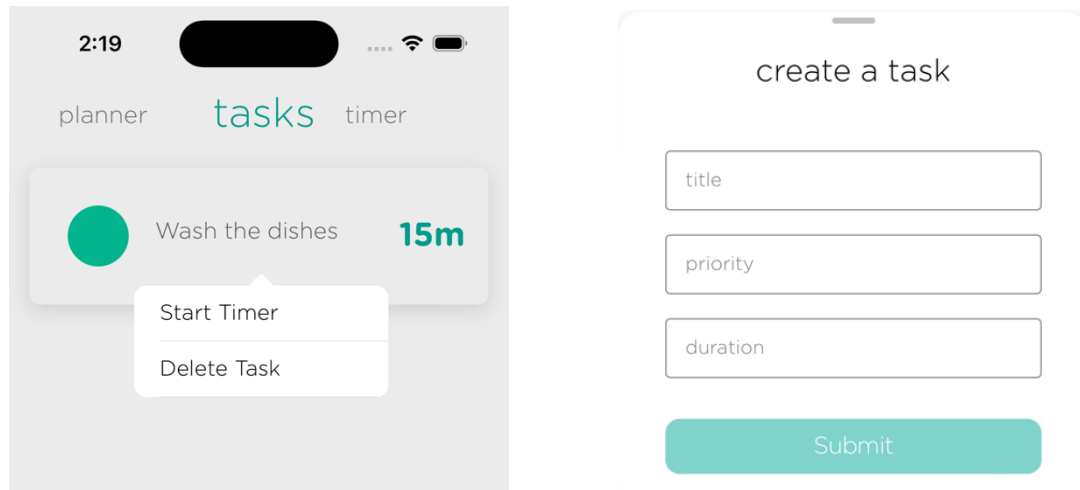

Figure 63: Front-end User Interface

The application uses language that aligns with the user's perspective rather than system-oriented terms. For instance, the application uses terminologies like "tasks," "planner," and "timer," which naturally correspond with the typical vocabulary of a student managing their tasks (Figure 63).
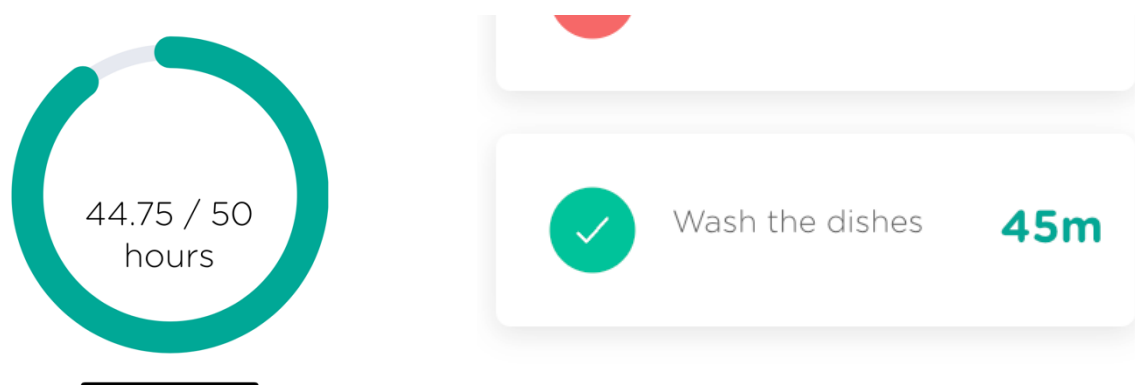

Figure 64: Use of Familiar Icons and Symbols

The application employs familiar icons and symbols that are prevalent in many other applications, such as a tick for task completion and a circular progress bar for time tracking (Figure 64). These recognisable visual cues encourage intuitive interaction, making it easier for users to navigate and use the application.

Overall, the application's design follows the real-world conventions, which enhances the user's comprehension and ease of use. The familiar elements help to minimise the learning curve, allowing the user to efficiently operate the application from the very beginning.

5.1.3   User Control and Freedom

Users often perform actions by mistake. They need a clearly marked "emergency exit" to leave the unwanted action without having to go through an extended process [8].

One of the crucial aspects of Jakob Nielsen's usability principles is to provide users with a sense of control and freedom while navigating the system. While the application excels in many usability principles, it does fall short in fully aligning with this specific principle.

Figure 65: Lack of Cancel When Creating Tasks

Though the application provides a user-friendly interface, it lacks certain elements that would empower the user with greater control. A noticeable omission is the absence of an "cancel" feature, which prevents the users from easily cancelling their actions if mistakes are made while entering a task or wish to block the action. (Figure 65).

Furthermore, the inability to customise the duration of the focus timer or break intervals constrains the user's freedom to adjust the system according to their personal preferences and requirements. This rigid structure may not cater to the diverse needs of all ADHD students, who might benefit from personalized focus periods and breaks (this can be seen in Figure 57).

Unfortunately, the application's design does not entirely support the user control and freedom principle. Future iterations of the application could benefit from incorporating features such as "cancel" or "undo" buttons, that allow greater flexibility and control to cater to individual user preferences.

5.1.4 Consistency and Standards

Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform and industry conventions [8].

The principle of consistency and standards suggests that applications should follow established rules and incorporate consistent elements to prevent user confusion. The application design effectively demonstrates this principle through various means.
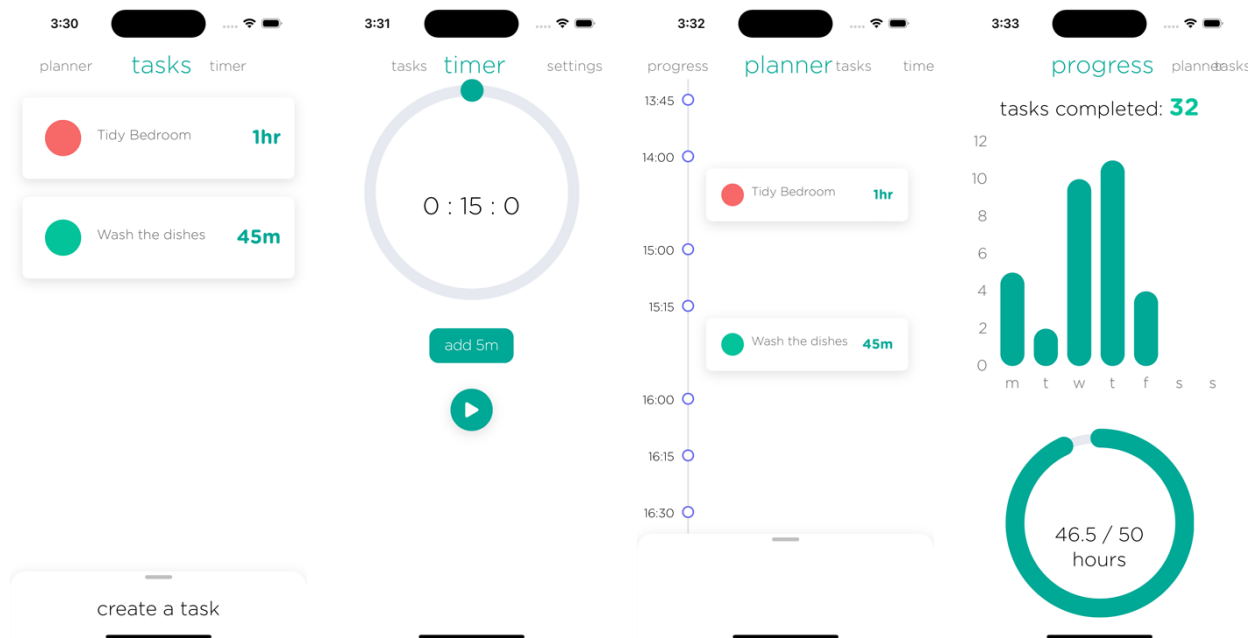

Figure 66: Consistent Design Throughout the Application

All pages within the application employ a uniform design pattern. For instance, the Tasks, Timer, Planner, Progress, and Settings pages all feature consistent typography and colour scheme, facilitating a smooth and predictable navigation experience (Figure 66).
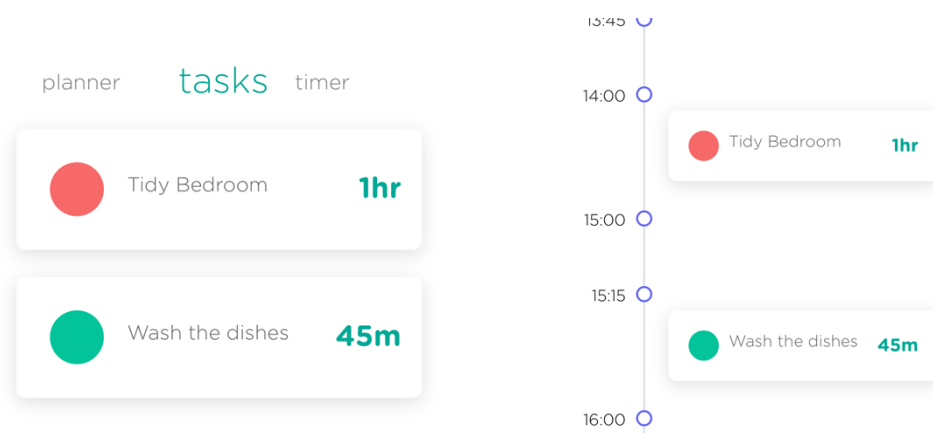

Figure 67: Task Design

The application also upholds consistency in interactive components. The card design used in the tasks, for instance, uses a priority circle, title, and duration. This design is used on the tasks page and carries over to the Planner page, where tasks from the bottom sheet can be dragged and dropped onto the timeline, maintaining familiarity and coherence (Figure 67).

Overall, the application abides by the principle of consistency and standards largely, ensuring a user-friendly and intuitive experience.

5.1.5 Error Prevention

Good error messages are important, but the best designs carefully prevent problems from occurring in the first place. Either eliminate error-prone conditions, or check for them and present users with a confirmation option before they commit to the action [8]*.*

The principle of error prevention stresses the importance of system design that mitigates the risk of user errors. The application incorporates a number of features to prevent errors, although some areas could be further enhanced.
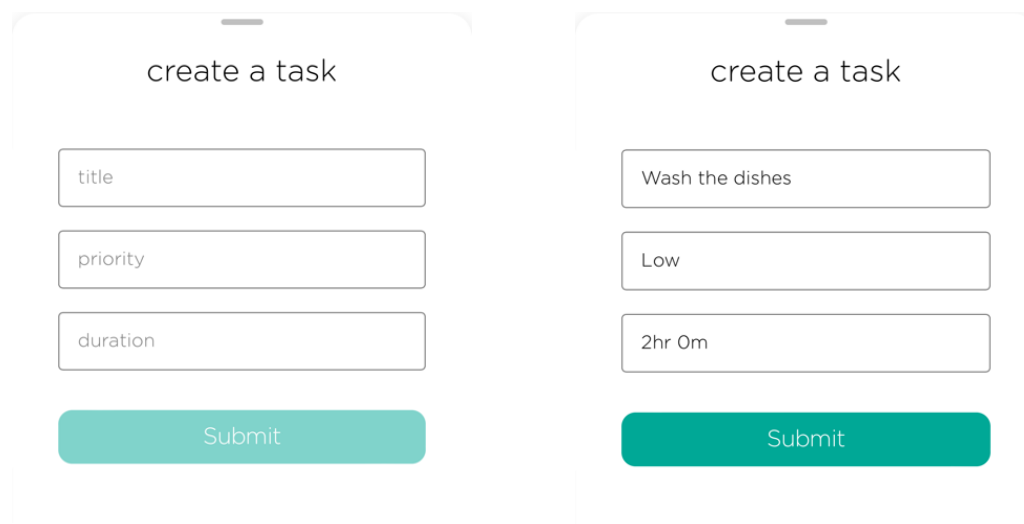

Figure 68: Front-end Create Task Form

The application's design makes use of a simple and intuitive interface, reducing the potential for user error. For example, the task creation form on the Tasks page explicitly asks for the title, priority, and duration of a task, guiding the user to input necessary information (Figure 68).

However, the application could improve in providing input validation to prevent errors. For instance, it could add form validation to ensure the user doesn't leave any fields empty or input inappropriate values when creating a task.

The timer component on the Timer page, with its ability to add five minutes and a play/pause button, simplifies interaction and avoids errors related to time management. And on the Planner page, tasks can be moved and adjusted on the timeline, allowing for corrections and preventing scheduling errors (see Figure 66).

Despite these features, the application could enhance error prevention through incorporating features like confirmations for destructive actions. For example, asking for user confirmation before deleting a task could prevent accidental removals.

In conclusion, while the application incorporates certain elements to prevent errors, it could potentially be improved in areas such as input validation and confirmations for destructive actions to fully align with the error prevention principle.

5.1.6   Recognition Rather Than Recall

Minimize the user's memory load by making elements, actions, and options visible. The user should not have to remember information from one part of the interface to another. Information required to use the design (e.g. field labels or menu items) should be visible or easily retrievable when needed [8].

The principle of recognition rather than recall emphasises the importance of making objects, actions, and options visible to users. By employing this principle, the application supports users by not burdening them with remembering information from one part of the interface to another.

The tasks page is a prime example of this principle in action, with each task item presented in a card design that includes the priority circle, title, and duration (see Figure 67). This layout allows users to recognise each task's status without having to recall specific information.

Figure 69: Timer Play/Pause Button

The timer page aids recognition through the use of universally accepted symbols for the play/pause button (Figure 69). These icons, familiar to most users, enable instant recognition, simplifying interaction.
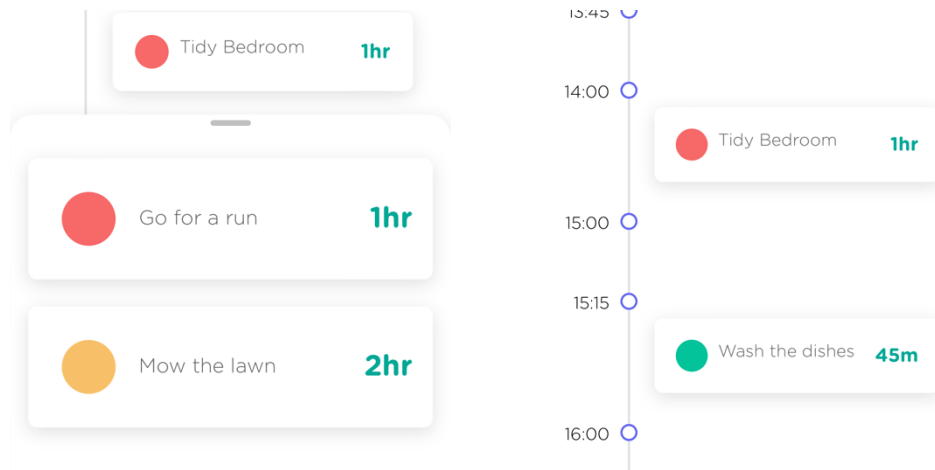
Figure 70: Planner Page

Similarly, the planner page displays tasks from the tasks page in a draggable bottom sheet, helping users recognise and schedule their tasks (Figure 70). The timeline representation with time intervals supports users in recognising their schedule without needing to recall task timings.

In summary, the application largely employs the principle of recognition rather than recall, offering an intuitive, user-friendly interface that reduces the cognitive load on users.

5.1.7 Flexibility and Efficiency of Use

Shortcuts — hidden from novice users — may speed up the interaction for the expert user so that the design can cater to both inexperienced and experienced users. Allow users to tailor frequent actions [8].

The principle of flexibility and efficiency of use suggests that an application should cater to both novice and experienced users by allowing customisation and providing accelerators to speed up interaction. The application demonstrates this principle to some extent, but there is room for improvement.

The Tasks page offers an intuitive way to create tasks and mark them as complete, catering to both novice and experienced users (see Figure 63). Yet, the application could provide more flexibility by allowing users to edit tasks after creation, which could enhance efficiency for more advanced users.
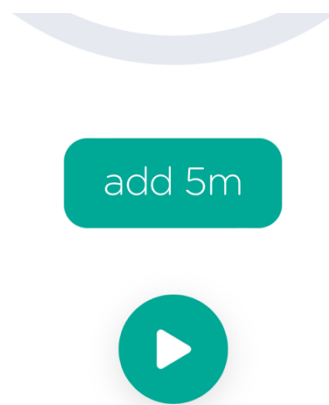

Figure 71: Add Five Minutes Timer Button

The Timer page includes a button to add 5 minutes to the timer, enabling users to extend their focus time as needed (Figure 71). However, offering more customisation options for the duration of the timer and the break intervals could better accommodate diverse user preferences and habits.

On the Planner page, the ability to drag and drop tasks onto the timeline and adjust their duration or timing provides flexibility and ease of use (Figure 70). Still, including a feature for recurring tasks or templates for common schedules could significantly improve efficiency for frequent users.
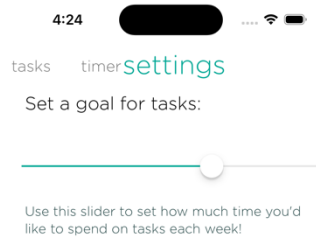
Figure 72: Front-end Settings Page

The Settings page allows users to set a goal for the number of hours they aim to spend completing tasks each week, offering a degree of customisation (Figure 72). However, providing more options for personalisation could enhance the app's adaptability to individual user needs.

In summary, while the application incorporates certain elements of flexibility and efficiency of use, greater personalisation and advanced features could be incorporated to cater to the needs of both novice and more experienced users, better aligning with this usability principle.

5.1.8 Aesthetic and Minimalist Design

Interfaces should not contain information that is irrelevant or rarely needed. Every extra unit of information in an interface competes with the relevant units of information and diminishes their relative visibility [8]*.*

The principle of aesthetic and minimalist design promotes simplicity, where unneeded information is reduced, allowing relevant content to stand out. The application demonstrates this principle quite effectively in its design.
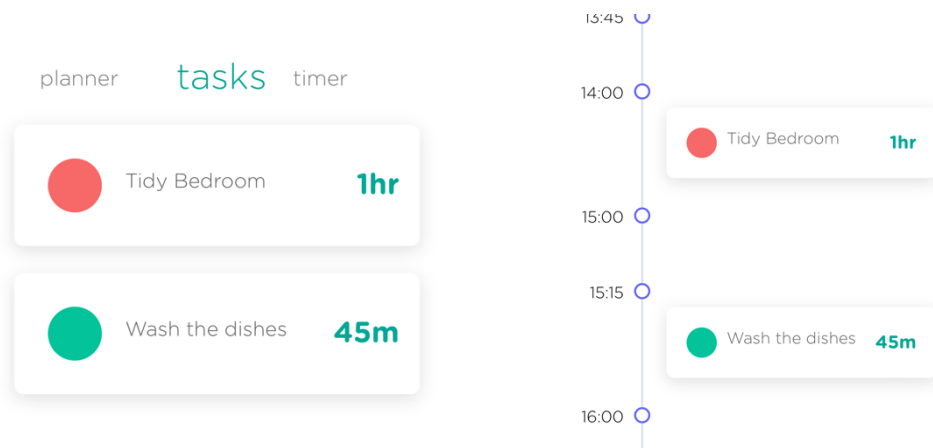

Figure 73: Task Design

The Tasks page illustrates this principle through a clean card design, with each task card featuring only essential information: a colour-coded priority circle, the task title, and the task duration (Figure 73). This minimalistic approach makes it easy for users to quickly scan and understand their tasks.
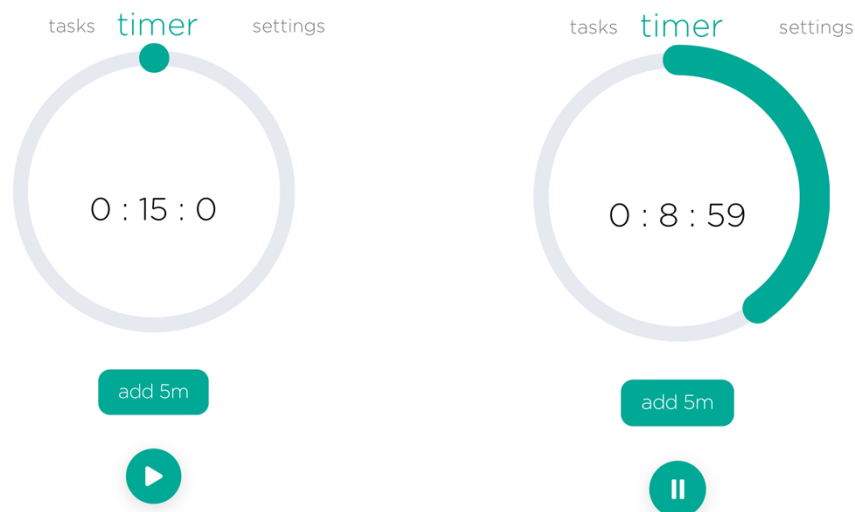

Figure 74: Front-end Timer Page

The Timer page illustrates simplicity with a straightforward progress bar and essential buttons for controlling the timer (Figure 74). The absence of unnecessary information or options reduces distractions and makes the page efficient for its purpose.
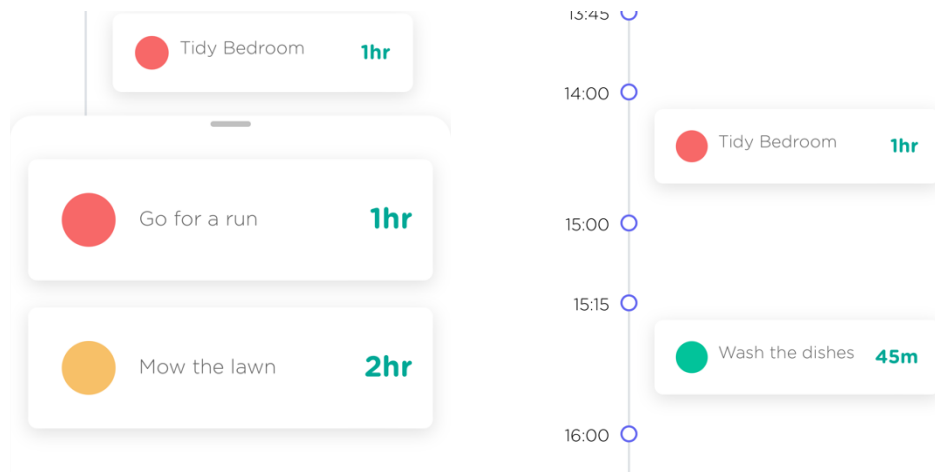
Figure 75: Front-end Planner Page

The Planner page also adheres to a minimalist design, with a clear timeline and drag-and-drop tasks from a bottom sheet. This approach simplifies scheduling tasks without clutter (Figure 75).
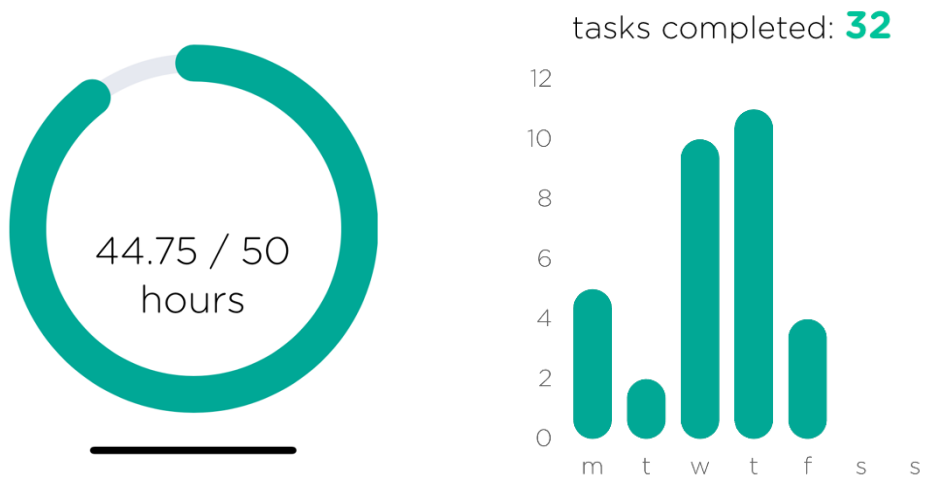

Figure 76: Front-end Progress Page Components

Similarly, the Progress page employs a straightforward layout with a weekly task completion chart and a circular progress bar to represent hours spent on tasks, providing a quick overview of the user's progress without excess information (Figure 76).

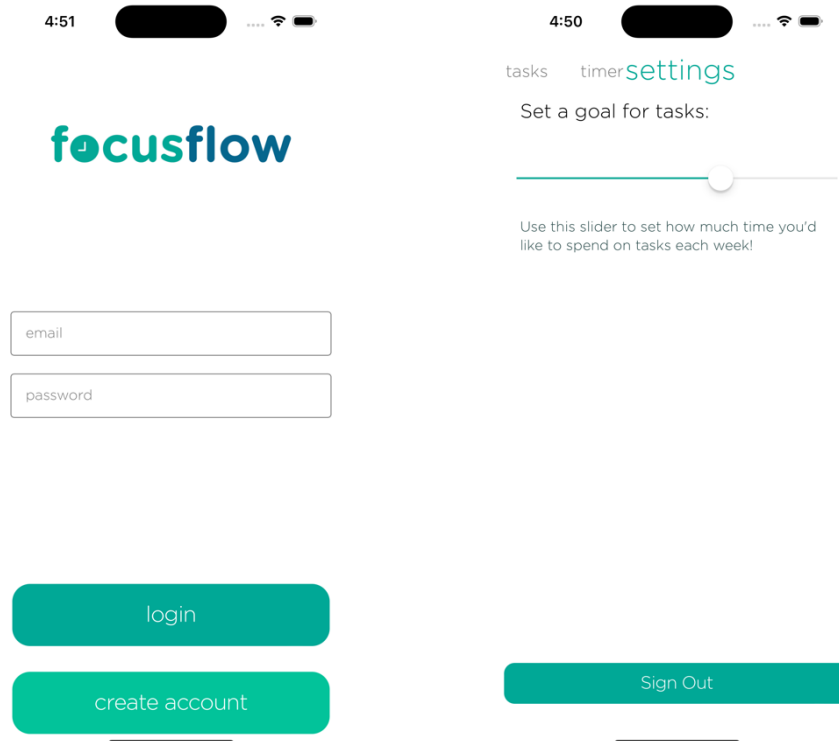*Figure 77: Front-end Login and Settings Page*

Lastly, the application's login and settings pages contain only the necessary fields and options, making them easy to navigate and use (Figure 77).

In essence, the application aligns well with the principle of aesthetic and minimalist design, presenting only necessary information and functionality while maintaining an attractive and easy-to-navigate interface.

5.1.9 Help users recognise, diagnose, and recover from errors

Error messages should be expressed in plain language (no error codes), precisely indicate the problem, and constructively suggest a solution [8].

The principle of helping users recognise, diagnose, and recover from errors advocates for clear and simple error messages that guide users towards solutions. It appears that this area is where the application could improve.
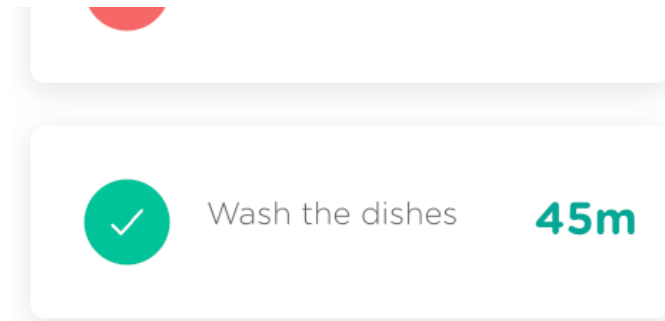

Figure 78: Task Completion Checkmark Animation

The application includes animations and success/error toasts to communicate the system status. For instance, when a task is marked as complete, an animation plays, and the task moves upwards off the screen, clearly indicating the successful completion of the task (Figure 78).

However, the application seems to lack clear and explanatory error messages when things go wrong. If an error occurs, such as failure to load data or unsuccessful task creation, the application could be more explicit in communicating these errors to the user, along with steps for recovery.
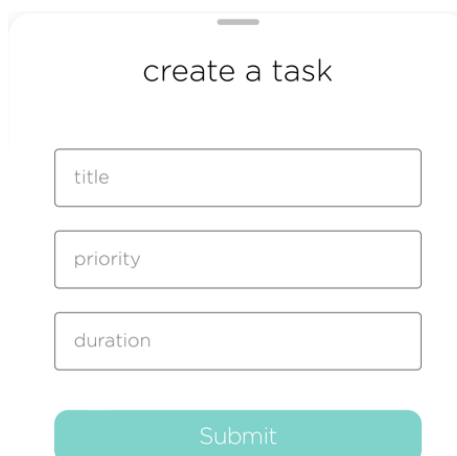
Figure 79: Empty Create Task Form With Button Disabled

In the current design, if users make an error, such as leaving a field empty while creating a task or entering an incorrect login credential, the application does not provide an explicit error message guiding them to rectify the problem (Figure 79).

The application could benefit from incorporating detailed and easy-to-understand error messages that not only indicate that an error has occurred but also guide users on how to correct the issue.

In conclusion, while the application does well in various aspects of usability, further improvement in helping users recognise, diagnose, and recover from errors would enhance its overall usability and user experience.

5.1.10 Help and Documentation

It's best if the system doesn't need any additional explanation. However, it may be necessary to provide documentation to help users understand how to complete their tasks [8].

The last of Nielsen's usability principles suggests that it can be beneficial to provide help and documentation. While users should not have to resort to a help manual to use the system, having easily accessible, searchable, and beneficial documentation can be of significant assistance when users are stuck or confused.

In its current version, it seems the application could be improved to strengthen its alignment with this principle. Currently, the application does not provide an in-built help or documentation system to assist users when they encounter issues. Due to limited time, this was a feature that had to be missed however, it could be easily added in the future.

This lack of available help could be fixed with the introduction of a dedicated 'Help' or 'FAQ' section on the settings page, where users could find answers to commonly asked questions and documentation of the application's features and functions. This section could include helpful tips for getting the most out of the application's capabilities, troubleshooting advice, and guidelines for managing tasks more effectively.

Furthermore, incorporating in-context help or tips could be advantageous. For instance, the application could offer tooltips when users press and hold a button or feature, explaining its function. This assistance could reduce confusion and enhance usability.

In conclusion, while the application demonstrates many strengths in its design and functionality, the addition of easily accessible help and documentation could further improve the user experience and adherence to Nielsen's usability principles.

5.5   User Evaluation

The User Evaluation section presents a brief analysis of feedback gathered from a group of users who have been previously diagnosed with ADHD. These users were recruited through an Instagram story post seeking students diagnosed with ADHD who were willing to participate in a brief user study survey. The purpose of this evaluation was to assess the usability of the application and identify areas for improvement. The evaluation was structured around a series of questions designed to gather insights into various aspects of the user experience, including learnability, feedback and confirmation, consistency, navigability, error handling, efficiency, and simplicity. Each question is followed by a rationale explaining its purpose and an evaluation of the application based on the users' responses.

5.5.1   Question 1: How easy was it for you to learn how to use the app?

Answer options: Extremely easy, Somewhat easy, Neutral, Somewhat Difficult and Extremely difficult.

🔵	Extremely easy	1
🟠	Somewhat easy	2
🟢	Neutral	1
🔴	Somewhat difficult	1
🟣	Extremely difficult	0

Figure 80: User Evaluation Question 1 Results

Rationale
This question was designed to assess the app's learnability, which is a crucial aspect of usability. A user-friendly app should be easy to learn and use, even for first-time users.

Evaluation
The majority of users found the app either extremely easy or somewhat easy to learn, indicating that the app's design and interface are intuitive and user-friendly. However, one user found it somewhat difficult, suggesting that there may be room for improvement in the app's onboarding process or in-app guidance.

5.5.2 Question 2: Did the app provide appropriate feedback and confirmation for your actions?

Answer options: Yes, No, Sometimes.

🔵	Yes	4
🟠	No	0
🟢	Sometimes	1

Figure 81: User Evaluation Question 2 Results

Rationale
Feedback and confirmation are essential for a positive user experience. They reassure users that their actions have been successful or alert them to any errors.

Evaluation
Most users felt that the app provided appropriate feedback and confirmation for their actions. This suggests that the app effectively communicates with users about the results of their actions, contributing to a smooth and intuitive user experience.

5.5.3 Question 3: Were there any inconsistencies in the app's interface or design that caused confusion?

Answer options: Yes, No.

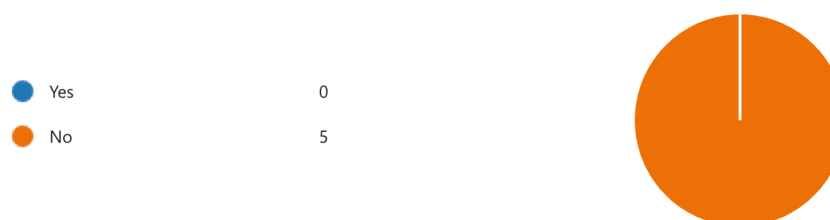|		
🔵	Yes	0
🟠	No	5

Figure 82: User Evaluation Question 3 Results

Rationale
Consistency in an app's interface and design can significantly enhance usability by making the app easier to learn and use.

Evaluation
All users reported no inconsistencies in the app's interface or design, indicating that the app maintains a consistent look and feel throughout, which can help users learn how to use it more quickly and easily.

5.5.4 Question 4: Were there any instances where you had difficulty locating specific features or options within the app?

Answer options: No, Other (please specify).

🔵	No	2
🟠	Other	3

Figure 83: User Evaluation Question 4 Results

Rationale
This question was designed to assess the app's navigability. Users should be able to easily locate and access all features and options within the app.

Evaluation
While some users had no difficulty locating specific features or options, others reported minor issues, particularly with the task creation and planner features. This feedback suggests that these features may need to be made more intuitive or that additional guidance may be needed to help users understand how to use them.

5.5.5 Question 5: Did the app provide appropriate error handling and help you recover from any mistakes?

Answer options: Yes, Other (please specify).

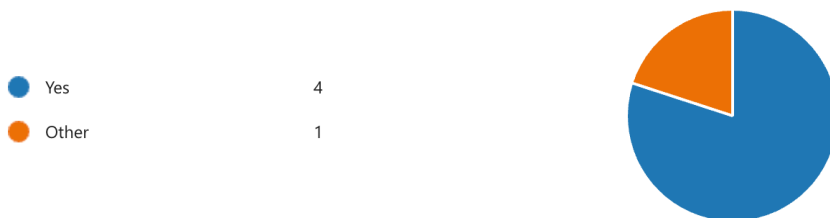|		
🔵	Yes	4
🟠	Other	1

Figure 84: User Evaluation Question 5 Results

Rationale
Good error handling is crucial for a positive user experience. The app should not only prevent errors where possible but also provide clear and helpful error messages when errors do occur.

Evaluation
Most users felt that the app provided appropriate error handling. However, one user reported an issue with the task creation form validation, indicating that the app may need to improve its error handling in this area.

5.5.6 Question 6: Were the interaction patterns (e.g., swiping, tapping, dragging) consistent and predictable throughout the app?

Answer options: Yes, Other (please specify).

● Yes	4
● Other	1

Figure 85: User Evaluation Question 6 Results

Rationale
Consistent and predictable interaction patterns can enhance usability by making the app easier to learn and use.

Evaluation
Most users found the app's interaction patterns consistent and predictable. However, one user reported occasional glitches when dragging tasks on the planner screen, suggesting that this feature may need to be refined to ensure a smoother user experience.

5.5.7 Question 7: How quickly were you able to accomplish tasks using the app?

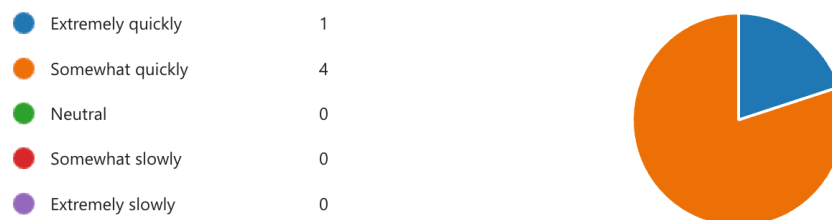Answer options: Extremely quickly, Somewhat quickly, Neutral, Somewhat slowly, Extremely slowly.

● Extremely quickly	1
● Somewhat quickly	4
● Neutral	0
● Somewhat slowly	0
● Extremely slowly	0

Figure 86: User Evaluation Question 7 Results

Rationale
This question was designed to assess the app's efficiency. Users should be able to accomplish tasks quickly and easily using the app.

Evaluation
All users were able to accomplish tasks either extremely quickly or somewhat quickly, indicating that the app is efficient and allows users to complete tasks with minimal effort.

5.5.8 Question 8: Were there any instances where you felt overwhelmed by the amount of information or options presented?
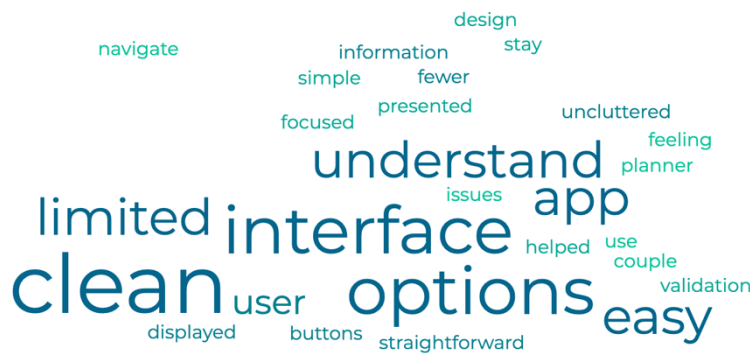

Figure 87: User Evaluation Question 8 Word Cloud

Answer options: Open text answer.

Rationale
This question was designed to assess the app's simplicity and clarity. Users should not feel overwhelmed by the amount of information or options presented in the app.

Evaluation
All users reported that they did not feel overwhelmed by the amount of information or options presented in the app. This feedback suggests that the app's design is clear and uncluttered, which can help users focus and avoid feeling overwhelmed.

5.5.9 Question 9: Any other feedback you could provide on your experience using the application?

Answer options: Open text answer.

Figure 88: User Evaluation Question 9 Word Cloud

Rationale
This open-ended question was included to capture any additional feedback or observations from users that may not have been covered by the previous questions.

Evaluation
Users provided a range of feedback, highlighting both the strengths and areas for improvement in the app. Positive feedback included the app's simplicity, easy navigation, and clean user interface. Areas for improvement included the need for more flexibility with task durations, improvements to the planner feature, and the addition of features like reminder notifications, task editing, and timer customisation.

5.5.10 Summary of User Evaluation

The user evaluation provided valuable insights into the app's usability and user experience. Overall, users found the app easy to learn and use, with consistent and predictable interaction patterns and appropriate feedback and confirmation for their actions. The app's simplicity and uncluttered design were also appreciated, with users reporting that they did not feel overwhelmed by the amount of information or options presented.

However, the evaluation also highlighted areas for improvement. Some users reported minor issues with locating specific features or options and with the task creation and planner features. Feedback also suggested that the app could benefit from more flexibility with task durations, improvements to the planner feature, and the addition of features like reminder notifications, task editing, and timer customisation.

This feedback will be invaluable in guiding future improvements to the app, with the aim of enhancing its usability and user experience for individuals with ADHD. By addressing the identified issues and incorporating users' suggestions, the app can better meet the needs and preferences of its target users.