UNIVERSITY OF TARTU
Institute of Computer Science
Computer Science Curriculum

Roberta Solom

A Prototype for an Athlete Recovery App

Bachelor's Thesis (9 ECTS)

Supervisor:
Dr. Velvet Spors

Tartu 2025

A Prototype for an Athlete Recovery App

Abstract:

The purpose of this thesis was to create a prototype for an athlete recovery app. Recovery is an essential part of exercise, as it allows athletes to perform at high levels and prevent injuries. It is often overlooked because of a lack of consistency and motivation. The thesis gives an overview of recovery in sports, its purpose, and the different types of it. The prototype design is based on theoretical frameworks like User-Centered Design and Behavioral Design. A competitor analysis was conducted to evaluate existing solutions and identify areas that can be done better. In addition, a survey and interviews were carried out among athletes to better understand their needs and preferences for app functionality. The thesis leans on primary components of Human-Computer Interaction (HCI), such as creating user personas, mapping user journeys, designing wireframes, and conducting user tests. These steps contributed to the creation of the final prototype.

Keywords: Human-Computer Interaction, Behavioral Design, User-Centered Design, prototyping, sports recovery

CERCS: P175 Informatics

Sportlase taastumisäpi prototüüp

Lühikokkuvõte:

Bakalaureusetöö eesmärk oli luua sportlase taastumisäpi prototüüp. Taastumine on treeningu oluline osa, kuna see aitab sportlasel teha maksimaalseid sooritusi ja vältida vigastusi. Sageli jäetakse taastumine tagaplaanile järjekindluse ja motivatsiooni puudumise tõttu. Töö annab ülevaate spordis taastumise olemusest, selle eesmärgist ja erinevatest liikidest. Prototüübi disain tugineb teoreetilistel raamistikkudel nagu kasutajakeskne disain ja käitumuslik disain. Töö raames viidi läbi konkurentsianalüüs, et hinnata olemasolevaid lahendusi ja tuvastada valdkondi, mida saaks paremaks muuta. Lisaks viidi sportlaste seas läbi küsitlus ja intervjuud, et paremini mõista nende soove ja eelistusi äpi funktsionaalsuse osas. Lõputöö tugineb inimese ja arvuti interaktsiooni põhikomponentidele, nagu persoonade loomine, kasutajateekondade kaardistamine, *wireframe*'ide disainimine ja kasutajatestide läbiviimine. Need sammud aitasid kaasa lõpliku prototüübi loomisele.

Võtmesõnad: inimese ja arvuti interaktsioon, käitumuslik disain, kasutajakeskne disain, prototüüpimine, sportlase taastumine

CERCS: P175 Informaatika

Table of Contents

Introduction

Training and participation in competitions are not the only factors that make an athlete successful. High performance also requires enough rest and recovery. Unfortunately, many athletes often overlook the importance of recovery due to a lack of motivation and consistency. Weatherly-White *et al.* (2012: 38) emphasize that the belief that more training leads to better results is common. In reality, the authors highlight that recovery is equally a key to success. This gap represents an opportunity for a digital tool that helps to integrate recovery into athletes' daily routines.

This thesis aims to design a prototype for a platform that allows athletes to track their recovery easily. The goal is to use artificial intelligence to provide helpful insights to help athletes enhance their performance and well-being. The main objective of this thesis is to design an app that integrates recovery into athletes' daily routines and makes it a crucial part of their training.

This thesis builds on principles of Behavioral Design and User-Centered Design (UCD). These frameworks are commonly used in Human-Computer Interaction (HCI) to ensure usability, habit formation, and user engagement. A more detailed theoretical overview is provided in Chapter 1.3.

This thesis is divided into six chapters. The first chapter introduces the definition of recovery, its different types, and the theoretical frameworks. The second chapter analyses the competitors and presents the problem-solution statement. The third chapter describes the methodology used for user research. The fourth chapter presents the data collection results and user personas created from the data. The fifth chapter introduces the design and prototyping process. It includes user journeys and scenarios, wireframes, and a clickable prototype. The final chapter outlines the structure of user testing and analyzes user feedback. It also discusses the challenges faced and future development opportunities.

The Appendices section includes the informed consent forms used in user research, the questionnaires of the survey and interviews, the grounded theory coding table, and user testing instructions.

This thesis used a language editing tool, Grammarly AI (2025), to improve clarity and sentence structure.

1. Background

This chapter gives an overview of the definition of recovery and explores why it is a key focus area for athletes. It discusses the main categories of recovery. Additionally, this chapter establishes the foundation for the prototype by discussing concepts of User-Centered Design, principles of Behavioral Design, and the importance of habit formation.

1.1 Recovery

Athletes and coaches always look for ways to gain a competitive edge to achieve success in sports (Halson, 2013: 1). However, training and participation in competitions are not the only factors determining a successful athlete. In addition to consistent training, good performance requires adequate rest and recovery. In the article by Weatherly-White *et al.* (2012: 38), recovery is defined as the process of restoring the body to its initial state after stress, such as training. According to the authors, the goal of recovery is to restore biological and psychological balance. Kellmann highlights that recovery has been overlooked both in research and everyday life (Kellmann *et al.*, 2023: 3). This oversight could impact how people view the best opinions for exercising. For example, Weatherly-White *et al.* (2012: 38) point out that a common misunderstanding is that more training tends to result in better performance. They stress that recovery is key to enabling the body to respond to stress continuously and effectively. Kellmann (2010: 95-96) emphasizes that finding a balance between training load and recovery is crucial to avoid overtraining and ensure the athlete's best performance. Recovery, as supported by Kellmann's research, helps most athletes to train more efficiently and effectively, improving overall fitness and technique. Finding a balance is a constant process that requires short-term and long-term strategies to restore resources (Kellmann *et al.*, 2023: 13). As Theobald and Dennis emphasize, the growing focus on high-level performance, championships, and scholarships has increased pressure among young athletes and has led them to train at unhealthy levels. As a result, many athletes push their bodies beyond limits by competing while sick, skipping warm-ups and cooldowns, and rushing recovery. Theobald and Dennis claim that due to this pressure, athletes commonly ignore the pain and their body's stress responses in pursuit of success (Theobald & Dennis, 2022: 1). Another aggravating factor athletes face is the pressure to avoid appearing weak when in pain. A study done about the experience of low back pain in competitive rowers found that many kept their pain secret to avoid looking weak. This led to feelings of confusion about how to manage their condition

(Wilson *et al.*, 2021: 334-335). These situations highlight how easy it is to ignore the importance of recovery and how it can significantly affect both physical and mental health.

1.2 Types of Recovery

There are various techniques available to restore the balance between recovery and training stress. The choice of these methods depends on the activity of an athlete and the time of their next training session (Halson, 2013: 1). Recovery can be divided into two main categories: passive recovery, which includes rest periods between training sessions, and active recovery, which involves low-intensity exercises (Weatherly-White *et al.*, 2012: 38). Passive recovery refers to activities where the athlete remains inactive and does not make any physical effort (Cullen *et al.*, 2021: 351). However, a culture of high performance and success makes passive recovery challenging to embrace. Athletes may fear that rest is a sign of weakness rather than a necessary part of improving performance. This perspective is often reinforced by the belief that being unproductive equals worthlessness, while productivity is highly valued (Price, 2021: 15). Though passive recovery may be overlooked, Keating (2016: 6) emphasizes that it is always accessible. Examples of passive recovery include activities such as sleeping, sitting, or lying down. In comparison, active recovery is defined as doing low-intensity activities to boost the recovery process (Liiv, 2018: 6). As Keating (2016: 5-6) explains, active recovery involves doing movements that increase endorphin levels and lead to the body's temperature rise. For example, active recovery includes activities such as running, active stretching, or walking (Li *et al.*, 2024: 2). Both passive recovery and active recovery play important parts in restoring holistic balance. As there are many different ways to approach recovery, Halson (2013: 5) emphasizes that every athlete should try out different options and methods to find out what works best for them. A recovery app could provide positive benefits when considering the various techniques available for athletes to enhance their recovery. It would provide features to compare different recovery strategies, track various data, and evaluate how the body feels each day.

1.3 Theoretical Frameworks

This chapter examines the theoretical frameworks used in this thesis. The first subsection discusses the importance of prioritizing the user through User-Centered Design when making a prototype. The second subsection explores ways to establish habits and ensure daily usage of the app with Behavioral Design.

1.3.1 User-Centered Design

One of the keys to creating well-designed technology is focusing on the people who use it. It is essential to understand them before categorizing them as users. Travis Lowdermilk, the author of the book *User-Centered Design: A Developer's Guide to Building User-Friendly Applications*, explains that developers often believe they can make design decisions based on their ideas and desires. However, Lowdermilk claims that this approach needs to be corrected and highlights the importance of understanding the definition of User-Centered Design (UCD). It comes from Human-Computer Interaction (HCI), which focuses on understanding how humans interact with technology (Lowdermilk, 2013: 5-6). In sports, a specialized field called SportsHCI applies these principles. Elvitigala *et al.* describe it as a diverse field that combines technology and UCD to transform athletes' training at all levels. They point out a growing need for new solutions for athletes and coaches as sports become more competitive and reliant on technology. Elvitigala *et al.* also explain that in recent years, HCI has played a key role in the rapid advancement of sports technology. However, they also highlight that many sports technology projects are becoming repetitive, especially performance-tracking apps, possibly due to a lack of clear research direction (Elvitigala *et al.*, 2024: 1-2). Returning to the broader discussion on UCD, Lowdermilk defines UCD as a strategic approach for creating apps that prioritize user feedback and needs. Lowdermilk highlights that focusing on users requires listening to and analyzing the data from user feedback to understand their preferences. This is why effective communication is essential with users to truly understand their experiences. Lowdermilk explains that another critical aspect is understanding what users find challenging or frustrating in an interface to make meaningful improvements. Gathering feedback provides insights into functionalities needing improvement and ensures the app meets or even exceeds user expectations. In conclusion, Lowdermilk states that UCD helps maintain focus on the most important element of the process: the user (Lowdermilk, 2013: 5-13).

1.3.2 Behavioral Design

Understanding the definition of Behavioral Design is essential for creating an app that is used daily and consistently. By applying Behavioral Design principles, developers can create features that support habit formation, enhance satisfaction, and motivate users to use the app repeatedly. Stawarz *et al.* (2015: 2653-2654) explain that habit formation is crucial in changing behavior. The authors point out that to successfully change something in one's life, the change must become a habit, and that can only be done by repeating the action frequently. The authors

highlight that repetition of a task alone is not the only thing that can make a habit stick. They bring out different cues and triggers that can simplify the process, such as implementation intentions, reminders, positive reinforcement, and rewards. Implementation intentions, defined as action plans, can help users integrate new behaviors into their routines. If people perform a new behavior after completing a daily task, they find it easier to make that habit stick. A trigger needs to happen as frequently as a new habit is wanted to be repeated. As James Clear explains in *Atomic Habits*, a trigger must also be highly specific for habit formation to be effective (Clear, 2018: 78). For example, if a recovery app requires regular usage, users should log their training and recovery data right after every session where they engage in recovery activities. Since training is already a part of an athlete's routine, stacking the logging habit on existing ones, such as stretching or cooling down, makes it easier to adopt. To make the trigger specific, athletes could set a cue: "When I sit down in the changing room after training" or "When I finish my cooldown routine, I log my session.". Tobias (2009: 409) highlights the importance of reminders in starting the habit development process. He explains that although reminders might work less over time, the new habit can already become well-established during this period. Positive reinforcement is another strategy that can simplify the process. Even small achievements can bring a sense of well-being and motivate the persistence of a new habit (Lally & Gardner, 2011: 152). Although positive reinforcement plays a smaller role compared to other factors, it can still be effective and can involve giving rewards (Stawarz *et al.*, 2015: 2654). Gamification is another strategy used to support habit formation. Huotari & Hamari (2012: 19) define gamification as a service enhancement approach that enhances experience and creates value through game-like elements. However, to effectively build a habit, rewards should be unrelated to performance to prevent reliance on them over the habit itself (Lally & Gardner, 2011: 147). While Behavioral Design principles can effectively support habit formation, it is essential to consider ethical concerns as well. As Jun *et al.* (2018: 118) emphasize, behavior change interventions should be based on reliable evidence to ensure knowledgeable decisions. They should also include the opinions of users from the start to make sure their voices are part of the process. To conclude, Stawarz *et al.* (2014) highlight three critical aspects for making a good app with Behavioral Design: encouraging users to form implementation intentions, sending notifications, and post-completion checks to reinforce task completion positively.

2. Competitor Analysis

Understanding competitors helps identify opportunities to improve (Neusesser, 2024) and find effective ways to apply Behavioral Design principles. In this chapter, the author examines three competitors: two sports recovery apps and one artificial intelligence (AI) powered journaling mental health app. It explores their services and brand descriptions, analyzes their app content and features, and evaluates their strengths and weaknesses. Additionally, it outlines the problem-solution statement and examines the stakeholders.

2.1 Selection Criteria for Competitor Analysis

The competitors for this analysis were found through a pilot search for recovery-related apps in the App Store and on the Internet. The initial search in the App Store revealed relatively few dedicated sports recovery apps. When using the keyword “recovery”, many of the results were related to addiction recovery or centered around booking physiotherapy appointments rather than sports recovery.

The author searched Google with the keyphrase ”best sports recovery apps” to gather user opinions. The author also explored AI journaling apps with the keyword “AI journal” in the App Store to further expand the search. The reasoning behind this is that the prototype being developed aims to incorporate AI to simplify athletes' logging and tracking progress. Through this process, six apps were identified and reviewed. Table 1 summarizes the pilot search findings and their insights.

Table 1. Pilot search competitors and initial insights.

App Name	Insights
Recover athletics	Popular for its integration with Strava, user-friendly, requires an account
Athlythic	Syncs with Apple Watch, provides detailed data
WHOOP (WHOOP, Inc., 2025)	Requires a WHOOP device, not accessible without it
Reflectr	AI-powered journaling app, focused on mental health with minimal user interface

1Fit (1Fit, LLC., 2025)	Membership-based fitness app made for studio booking, not recovery-specific
HRV4Training (Marco Altini, 2013)	Paid app focused on heart rate variability tracking, less accessible for casual users

The selection process became easier as it became clear that some of these apps required subscriptions and technologies that were unavailable to the author. This demonstrates the need for more accessible sports-specific recovery apps.

Ultimately, six apps were screened before landing on the final selection of three. The final choice was based on apps that were both accessible and relevant to the research focus. The first two apps, Recover Athletics and Athlytic, were chosen based on their reliance on commonly used platforms. Recover Athletics integrates with a well-known training tracker, and Athlytic works with Apple Watch. This ensured that the chosen competitors had strong data-tracking capabilities and popularity among users.

Since there were not a lot of dedicated sports recovery apps, the search was expanded to include AI-powered journaling apps. The final competitor was an AI journaling mental health app called Reflectr that was selected based on its minimalistic user interface (UI) and integration with AI-based insights.

2.2 Competitors

Recover Athletics

Description of the Service and Brand

Recover Athletics is a mobile app that offers personalized recovery programs (version 1.381.0, Recover Athletics, Inc., 2020). It is designed for Strava athletes and integrates with the Strava platform to enhance functionality (version 399.0.1, Strava, 2025). The app helps users address aches and monitor recovery progress. Recover Athletics brand's main focus is to help athletes stay healthy. They emphasize the importance of injury prevention by offering personalized solutions for tracking soreness and reducing discomfort.

Content

The app allows users to keep track of their recovery and soreness levels. Users select the specific area of the body where they feel soreness and then use a sliding scale from 1 to 10 to

indicate the intensity. Figure 1 shows how users interact with the soreness tracker and adjust the soreness level.

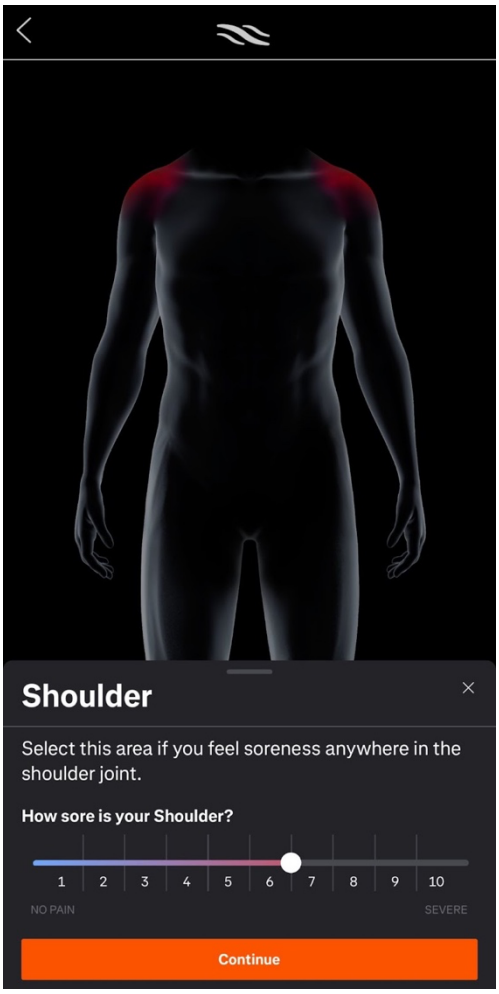

Figure 1. Soreness tracking interface.

Recovery progress is tracked using a goal-based system. The app visualizes this progress with a graph, where each completed recovery session moves the user closer to their goal. Figure 2 displays an example of the recovery progress graph.

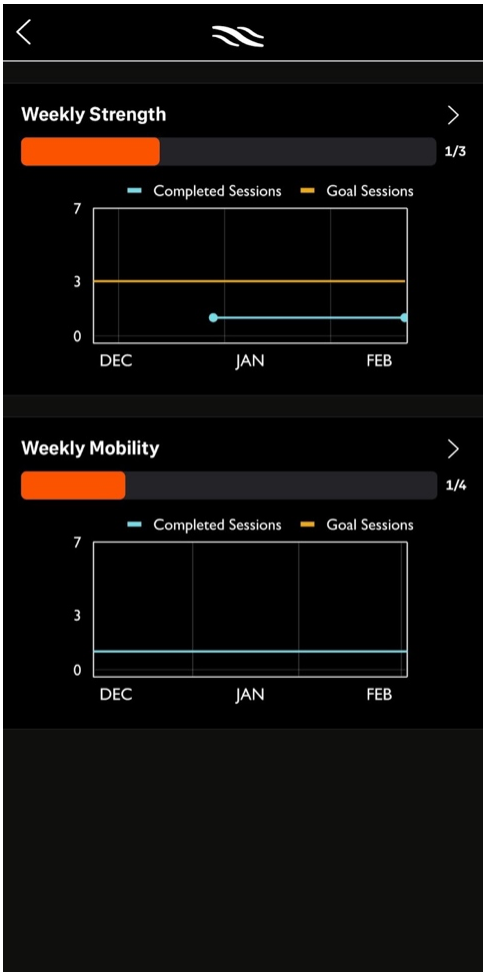

Figure 2. Recovery progress graph.

Based on your soreness input, the app suggests specific programs and customized ones. The key features are an interactive soreness tracker, personalized recovery programs, a prehab goals tracker, program exploration, and smart reminders.

Strengths and Weaknesses

One of the main strengths of this app is its uncluttered and well-organized UI. The app has a minimalistic layout with only the necessary information visible on the screen. Figure 3 illustrates the app's necessary information on the home page without overwhelming the user.

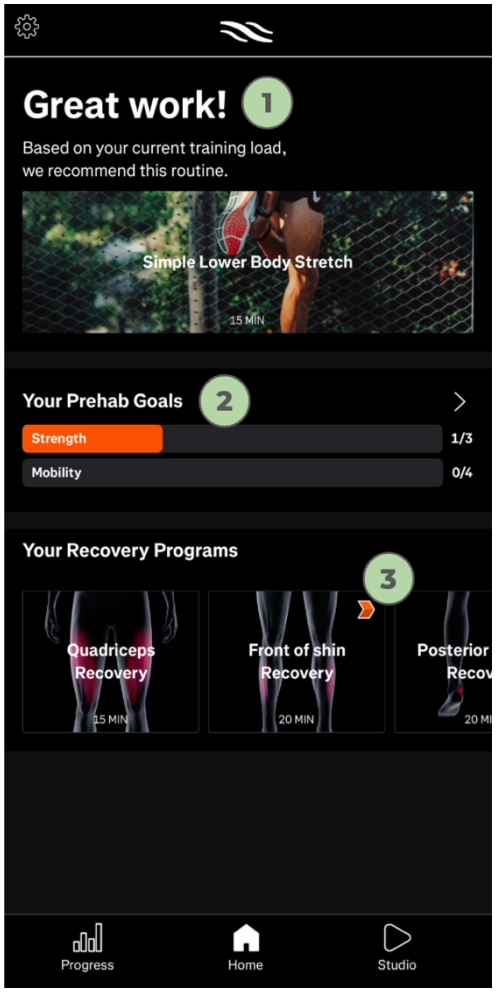

Figure 3. UI of Recover Athletics.

The app uses an elegant color scheme with black and minimal accents of other colors. UI components like icons and labels have consistent styling throughout the app. For example, headings follow a consistent placement and typography across screens (See Figure 3, Annotation 1). It is beneficial for those who are new to fitness or recovery apps. Another strength is that the built-in trackers allow users to easily monitor their soreness, recovery, and goals. The trackers display real-time updates on goal completion through progress bars (See Figure 3, Annotation 2). It is especially great for positive reinforcement.

The weaknesses come out outside of UI. The first one is the significant reliance on Strava. The app requires a Strava account for full functionality. This can be a considerable limitation for users as the app provides no alternative sign-in method. Secondly, advanced features require a premium subscription. While the basic recovery options are free, unlocking the most valuable features, such as personalized recovery plans, requires a subscription. This could frustrate the users as the paid subscription features are only marked with a small icon (See Figure 3,

Annotation 3) that is not explained during onboarding. Thirdly, there is a lack of support for other sports. Strava is primarily designed for endurance athletes, particularly runners and cyclists. This narrow focus limits its appeal to a broader audience, for example, basketball players, gymnasts, wrestlers, etc. Users from other sports may find it difficult to relate to the app's content.

Athlytic: AI Fitness Coach

Description of the Service and Brand

Athlythic is a mobile app that transforms data from your Apple Watch into actionable insights (version 5.7.8, Myndarc, LLC, 2021). It helps users interpret their health metrics to understand their recovery, sleep, and exertion. Athlytic helps individuals make sense of the data they encounter on their smartwatch. It provides valuable insight into their health and performance based metrics.

Content

The app analyzes info such as heart rate and oxygen levels. It explains how these metrics impact different aspects of the user's health. For example, it tracks recovery through heart rate variability, shows how much energy a user has burned, and analyzes sleep patterns by breaking down different sleep phases. The key features are daily insights, trends and graphs, workout summaries, journaling with tags, and an integrated calendar.

Strengths and Weaknesses

The main strength of this app is journaling with daily tags. This feature allows users to add daily tags for caffeine intake, stress levels, traveling, and more. It helps users consider how these real-life factors influence health and recovery. Figure 4 illustrates how users can add daily tags.

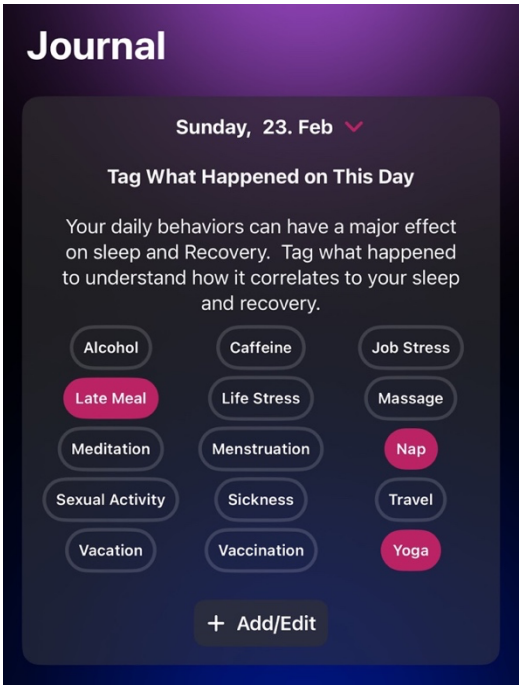

Figure 4. Daily tags feature.

Another strength is the calendar view. Users can see their activity on specific dates and view the insights. This feature offers immediate feedback on progress and behavior patterns over time. Finally, the tips and examples provided by the app are beneficial. It gives users accessible guidance directly from the app to help interpret their data and make the most of its features.

The biggest weakness of Athlythic is the UI. It is overly cluttered. Figure 5 shows how the app presents many colors, messages, and visuals competing for attention. It overwhelms the user and can distract them from core functionality. Additionally, the app provides a recovery percentage of 34%, but it lacks any explanation of how it is calculated. As a result, the user interface (See Figure 5) lacks context for the user.

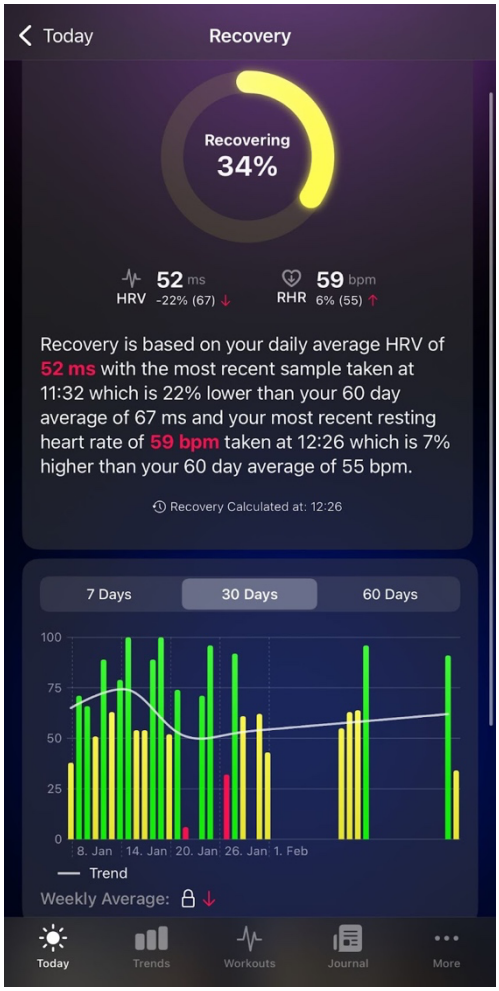

Figure 5. UI of Athlythic.

Secondly, the app has an overwhelming amount of data. It presents too much information at once without a clear visual hierarchy. Due to that, users may feel overwhelmed and cannot focus on what matters most to them. Finally, a significant portion of the app is subscription-based, restricting many functionalities. This can create confusion or frustration for the user.

AI Journal & Diary - Reflectr

Description of the Service and Brand

Reflectr is a mobile app designed to support mental health and personal growth (version 1.20.1, Daily Labs, LLC, 2024). It offers a space for journaling, mood tracking, and AI-powered reflections to help users better understand their thoughts and emotions. The brand's mission is to provide a journaling experience that encourages users to reflect on their emotions and thoughts.

Content

The app makes journaling effortless by allowing users to write their entries quickly. Users can engage with chatbots called AI friends, who offer supportive comments and perspectives on their entries. The app also includes intuitive mood tracking to reflect on their mental well-being over time. The key features are a posts feed, journaling prompt, mood tracking, easy text modification, chatting with AI friends, and an introspect that answers questions about viewpoints and recommendations.

Strengths and Weaknesses

The biggest strength of this app is its easy journaling. Users can use AI to clean up or simplify their journalized text. Users receive real-time writing support. The second strength is the ability to interact with unique AI personas. Users can choose which friends can comment and provide insights on their posts. This feature allows users to personalize their experience. Figure 6 demonstrates how AI-generated responses appear when the author posts a journal entry in the journaling interface.

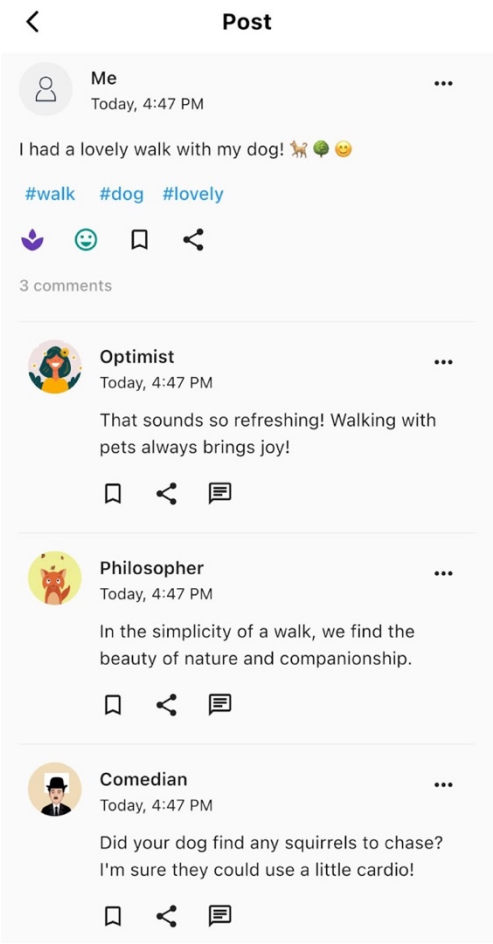

Figure 6. Journal entry with comments from AI friends.

Finally, another strength is the introspection feature. Users can ask questions like "What are three topics on my mind?" or "What am I thinking about?". Based on the user's post data, the AI provides thoughtful answers.

One of the weaknesses of Reflectr is its limited personalization. For example, if a user posts about their day, the app automatically adds mandatory emojis and hashtags, even if they do not include them. It overrides the user's freedom and may affect the tone of their entries. Secondly, a pain point is the potential emotional dependency on AI. Users interact with "friends" and ask what's on their minds, with AI providing answers. Relying on the app could be an issue for people with mental health struggles. Instead of reaching out for human contact, the person can turn to AI, which can be isolating.

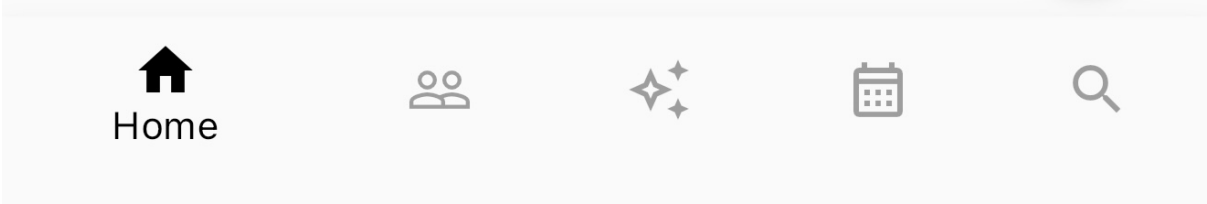

Figure 7. Reflectr bottom navigation bar.

Finally, the navigation bar icons only display text labels after being clicked (See Figure 7). It does not provide clear and immediate feedback about the functionality of each icon. This delay in providing text labels can make navigation feel unintuitive.

2.3 Problem-Solution Statement and Stakeholders

Following a thorough analysis of competitors, the problem-solution statement is established in this chapter. This statement is an essential element of research, as it provides a clear direction and framework to follow (Aditya Sai Srinivas *et al.*, 2023: 11). Aditya Sai Srinivas *et al.* emphasize that the problem-solution statement highlights the importance of the issue at hand and demonstrates its significance. Additionally, the main stakeholders are identified to provide an understanding of the research participants and the future users of the prototype.

Below is a structured list presenting the summary, problem, solution, and stakeholders of the athlete recovery app:

- **Summary**
    - An athlete recovery app helps athletes track their recovery and daily physical/mental states to enhance performance and well-being.

- **Problem**
    - Athletes work hard to achieve their goals by training and competing, but good performance also requires good recovery.
    - Keeping track of all the recovery methods and their effects can be complex and confusing.
    - This can lead to a higher risk of injuries and a negative impact on health.
- **Solution**
    - An athlete recovery app provides a platform for athletes to easily track their recovery.
    - The app aims to make recovery a mandatory habit in an athlete's daily routine using features such as logging, reminders, and reward systems.
- **Stakeholders**
    - The primary stakeholders for this app are professional and semi-professional athletes who want optimal recovery to maintain their best performance and avoid injuries.
    - The secondary stakeholders are recreational athletes who focus on personal fitness and well-being.
    - The app is a valuable tool for both groups to help them track recovery, improve performance, and support health goals.

In summary, the app helps athlethes track their recovery, turn it to a daily habit and improve their performance.

3. Methodology

User research was conducted among the identified stakeholders to explore the potential of an AI-driven recovery app. Following User-Centered Design principles, the study aimed to ensure the app effectively addresses their needs and that their opinions are part of the process. A survey and interviews were carried out to help determine their pain points, goals, and preferences for the app. The following section presents the methods used for the survey and interview design, distribution, and analysis.

3.1 Overview of Participants

This thesis survey and interviews targeted athletes with different experiences who are categorized as professional, semi-professional, and recreational. The aim was to understand the various habits of recovery and training of these groups, as well as their views and preferences on recovery apps. It was important to gather insight from people with different backgrounds since the app aims to help all athletes. This approach aligns with the principles of UCD, which emphasizes understanding all the user's needs and preferences.

To collect responses, the survey used a combination of convenience sampling and snowball sampling methods (Rämmer, 2014). Convenience sampling involved sharing the survey via Messenger within the researcher's network. Snowball sampling involved respondents further sharing it with people of similar backgrounds. This approach helped to widen the number of respondents. The initial expected sample size was 30, which consisted of 6 professional basketball players, 6 weightlifters, 6 gymnasts, 6 track and field athletes, and 6 people with various fitness activities like tennis and pilates. The survey was based on informed consent.

In addition to the survey, interviews were conducted with three athletes with different training and recovery habits. All participant names are pseudonyms. The participants included one woman and two men. One was a professional basketball player with access to a physiotherapist and various recovery equipment. Another was a self-taught weightlifter who followed independent recovery routines. Finally, a retired gymnast gave insights into how a lack of recovery in sports can affect recovery routines later on. This approach helped to explore athletes' recovery practices and specific expectations for a recovery app. The sample was also selected using convenience sampling.

3.2 Survey Design

A survey is one of the best approaches to finding out who the users are and their views (Kuniavsky, 2003: 303). As Kuniavsky explains, the set of questions provides a structured approach for individuals to share their identities, insights, and preferences.

The survey for this thesis was conducted using Google Forms. The survey took place between 30th January and 8th February 2025. The survey was divided into four main sections: general background, pain points, technology use, preferences and expectations. It included a total of 19 questions. Completing the survey took approximately 5-7 minutes. The *general background* section focused on gathering essential information and participants' athletic background. The *pain points* section explored the main challenges of recovery. The *technology use* section examined whether respondents had used recovery apps before and what features they found helpful. The *preferences and expectations* section looked into the functionalities that the respondents looked for in the app. Finally, participants were asked to provide insight into their recovery goals. The questionnaire design was reviewed using the checklist in *The Handbook of Marketing Research: Uses, Misuses, and Future Advances* (Grover & Vriens, 2006: 92–93) to ensure clarity and professionalism.

Informed consent was included at the beginning of the survey. The survey was designed to understand the users' expectations and desired features, aligning with the principles of UCD (see Section 1.3.1), before the design process started. The full list of survey questions and the consent form can be found in Appendix 1.

3.3 Interview Design

The interview consisted of 24 questions divided into five main categories. It followed a semi-structured format to allow the researcher to ask follow-up questions and provide participants additional opportunities to share their insights about important issues (Longhurst, 2016: 143). At the beginning, respondents were asked about their current recovery practices and processes. Next, they were questioned about any pain points in the recovery process and how these affect their mental well-being and performance. The third category focused on current technology to help understand whether respondents had used any fitness apps and how these apps supported their recovery. Next, the interview explored expectations for a recovery app. It included questions about desired functionalities and design. In the end, participants were asked if they had any new ideas for features that could be included in the prototype.

The interviews were conducted individually in person between 30th January and 10th February. Each interview lasted approximately 16 minutes. All the participants were asked to sign a consent form to ensure full transparency and meet ethical requirements. All interviews were audio recorded, so they could be transcribed and analyzed later.

The interviews were designed to understand the participants' preferences and expectations of a recovery app more in-depth. The full list of interview questions and the consent form can be found in Appendix 2.

3.4 Data Analysis

The data gathered was analyzed using a mixed-methods approach. Brannen explains that mixed-methods research involves employing more than one research method and often integrating both qualitative and quantitative approaches to provide a comprehensive understanding of the data (2005: 4).

First, the data was cleaned by removing responses that provided unnecessary information, as suggested by Müller *et al.* (2014: 254). The quantitative data from the rating scale questions was analyzed using descriptive statistics, as Müller *et al.* highlight for identifying response trends. This included calculating mean, median, mode, and minimum/maximum values. These statistics provide valuable information about variability, central tendencies, and understanding of user responses. The findings were visualized using a table.

Grounded theory was used to analyze qualitative data from survey responses and interview transcripts, as referenced by Müller *et al.* (2014: 257) in the article Survey Research in HCI. Before analysis, the interviews were transcribed using WhisperTranscribe (WhisperTranscribe B.V., 2022), and any transcription errors were corrected by the researcher. Grounded theory, first introduced by Glaser & Strauss (1967), involves coding, where answers are summarized into short labels to categorize responses systematically. Using an inductive approach, which Müller *et al.* identify as the preferred method, themes were constructed through re-reading and coding rather than relying on predefined ones. This process helped the researcher identify patterns, key issues, and central themes.

Additionally, multiple-choice survey questions were analyzed. First, the multiple-choice responses were treated as quantitative data and analyzed using frequency distribution to determine response frequencies. The most often chosen responses were then incorporated into qualitative grounded theory analysis to align with interview and open-question findings.

Several multiple-choice responses matched directly with themes identified through interview and open-question coding. This follows a deductive approach, as explained by Müller *et al.*, where multiple-choice survey responses were matched to pre-existing categories rather than generating new themes (2014: 257). This process strengthened the validity of the grounded theory categories.

Finally, the data analysis was a foundation for persona creation. Three personas were developed to represent the findings from the data analysis. The categorized codes and themes defined their goals, pain points, and expectations. This ensured that the app design aligned with user behavior and recovery habits.

4. Data Collection Results and Personas

This chapter presents key insights from both descriptive statistics and grounded theory analysis. Both analyses give an overview of athletes' recovery habits, desired features, and their relationship with technology. Considering these results further strengthens UCD practices and highlights the potential of Behavioral Design.

Descriptive Statistics

The descriptive statistics of the survey's 5-point rating scale responses reveal key insights into athlete recovery habits and their relationship with technology use. This scale is a variation of the Likert technique for the measurement of attitudes (Likert, 1932), which is widely used in surveys (Müller *et al.*, 2014: 230).

Athletes feel that a lack of recovery moderately affects performance, with an average rating of 3.17. The most common response, 3, suggests that many athletes experience occasional performance issues due to insufficient recovery. This shows that better tracking features and reminders could enhance consistency.

The use of technology in fitness routines is low, with an average score of 1.77. The mode of 1 shows that most respondents rarely use fitness apps, trackers, or other digital tools in their fitness routine. This indicates a potential gap for a user-friendly and intuitive app that can be easily integrated into training routines.

The usefulness of recovery apps was rated as moderate, with a mean score of 2.73, and the most common response, 3, indicates a lack of strong sentiment. As over 80% of the survey respondents do not use recovery apps, this rating likely reflects indifference and cannot be strongly relied upon.

Gamification features, such as badges and streaks, received mixed importance, with a mean score of 2.8 and a mode of 3. Social features were rated less critical, with an average score of 2.23 and a mode of 1. This suggests that many athletes prefer individual recovery tracking over a supportive community.

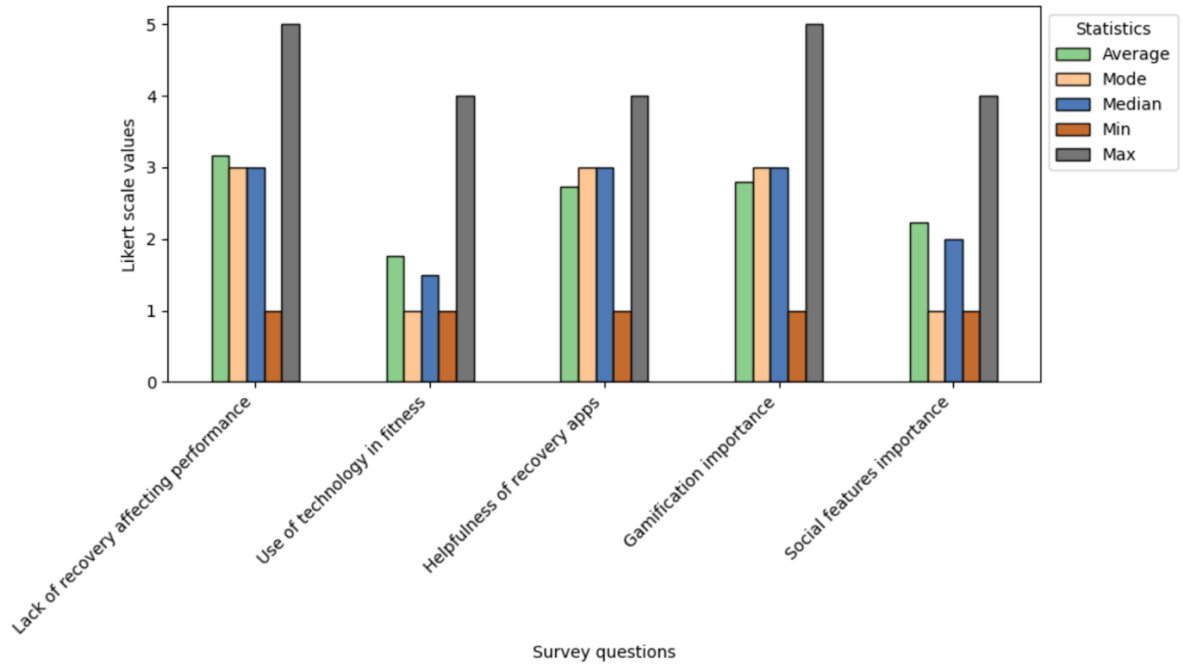

Figure 8. Descriptive statistics of Likert scale responses.

Figure 8 shows more detailed statistics on the survey responses. It gives an overview of how different scores reflect athletes' answers.

Grounded Theory Analysis

The grounded theory analysis (Glaser & Strauss, 1967) of interviews, open-ended and multiple-choice survey questions identified 14 key themes related to athlete recovery habits, challenges, and preferences.

Athletes use various recovery methods, including stretching, rolling, massages, and cold plunges. Most plan their recovery through self-research and the Internet, and recovery is generally seen as effective. However, a significant challenge is maintaining consistency. As Jordan explained:

Because at the moment I'm kind of like, I'm putting the pedal to the metal [...]. And then only backing off the gas when my body is kind of like screaming at, dude, please stop. But a much more consistent and better option in the long run is to do it before actually something happens or you have a nagging injury or anything. So, yeah, like having a consistent schedule or like a certain rest day or having a set training schedule and like, I don't know, let's say four days of training and one day off or something like that, but I'm pretty bad at that. (Quote 1, Interview)

This highlights that while athletes recognize the benefits of recovery, they often find it difficult to balance it with training. Over 60% of survey responders also identified balancing recovery with training as one of their biggest challenges. Athletes prioritize goals like high performance, injury prevention, and stress relief but struggle with motivation, inconsistency, and balancing training stress. Respondents reported that insufficient recovery causes cramps, fatigue, and poor performance. Taylor shared a personal experience that further illustrates the negative effects of inadequate recovery:

Yes, for example, when dancing, I felt during training that my legs were very cramped, but I didn't even stretch them afterwards. And at night, I had cramps. It ruined my sleep [...], so it (poor recovery) really affects me mentally. Plus, if my body is not in good condition, then first of all, I can't train that day as much as I wanted to because my body is just tired and not in its best shape. (Quote 2, Interview)

A considerable lack of awareness about recovery apps also emerged, and many respondents are unfamiliar with existing options. Alex noted this lack of awareness:

[...] I can't say that I have looked for a recovery app, but I for sure haven't seen one that would like invite me to use one. (Quote 3, Interview)

However, athletes who use smartwatches value tracking features for soreness, sleep, fatigue, and training logs. Table 2 presents two rows of the key themes and categories identified through grounded analysis. The full table can be found in Appendix 3.

Table 2. Grounded theory themes.

Themes	Categories	Quotes
Recovery methods	Stretching, rolling, massage, cold plunge, sauna, massage gun	Alex: *"It varies between the different practices, but most basic is we end practice, we do a cool down and then I get into the cold tub and after the cold tub I go straight into sauna. After that I [..] wrap up and go home and then the foam rolling, stretching and the machine gun work is also an option depending on how I feel."*
Recovery planning	Own methods, physio, Internet, and AI	Taylor: *"I once used a physio's help, probably. Right now, I just listen to my body and try to act accordingly. If I feel that my back hurts, I just roll that spot. […] I don't search much on the internet either."*

Athletes reported a preference for a recovery app with reminders, valuable insights and recommendations, tracking capabilities, personalized recovery plans, and seamless fitness tracker integration. With customizable options, the ideal user interface should be calming, interactive, and easy to use. Desired colors are pastels like green, blue, and purple. Daily or post-workout interactions are preferred.

Artificial intelligence can support recovery by providing intelligent recommendations, analyzing user data, personalizing recovery plans, and simplifying the logging process. Alex provided insight into the role AI should play in a recovery app:

The insights and recommendations would be good, but everything that's easier is always good. You know [...] if it can make the tracking or logging easier, then it feels very nice. [...] maybe since you start using it (recovery app), it learns [...] your ways of recovery and it learns what you usually do and [...] it gives you the options easily. So you can just [...] put the check in the box for example, so you don't have to search for anything or write it down or, [...] if you don't do the stuff that you usually do, you can easily remove it. But just learning from the early logins maybe. (Quote 4, Interview)

The data also indicated that while gamification elements like streaks and achievements are considered beneficial, they should remain optional. While one interview valued social features, other participants and survey responses preferred individual progress tracking over community support.

4.1 Personas

Data-informed personas make measurements about a certain user into a clear and well-defined description of a person (Jansen *et al.*, 2022: 25). Jansen *et al.* emphasize that in that way, the personas can be familiar to everyone, even to people who do not usually engage in user analytics. The authors affirm that with the help of data-informed personas that combine the understanding of personas and analytics insights, the focus stays on the most crucial part: the people. However, it is critical to acknowledge that personas can sometimes become stereotypical and reflect the perspectives of the designer (Marsden & Haag, 2016: 1). Therefore, a balanced approach is necessary to ensure they genuinely reflect data-informed insights and empathetic understanding.

In crafting these personas, it was important to include all the findings from the data analysis while keeping them clear and understandable. Making sure that all relevant insights are

included helps make later design processes easier by keeping the focus on the users and their aspirations and pain points. This led to the creation of three personas: a professional basketball player, a recreational fitness enthusiast, and a semi-professional runner. A Canva (Canva, 2013) template created by the author kavitaws was utilized to visualize the personas.

4.1.1 Professional Basketball Player Noah

Noah is a 25-year-old, determined professional athlete. He has over 18 years of experience as a basketball player. Noah trains 6-7 days a week and follows a structured training plan (Appendix 3, Theme *Recovery planning*). He understands the importance of recovery and does it after every training session. Noah practices various recovery methods, such as stretching, foam rolling, and cold plunges (Appendix 3, Theme *Recovery methods*). His coaches and sports therapists advise him if he struggles with soreness or an injury. He enjoys data-driven insights to optimize performance and prevent injuries (See Figure 9).

Figure 9. Persona of a basketball player.

Noah's goal is to prevent injuries and enhance his performance. He is interested in insights that help him stay in peak condition (Appendix 3, Theme *Goals*). Despite his experience, Noah sometimes struggles to recover effectively during intense training periods. He finds it

challenging to find the balance between training and recovery. He wants precise data-driven insights to help him optimize his training load and recovery practices (Appendix 3, Theme *Desired features*).

Noah believes that technology could help and optimize his recovery. He occasionally uses training apps for logging runs or walks, but has never explored recovery apps. Noah would benefit from an app that allows quick and easy data logging after every training session (Appendix 3, Theme *Interaction frequency*). The interface should be intuitive and customizable to user preferences. He is interested in AI-driven recommendations that could help him optimize his performance. He prefers a stronger focus on personal tracking and insights and does not need social features.

4.1.2 Fitness Enthusiast Olivia

Olivia is a 20-year-old fitness enthusiast who enjoys weight training and occasional cardio workouts. She works out primarily to stay fit and relieve stress (Appendix 3, Theme *Goals*). Although Olivia recognizes the importance of recovery, she often struggles to remain consistent (Appendix 3, Theme *Challenges*). She does not have access to personalized recovery plans or professional coaching (See Figure 10).

Figure 10. Persona of a fitness enthusiast.

Olivia's primary motivation is to avoid soreness so she can feel good. She also wants to improve her flexibility and ensure recovery is a must-do thing in her routine. Currently, Olivia tends to skip stretching and mobility work because she either forgets it or feels it takes too much time. Her inconsistency and lack of motivation make feeling and seeing results hard. She finds it difficult to determine which recovery methods work best.

Olivia rarely uses fitness apps and is unfamiliar with recovery apps (Appendix 3, Theme *Recovery app usage and awareness*). Still, she likes to incorporate the usage of a watch in her workouts, so all her workouts are logged that way. To help with her struggles with inconsistency, Olivia needs an easy-to-use app with daily reminders. She is motivated by gamification elements like streaks and achievement badges, and feels they could make a real difference. Olivia would love to get personalized recovery plans (Appendix 3, Theme *Desired features*).

4.1.3 Semi-professional Runner Jess

Jess is a 22-year-old dedicated runner who is currently facing an injury. This situation has frustrated and angered her because she needs to take a break. Jess often feels that recovery is not necessary and is eager to push through the pain (Appendix 3, Theme *Challenges*). She thinks recovery takes too much time, disrupts her training routine, and diverts her from her goals (See Figure 11).

Figure 11. Persona of a semi-professional runner.

Jess is motivated to succeed as a runner and hopes to break records and win important competitions. Her main goal is to overcome pain quickly so it does not hold her back (Appendix 3, Theme *Goals*). She disregards the importance of recovery because of the feeling that she can not train as much. This adds a lot of stress, and she finds it hard to deal with (Appendix 3, Theme *Challenges*). Jesse's biggest fear is losing her progress when she has to focus on something else.

Jess tracks her workouts using a smartwatch, but she does not take advantage of fitness apps that could help her set recovery goals. She is also resistant to adapting to new technologies. Jess would like an app that integrates with her existing smartwatch to make managing training and recovery more straightforward. Ideally, she would benefit from better progress tracking and reports that give insight into her performance. It would also help if she had reminders for recovery activities to ensure she prioritizes healing (Appendix 3, Theme *Desired features*).

5. Design and Prototype Development

This chapter introduces the key design concepts selected for the prototype. It presents user journeys based on personas that outline how different personas interact with the app. Additionally, it shows the designed wireframes that visualize key screens and user flows. Finally, the chapter introduces the core functionalities and screens of the completed prototype.

5.1 Design Concepts

This section introduces the design concepts applied in the prototype after an in-depth analysis of user data and personas. It discusses the selected colors and typography and explains their significance in shaping the user experience. Furthermore, it provides an overview of the tool chosen for the prototype development.

5.1.1 Colors

Before starting the prototyping process, it was essential to understand the psychology of colors and how they influence users' reactions and moods. Color psychology studies how different colors affect human emotions and behavior (Annet, 2025: 9). In web design, selecting the right colors plays a crucial role in shaping how users perceive an interface's functionality and reliability (Seifi & Moshayeri, 2024: 34). According to Seifi & Moshayeri, visually appealing websites tend to create a positive first impression, and it can lead to higher engagement.

Colors serve as a form of non-verbal communication that can help differentiate elements, emphasize essential aspects, and influence user moods (Majumdar, 2023: 92). As Khandelwal & Chaudhary (2023: 1-3) explain, a designer's choice of colors impacts the overall user experience. Warm tones like red, yellow, and orange often bring out feelings like happiness, passion, enthusiasm, and freshness (Gupta, 2020: 1325). Meanwhile, cooler tones like blue, green, and purple are linked to emotions such as health, harmony, and softness (Gupta, 2020: 1325). It is important to emphasize that colors hold different meanings and interpretations across various cultures. For example, as Gupta notes, in Western countries, white is traditionally worn for weddings, while in Asian countries like Korea and China, white is associated with bad luck. However, Gupta highlights that blue is one of the most universally accepted colors, representing positive meanings in nearly every culture (Gupta, 2020: 1327).

Since the goal of the recovery app is to promote well-being and calmness, blue was selected as the primary color for the prototype. As Gupta (2020: 1325) illustrates, blue is associated with security and calmness. These are essential emotions that the designer wants to evoke for

recovery app users searching for balance and well-being. Participants in user research further support this choice as they reported pastel shades of blue as their preferred color scheme (Appendix 3, Theme *UI preferences*).

Contrast was a key consideration when choosing the exact tones of these colors. As Majumdar (2023: 92) emphasizes, contrast helps distinguish elements from one another in UI design by choosing darker and lighter variants of selected colors. Majumdar explains that a general good rule in UI design is to choose a primary color, followed by a secondary color, and their respective variations. Orange was chosen as the secondary color for the prototype to bring freshness and enthusiasm into the app's design.

5.1.2 Typography

Another key aspect of the design process was typography selection. As Majumdar (2023: 93) explains, typography is an effective tool that helps maintain a balanced design and enhance the user experience. Majumdar further emphasizes that appropriate typography creates a hierarchy where essential elements can stand out. Additionally, she explains that different font styles and weights can highlight crucial components such as buttons, messages, and headings.

Abril Fatface and Lato were selected as the primary fonts for this prototype. The final choice was made after testing various font combinations to determine which ones complemented each other best. The goal was to maintain simplicity and neutrality while also incorporating a touch of freshness and playfulness.

According to the FontForge web page (FontForge, n.d.), these fonts pair well together because Lato's modern style complements the elegance of Abril FatFace. This combination creates a visually appealing design and is versatile enough for headings and body text use.

5.1.3 Figma

The prototype was developed using Figma (Figma, Inc., 2016). Figma is a web-based collaborative design tool. It is mostly used for interface and user experience design. This tool was chosen for this project due to its intuitive interface, ease of use, and strong community with many resources. Using Figma made the design process more efficient because of the author's prior experience.

5.2 User Scenarios and Journeys

User journeys were created to understand the personas' goals and pain points better. These journeys focus on their scenarios and the ways they interact with the app. User journeys illustrate the steps customers take while interacting with a service (Yoo & Pan, 2014: 550-551). They focus on user experiences and the emotions they encounter to enhance the designer's understanding of their journey. Yoo & Pan emphasize that mapping out the interactions makes it possible to identify challenges and facilitate a flow of events that the customer experiences to accomplish their scenarios. Scenarios forecast how various user types, who are defined by personas, will engage with an application in specific situations (Coorevits *et al.*, 2016: 97). Coorevits *et al.* highlight that these scenarios help illustrate how users might navigate the system to achieve a particular objective or goal.

The user journeys are based on Noah, Olivia, and Jess's personas. Each journey has been split into three stages: users' initial motivations and challenges (Awareness, Search, Download), users' interaction with the app (Installation, Use), and user results and experiences with the app (Support, Review). These stages reflect phases of user experience journey mapping, which include the actions, thoughts, and emotions a persona encounters while working towards their goal (Gibbons, 2018). The user journeys analyze elements such as goals, activities, touchpoints, emotions, pain points, and improvement opportunities. A Canva template created by the author Brainstorm was utilized to visualize the user journeys.

5.2.1 Noah's Journey and Scenario

Noah is a determined basketball player who wants to optimize his recovery and workouts (Appendix 3, Theme *Goals*). After an intense training session, he feels fatigued and wants to ensure he recovers properly. Noah logs his session into the recovery app with the help of AI and inputs his current energy levels (Appendix 3, Theme *Role of AI*). The app analyzes his data and provides insights into recovery based on his previously logged data (Appendix 3, Theme *Role of AI*). Based on the insights, Noah follows a suggested stretching routine and a cold plunge session (Appendix 3, Themes *Desired features, Recovery methods*). He follows the app's recommendations daily and starts seeing better results in his performance. This progress motivates Noah, and he integrates the app into his weekly training routine to improve his performance even more.

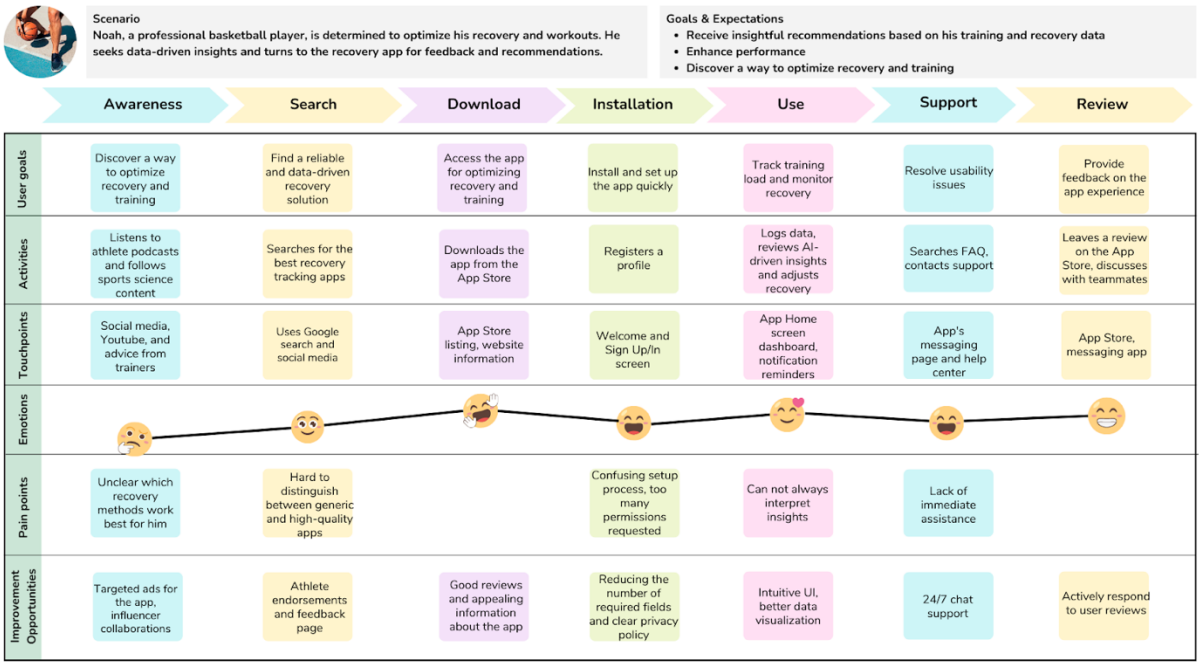

Figure 12. Noah's user journey.

Noah's user journey (See Figure 12) begins with his desire to improve recovery and figure out which recovery methods work best. He finds a recovery solution that provides insights. Noah downloads the app and sets up a new profile. He starts logging his training sessions and following AI-driven insights. As a result, Noah feels that his endurance and performance have improved. He is satisfied with his progress and integrates the app into his routine. Noah leaves positive feedback and recommends it to his teammates.

5.2.2 Olivia's Journey and Scenario

As a fitness enthusiast, Olivia enjoys going to the gym but often forgets to prioritize recovery (Appendix 3, Theme *Challenges*). After finishing a challenging workout, she receives a notification from her app reminding her to complete recovery to maintain her streak (Appendix 3, Theme *Desired features*). Although Olivia is tired and lacking motivation, the fear of losing her streak motivates her to complete the recovery session (Appendix 3, Theme *Gamification*). She does a quick five-minute mobility session and quickly finishes it. Once Olivia logs her completed activity, she earns a new achievement badge. Over the next few weeks, she felt less sore and more prepared before training. Olivia appreciates her progress and continues to use the app to turn the recovery into a rewarding part of her training routine.

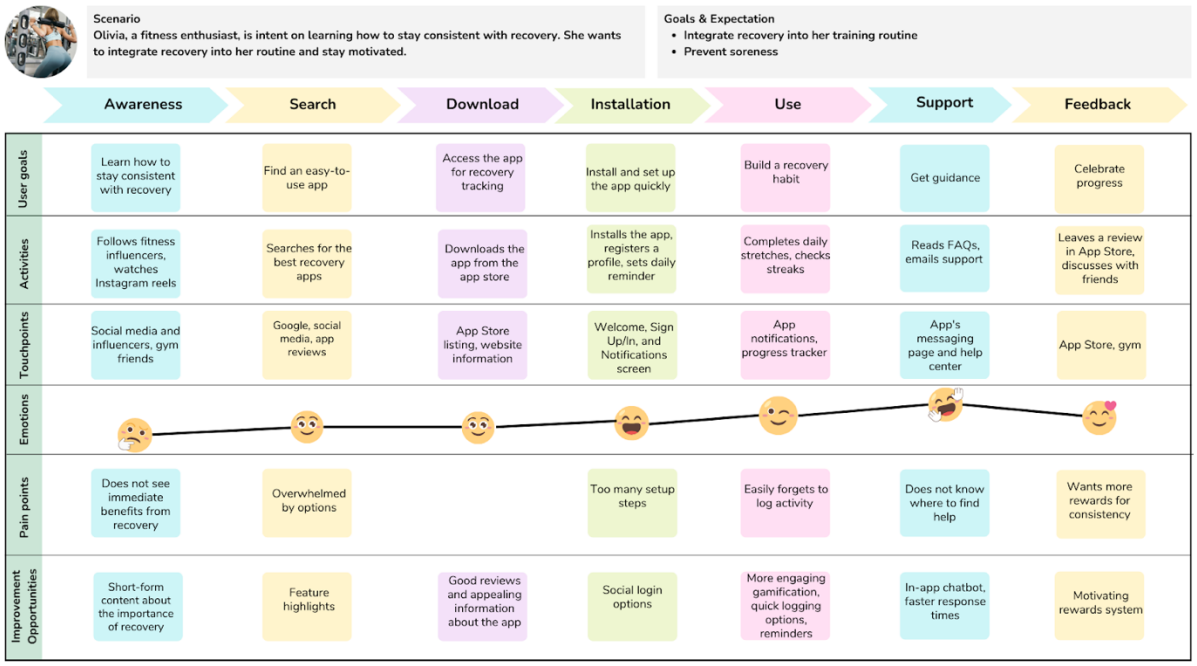

Figure 13. Olivia's user journey.

Olivia's user journey (See Figure 13) is about her wanting to build a consistent recovery habit, but often skipping it due to a lack of motivation. She discovers a recovery app by following influencers and listening to gym friends' recommendations. Olivia downloads the app for an easy and intuitive solution to build a recovery habit. The app's functionalities allow her to set reminders, maintain recovery streaks, and complete daily stretches. The recovery application's gamification features and quick logging options help her to stay consistent. Even when she sometimes forgets to log her activities, reminders help her stay on track. As a result, Olivia noticed reduced soreness and improved flexibility. This motivates her to continue using the app and share her progress with friends.

5.2.3 Jess's Journey and Scenario

Jess is a dedicated runner recovering from an injury and struggling to rest and slow down (Appendix 3, Theme *Challenges*). She is frustrated by the need to take a break. Jess is hesitant at first, but decides to log her pain level in the recovery app. The app suggests an easy training session that keeps the impact on the injury low (Appendix 3, Theme *Desired features*). As she starts logging her progress daily, she notices her pain levels decreasing and her recovery progress improving (Appendix 3, Theme *Goals*). She is encouraged by this and begins to trust the process. With a new mindset, the recovery app helps Jess balance her training and recovery more effectively and allows her to return to peak performance.

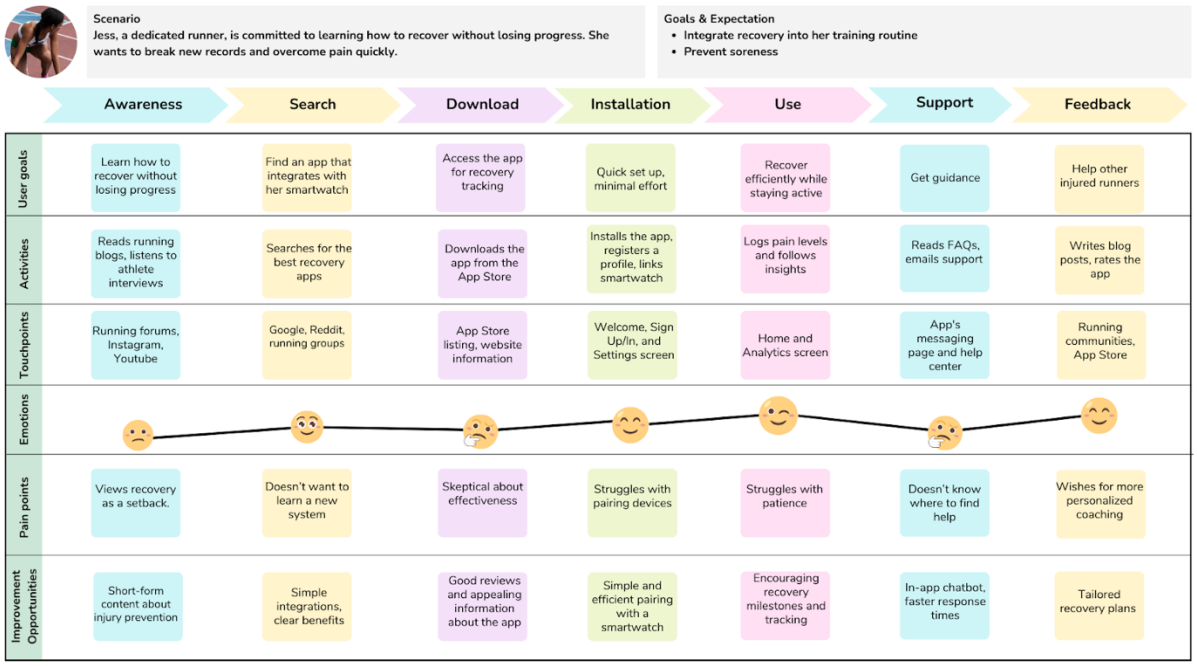

Figure 14. Jess's user journey.

Jess's user journey (See Figure 14) is about learning to recover without losing progress. She reads running blogs and listens to athlete interviews to better understand the importance of injury prevention. Determined to overcome her pain quickly, she finds an app that integrates with her smartwatch (Appendix 3, Theme *Desired features*). Jess sets the app up quickly with minimal effort. At first, she struggles to pair it with her watch, but she figures it out soon because of the simple steps used in the app. The app allows her to log pain levels and follow insights and recommendations about recovering effectively while staying active. Even when she sometimes struggles with patience, the milestones and simple tracking features help her stay on course. Over time, Jess balances her training with recovery, which allows her to get back in shape. Happy with the result, she recommends the app in her blog and gives it a good rating.

5.3 Wireframes

Wireframes were created based on user journeys and scenarios. As Heikkilä *et al.* (2023: 59) describe, wireframes provide a simplified application layout that illustrates how the content is placed and how the app users will interact with it. This chapter introduces the application's main screens and functionalities that were designed based on the user research insights, usability practices, and theoretical frameworks.

Wireframes

The welcome screen greets the users with the app's name and tagline. The author named the application Recoverit. The name makes a wordplay on the app's main goal (recovery) and recovery from soreness, injuries, and overall physical well-being (it). The tagline “Restore the balance” aligns with the recovery definition as a way to restore your body's balance. This screen also establishes the recovery app's visual identity with the help of the chosen colors and typography (See Figure 15).

Figure 15. Welcome screen.

The welcome screen, also called a splash screen, is the first screen users see upon launching the app. The screen aims to introduce the brand's identity and create a first impression, while it is also used for loading the app (Interaction Design Foundation, 2016).

Login and Signup Screen

The login and signup screens are designed with a simple structure to streamline the process for users without overwhelming them. It is essential to ensure that these interfaces are concise and easy to navigate so that every type of user understands them (See Figure 16).

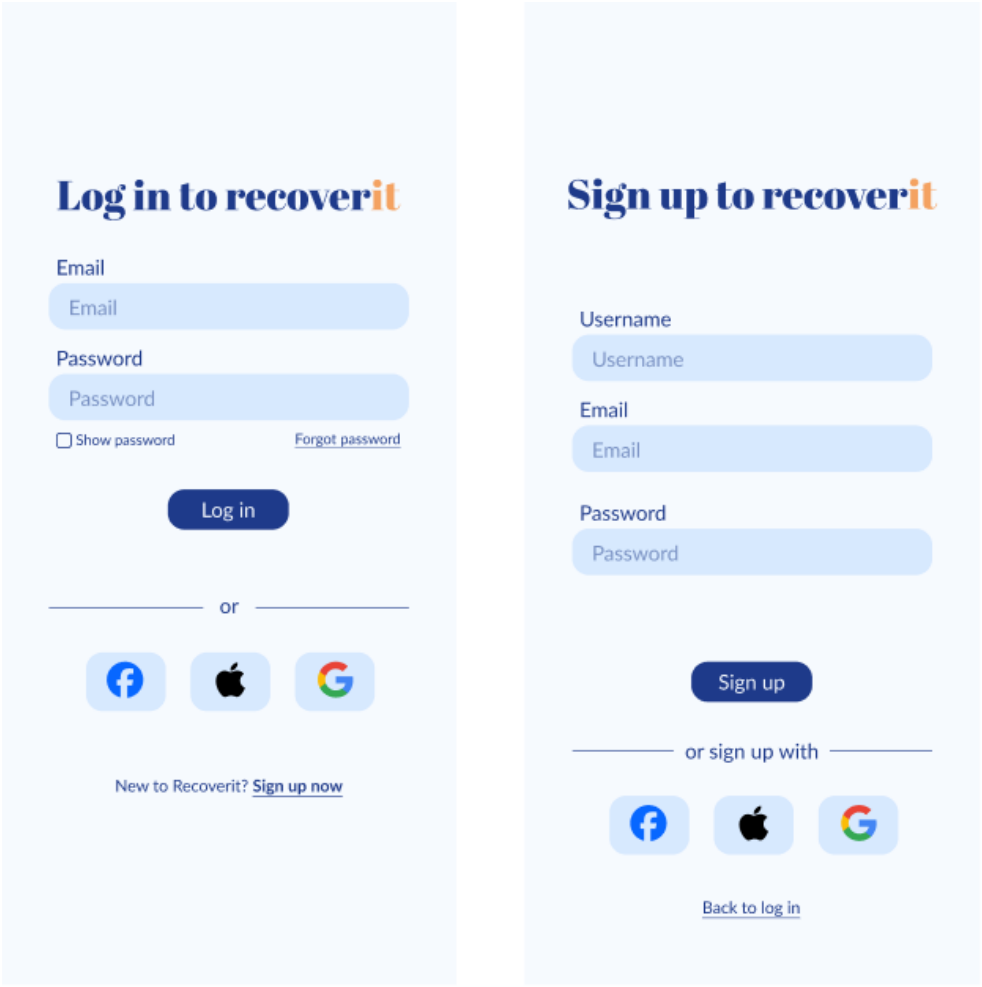

Figure 16. Login and signup screen.

The login and signup have the same components and design structure. The identical layout helps to make a consistent experience for the user, whether they are logging in or signing up. In addition, these interfaces follow several practices identified by Budiu (2017). The signup screen offers social logins to help users start quickly. It avoids the repetition of input fields to speed up the registration process and minimize errors. The login screen allows users to view their password by clicking the “Show password” button, so they can check their input. It also offers a “Forgot password?” link for easy account recovery.

Home Screen

The home screen is the heart of this app (See Figure 17). As Wang points out, the home page represents the first opportunity to engage users. She highlights this screen not only reflects the brand identity, but it also helps users achieve their goals in the application (Wang, 2024).

Figure 17. Home screen.

The home screen consists of top and bottom navigation bars and the summaries of different pages of the app. The top navigation helps maintain the brand identity with the Recoverit logo. It features the notification icon that directs users to the notification page and the user icon that leads to the user page (See Figure 18). Conducted user research indicated that reminders are a key element this app should include (Appendix 3, Theme *Desired features*), which supports the Behavioral Design strategies to establish user habits. The user page provides an easy way for users to check their account details and settings.

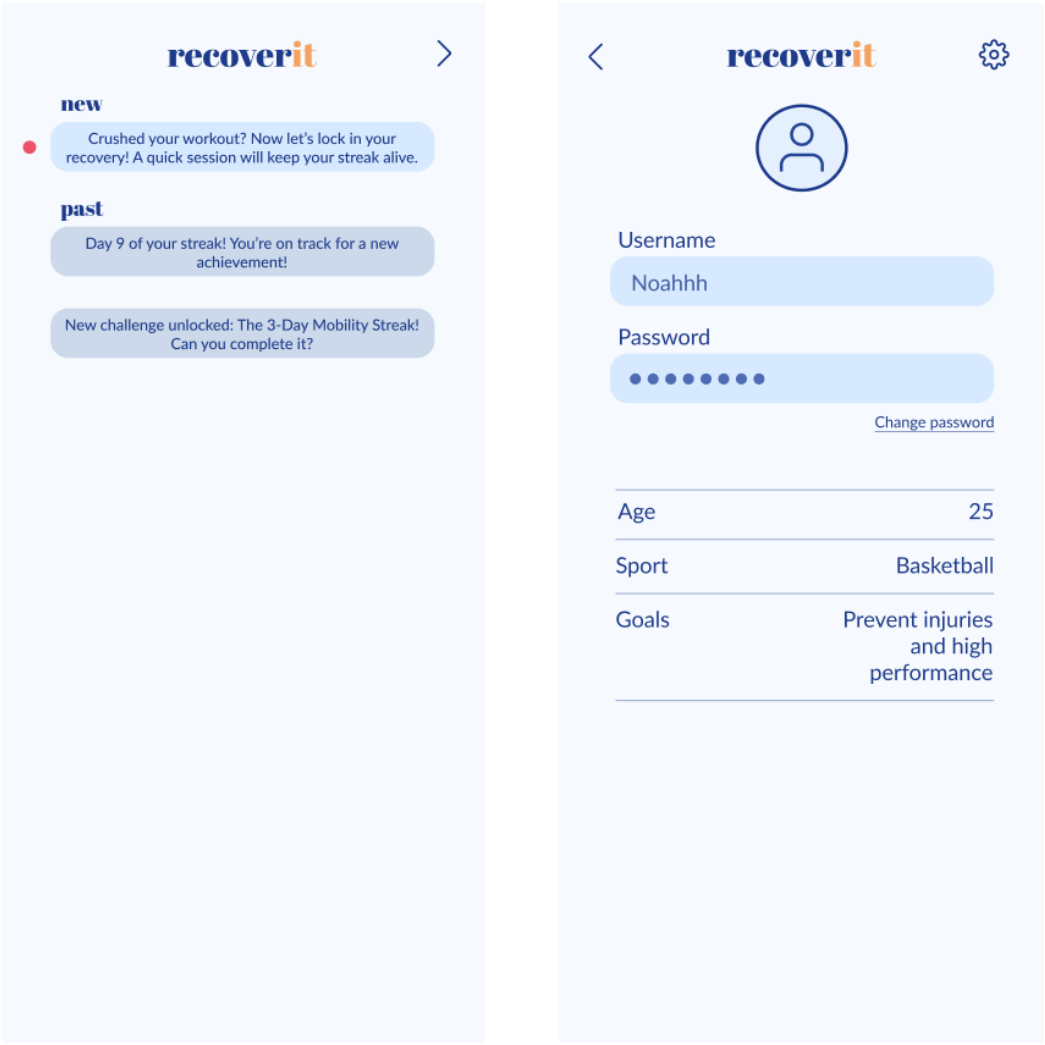

Figure 18. Notification and user page.

The purpose of the bottom navigation bar is to offer an easy movement between pages. Additionally, it provides a straightforward way to return to the home page from any screen. As Wang (2024) mentions, the home page is a safe place for the users, and it should be accessible on every page. The bottom navigation includes five icons: a home icon, an insights icon, a plus sign for user logs, a star icon for achievements, and a calendar icon. In addition, text labels were added to ensure that every user understood the meanings of the icons (Harley, 2014; Laubheimer, 2024). Another important aspect of the navigation bar is to orient users with the current location indicator (Laubheimer, 2024). For this purpose, the blue icon turns orange based on what page the user is currently viewing (See Figure 17).

The main body of this screen features four components: insights/recommendations, training, and the achievements page. Each component provides a summary of its corresponding pages.

As Wang (2024) notes, the home screen should provide snippets of what the application has to offer, and these components fulfill that purpose.

In the balance component (See Figure 19), users can review their soreness, fatigue, and sleep quality on a progress bar. Based on them, an overall balance score is generated to indicate the user's wellness. Instead of displaying a fixed numerical score, colors indicate changes after different actions. As Spiel *et al.* (2018: 7) highlight, representing the data as ranges rather than exact numbers makes tracking more transparent and adaptable for users.

The next component is the insights component, where AI offers initial feedback based on the user's data, with an easy-to-follow checklist recovery plan. These elements are prioritized in the layout (See Figure 19), as user research indicated that features like smart insights, recommendations, and recovery plans are highly desirable (Appendix 3, Themes *Desired features, Role of AI*). As Wang (2024) emphasizes, placing the most important info at the top, where users can view it without scrolling, is crucial to keep them engaged.

Figure 19. Balance and insights component on the home screen.

The next component is the trainings section (See Figure 20). This part provides an overview of the trainings the user has completed on that day, along with recommendations for when a recovery session is advisable. The final component is the achievements section (See Figure

20). This is considered the least important because some users expressed that the gamification features, like streaks and achievements, should remain optional (Appendix 3, Theme *Gamification*). As Wang (2024) stated, if scrolling is necessary, the less important sections should be located further down the page.

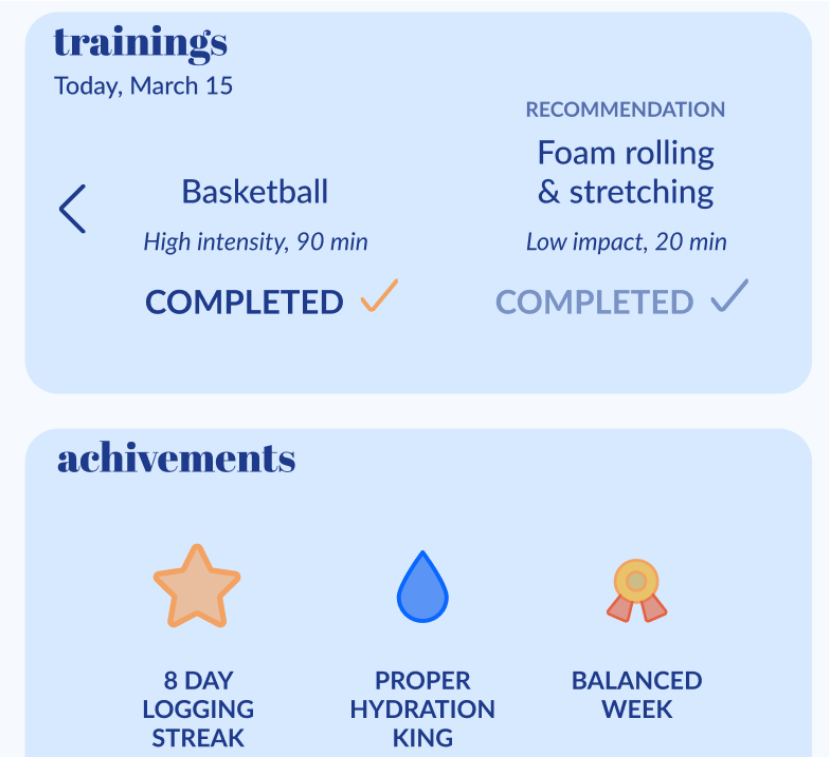

Figure 20. Trainings and achievements component on the home screen.

The goal was to maintain an intuitive, minimalistic, yet insightful design for the home page. Recognizing the user's desire for recommendations and insights, this screen effectively offers them an overview of everything in a simple manner.

Log Screens

The log screens provide options to track the data that user research indicated users wish to monitor (Appendix 3, Theme *Technology and data tracking*). The analysis revealed a clear need for logging training sessions, as well as tracking fatigue, sleep, and soreness. Log screens were developed to collect this data. Users can access these screens by clicking on the plus icon located in the center of the bottom navigation bar (See Figure 21). When the plus sign is clicked, a bar appears allowing the user to choose which data they want to log: training, injury/soreness, or sleep. Based on the user's selection, they are navigated to the corresponding log screen.

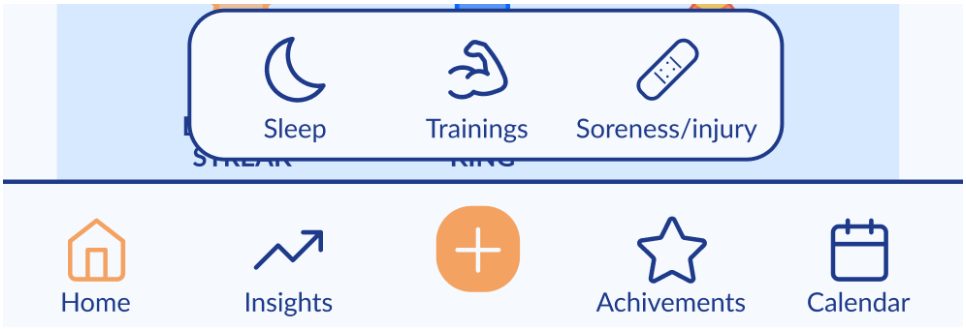

Figure 21. Log screen options bar.

In the upper right corner of every log screen is a settings button. The purpose of this button is to provide users with customization options. As different people have various goals and needs, this button allows users to select which data they wish to share and prioritize what matters most to them. Additionally, on every screen where data input is required, voice writing is available to make the data logging process as efficient as possible (Appendix 3, Theme *Role of AI*).

On the training log screen (See Figure 22), users are prompted to provide a brief summary of their training session. This enables the app to get a better understanding of the training's impact. The screen also offers quick add options based on the data the app has learned from the user's routine (Appendix 3, Theme *Role of AI*). Users then give info about their effort, fatigue, and training intensity. Following this, the app provides an initial insight, and users have the opportunity to add more notes to enhance these insights or change them. Finally, the user clicks "Save" to store the data.

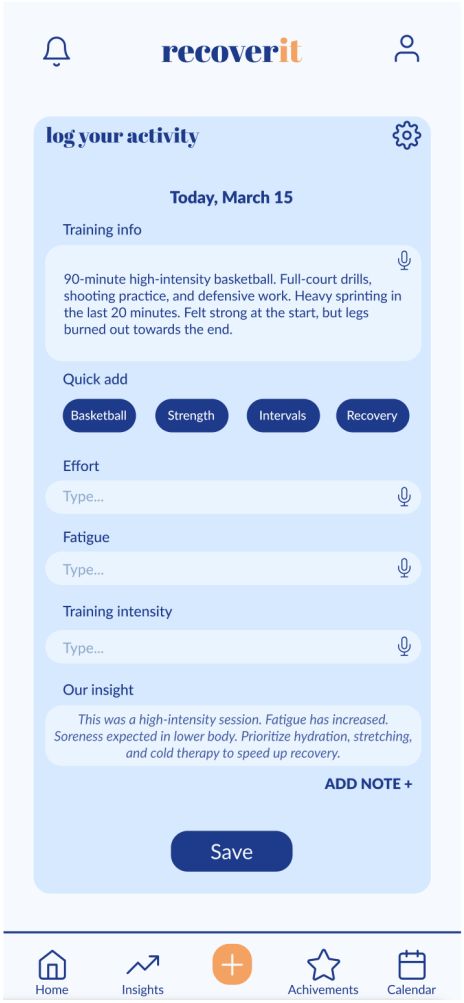

Figure 22. Training logging screen.

For the sleep log (See Figure 23), users provide input following a similar structure. This allows users to determine how much information they wish to share and to be as accurate as they desire. Next, two input fields are provided to evaluate sleep quality and morning sleepiness. Users can also indicate whether they woke up in the night to further assess their sleep quality. As with the training log, the sleep log screen concludes with AI insights, an option to add notes, and a save button.

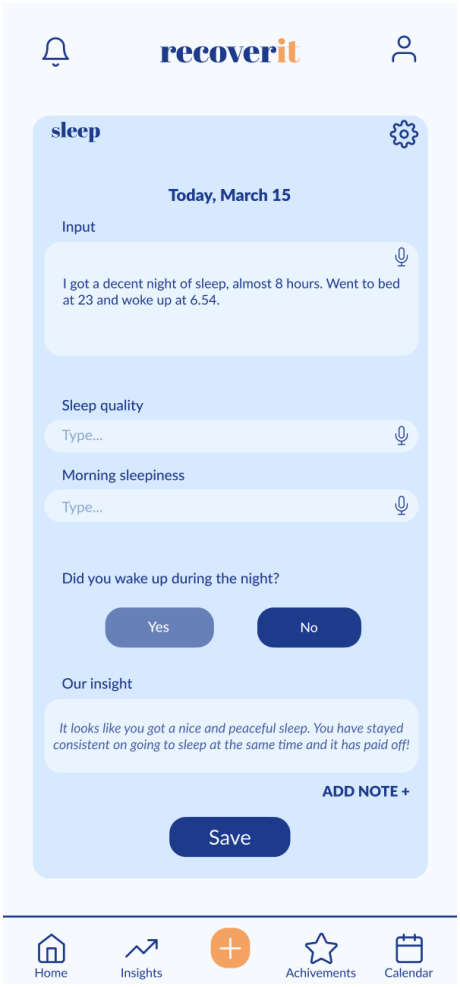

Figure 23. Sleep logging screen.

On the injury and soreness screen (See Figure 24), users input their data and select whether they want to log pain or soreness. They specify the intensity and how much it disrupts their activities. Additionally, they respond to a question about whether they can engage in a light activity or need a rest day.

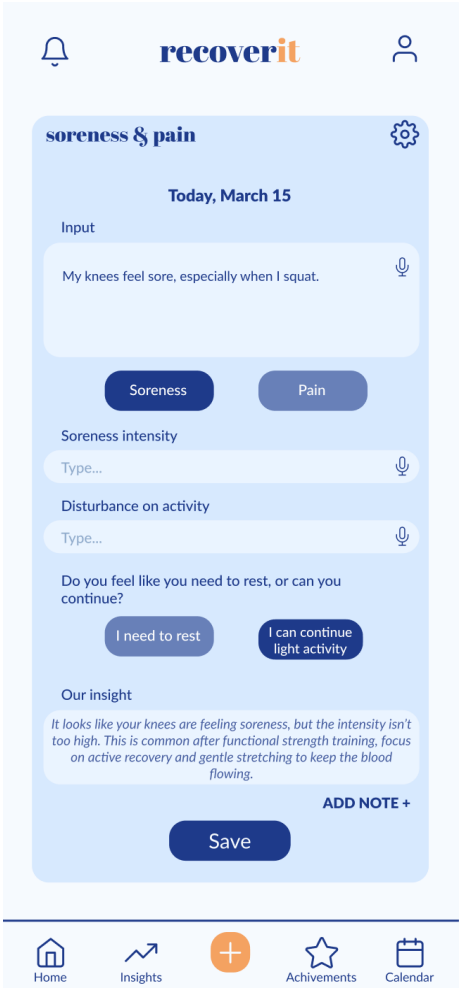

Figure 24. Injury and soreness logging screen.

The logs provide the app with valuable insights into the user's routine. Given the importance of delivering insightful recommendations (Appendix 3, Themes *Role of AI, Desired features*), the log screens play a crucial role in further improving these recommendations and contributing to the informative insights screen.

Insights Screen

On the insight screen (See Figure 25), users can review their levels of soreness, fatigue, and sleep quality on a scale. Colors like orange, yellow, and red indicate the severity of their levels. For example, if sleep quality is good, the color is yellow; if it is bad, it is red. Additionally, users see an overall balance circle that reflects wellness. Based on this, users can take actionable steps to improve their recovery. The screen features insights generated by the app that offer guidance on how to enhance the balance score. The user feedback from research indicated a preference for refined and helpful data (Appendix 3, Theme *Desired features*).

Therefore, an “Ask” button has been included that opens a chat interface where users can seek additional meaningful data (See Figure 26).

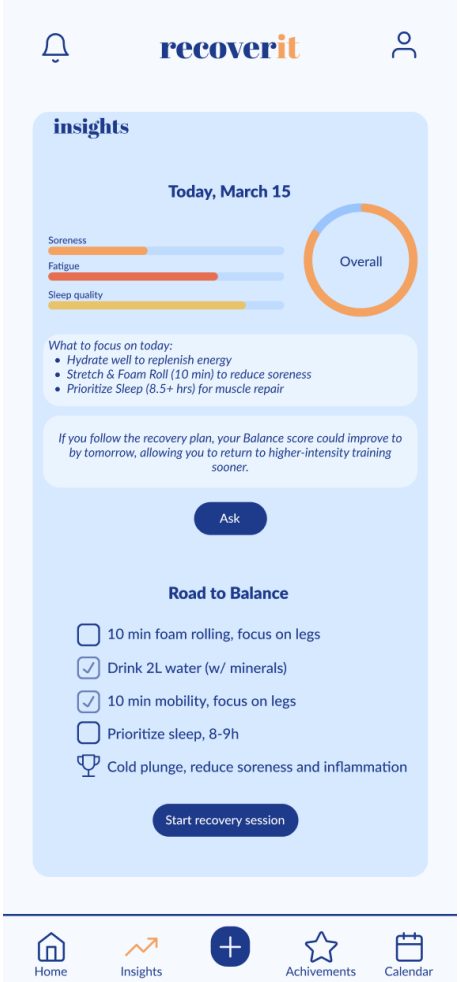

Figure 25. Insights screen.

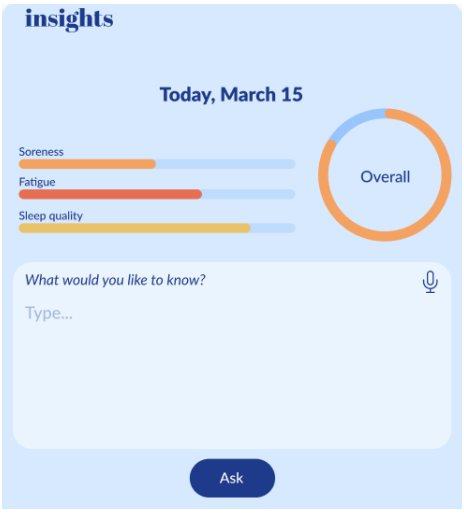

Figure 26. Insights screen chat interface.

The “Road to Balance” section provides users with a personalized plan based on their activities and data. A recovery plan that uses AI for assistance was a highly desired feature (Appendix 3, Themes *Desired feature, Role of AI*). Users can easily check off completed tasks and track their progress. The app generates tasks tailored to the user's data and offers various recovery options. For those who prefer not to do their recovery independently, a “Start recovery session” button is available. This leads to the recovery session screen (See Figure 27).

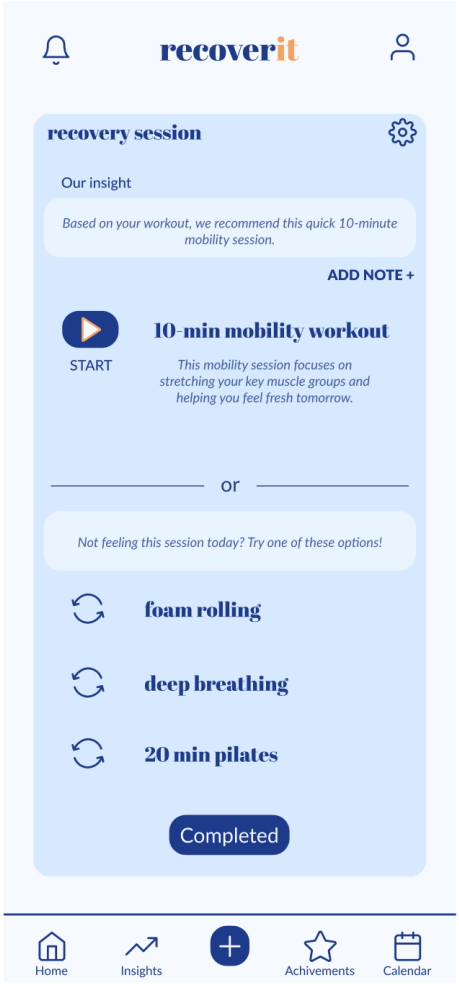

Figure 27. Recovery session screen.

The screen includes a play button that launches a guided video of the chosen recovery session. AI provides insight on why this workout is beneficial, and users can add notes to tailor their recovery even more. If the suggested session does not meet their needs, users can select alternative options. Once the recovery session is completed, users can mark it done and return to the insights screen, where the session is checked off in the plan.

Calendar Screen

The calendar screen (See Figure 28) provides users with a comprehensive view of their progress and activities. It showcases their balance scores and consistency. The main reason for this screen is to show the users all the hard work they have invested in themselves.

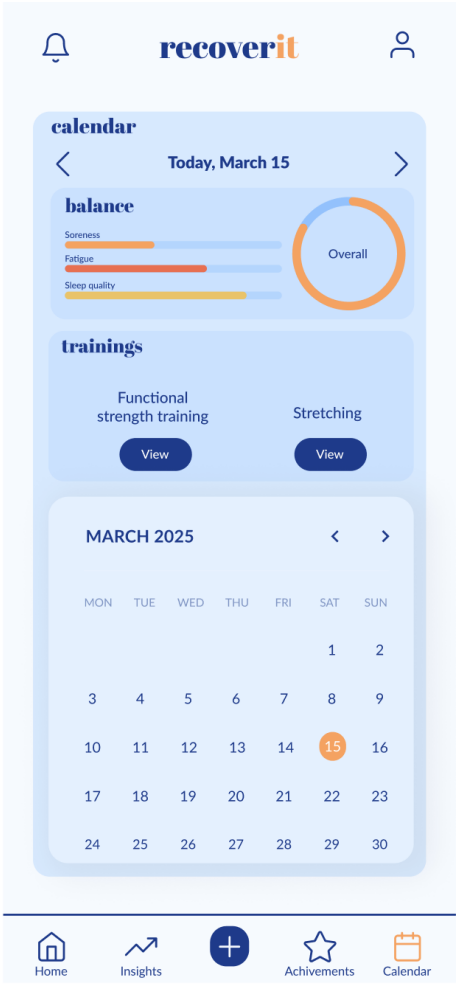

Figure 28. Calendar screen.

The screen displays the balance scores as in the home and insights screens. Additionally, it shows completed training sessions and recovery activities on that day. Users can click on each session to review detailed logs of these workouts. A date picker is included to offer users an easy navigation through different days. As Li (2017) highlights, date pickers are useful in situations where the user wants to choose a date close in time.

Achievements Screen

The achievements screen (See Figure 29) showcases the rewards users have earned over time. It is organized into four sections. The first section highlights the user's current streak of logs. It also displays the all-time record streak to further motivate users to maintain progress.

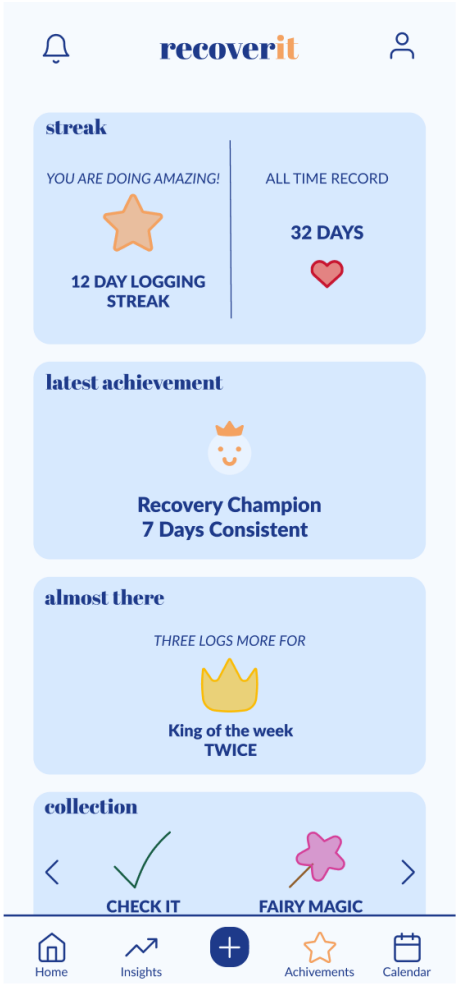

Figure 29. Achievements screen.

The second section presents the latest achievement the user has gotten. In the third section, users can see an award that is almost within reach. Lastly, the fourth section offers an overview of all the achievements accumulated over time. The achievements screen uses gamification to promote good habits and address the motivation challenge users have indicated they face (Appendix 3, Theme *Challenges*). The screen's positive reinforcement and rewards rely on the practices of Behavioral Design.

Onboarding Screens

Onboarding screens were created to introduce the app's primary functionalities and the content discussed in this chapter (See Figure 30). As Kendrick (2020) points out, these screens are used to familiarize users with the interface and its features. Many apps do not require onboarding screens, as users often learn more through self-navigation. If the screens are included, then the purpose should be to show elements and functionalities that set the app apart from others (Kendrick, 2020).

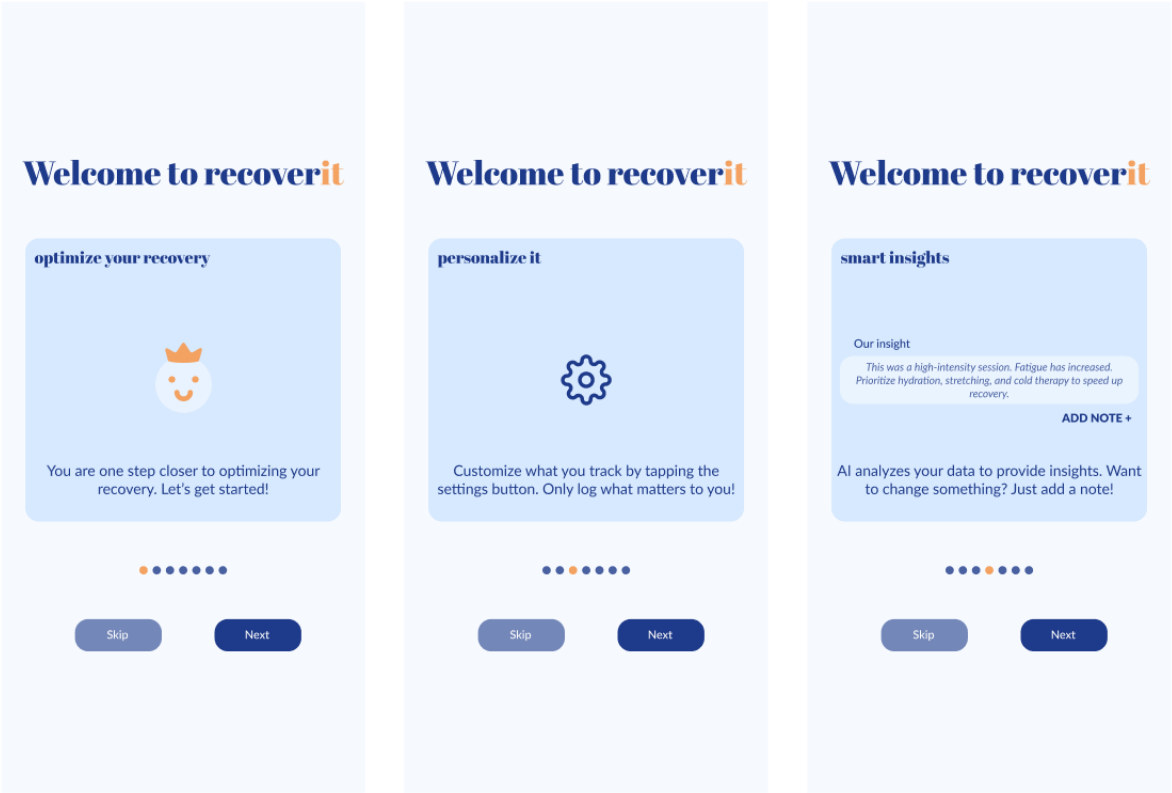

Figure 30. Onboarding screens examples.

These screens were designed to help users understand that the data provided by the app and the data they submit are optional and customizable. As Spiel *et al.* (2018: 7) emphasize, the app's data tracking should allow users to tailor it to their own needs to consider the diverse goals of different users. The onboarding screens reinforce that this app provides insights, but the user is in control.

5.4 Prototype and User Flows

User flows were created to understand how the personas achieve specific goals on wireframes. While user journeys focus on the interactions at a higher level, user flows break it down into particular interaction paths that users may encounter within the app (Kaplan, 2023). Kaplan explains that user flows focus on smaller, specific tasks. She points out that emotions are essential in user journeys but are not included in user flows. Kaplan highlights that creating journeys and flows helps to understand the user experience on smaller and larger scales. This chapter introduces the three persona flows and illustrates how they complete specific tasks in the app. A clickable prototype is also provided to demonstrate how users can interact with the app. It offers an overview of the design and overall user experience.

Noah's Flow

Noah is looking to enhance his recovery and performance. When he opens the recovery app, he is welcomed with a screen that directs him to the login page. As Noah already has an existing account, he logs in. He sees an overview of his current Balance score based on his soreness, fatigue, and sleep quality insights he provided in the app this morning.

The app recognizes from Noah's previous data that he has a hard training session scheduled today. The insights offer him several steps to prepare for his training. After his workout, Noah logs his training in the app. He writes a summary of his session and inputs his effort, fatigue, and training intensity. The app provides some initial insights, and Noah saves the data.

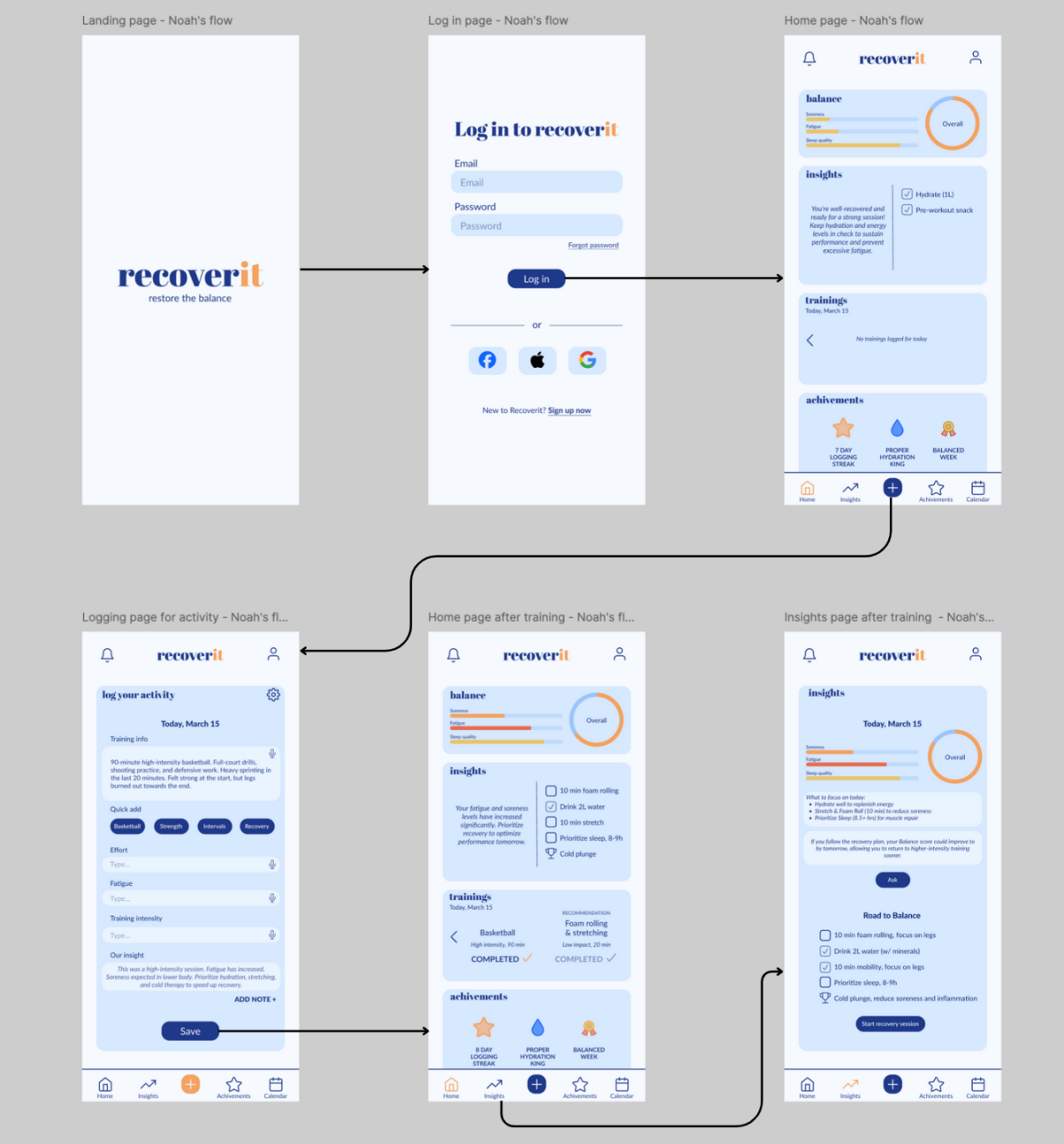

Figure 31. Noah’s flow.

Once uploaded, his Balance score and insights are updated. The insights suggest additional steps for him to take to restore his balance. To get a clearer understanding, Noah navigates to the insights page, where he can see recommendations, a recovery plan to follow, and a message button for further inquiries. Noah followed the recommended recovery routine to be better prepared for tomorrow's training. Noah’s flow is visualized in Figure 31.

Olivia’s Flow

Olivia wants to make recovery a consistent part of her routine. After training, the recovery app sends her a reminder to do recovery exercises and maintain her streak. When Olivia opens the app, she is greeted by the welcome screen and navigates to the home screen. In the upper left corner, she also notices that she has a reminder in the app. She opens the notifications screen to review the reminder she received.

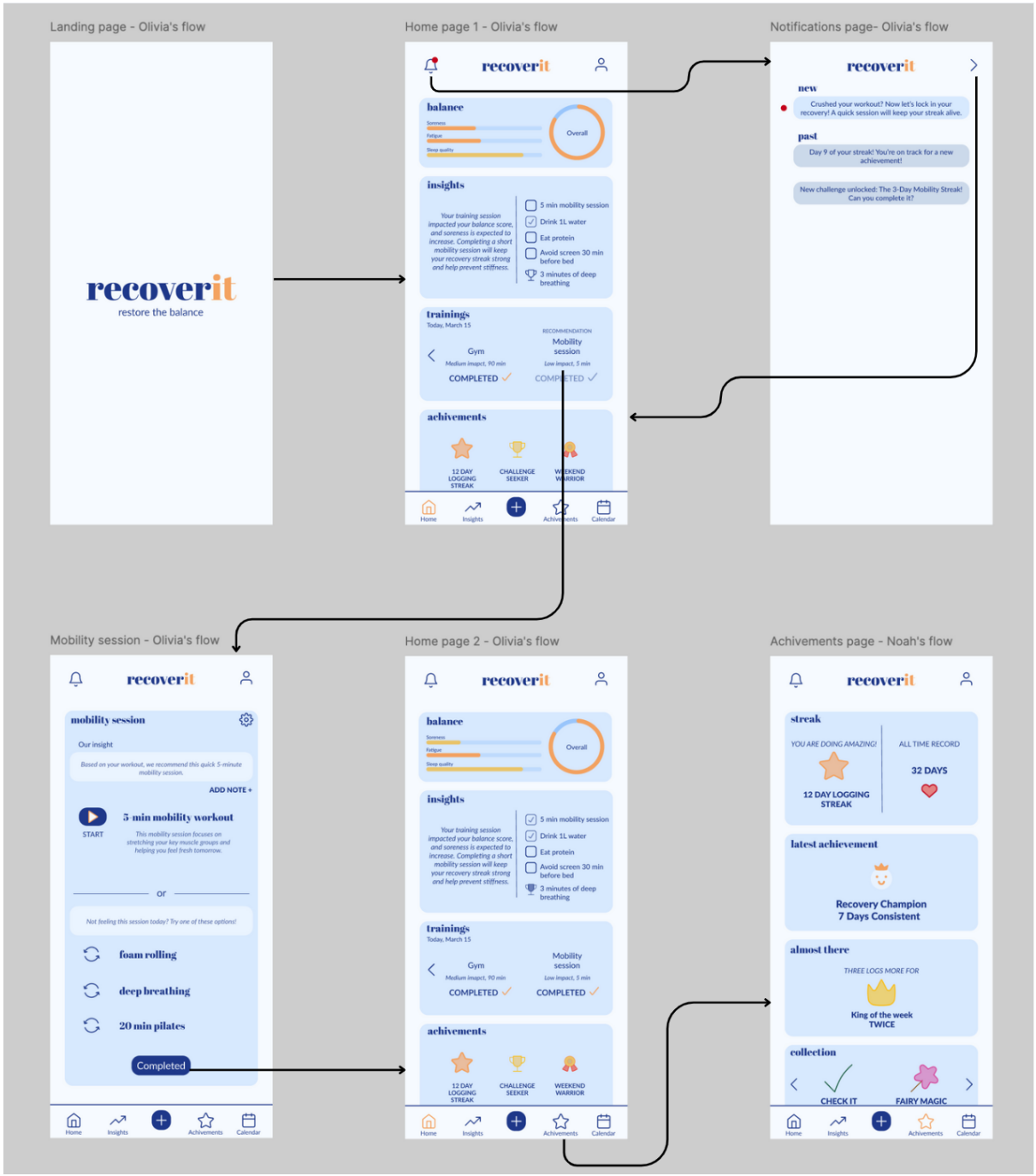

Figure 32. Olivia’s flow.

On the home screen, Olivia sees a recommended mobility workout in the training component. She clicks on it, and a recovery session screen opens up where she can complete a quick 5-minute mobility to stay consistent and continue her streak. After finishing her recovery, Olivia clicks “Complete”. She is returned to the home screen, where the recommended session is now marked as completed in the training section and the recovery plan. As Olivia wants to review her achievements and streak, she navigates to the achievements screen. Olivia’s flow is visualized in Figure 32.

Jess’s Flow

Jess wants to overcome her pain quickly. After completing her workout, she opens the recovery app and is greeted by the welcome screen. On the home screen, she sees that her smartwatch automatically logged her workout. Jess clicks on the plus button at the bottom navigation bar to log her pain levels. This action opens up a log component where she logs her pain by clicking the soreness/injury button.

Jess fills out the input fields on the pain log screen to provide an overview of what disturbs her and how intense the pain is. After completing the information, Jess clicks “Save”, which takes her back to the home screen. There, she sees a recommended recovery session and a plan to follow.

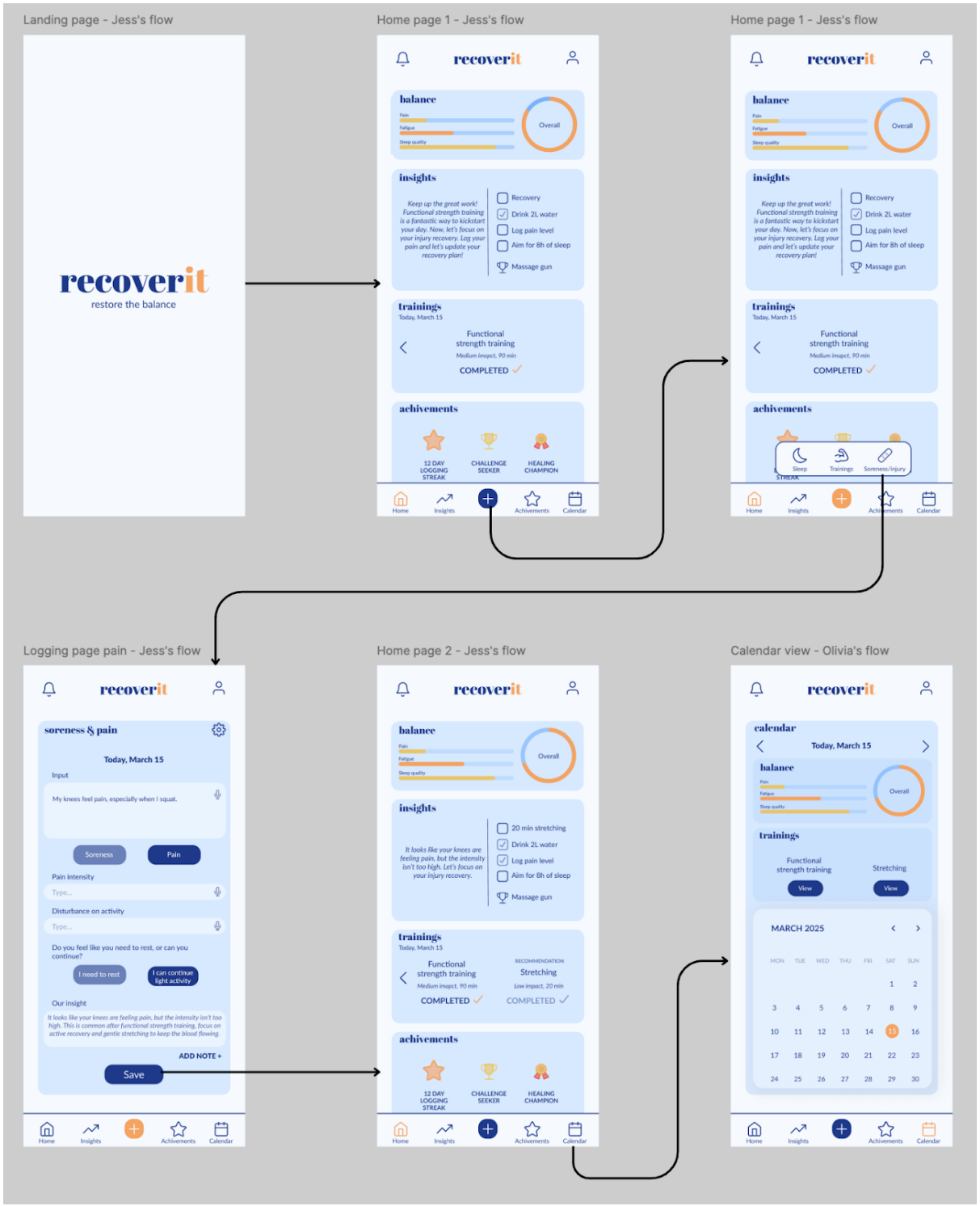

Figure 33. Jess's flow.

Once she finishes the recovery workout, she clicks on the calendar button in the bottom navigation bar to see an overview of today's scores and pain levels. Jess's flow is visualized in Figure 33.

5.4.1 Clickable Prototype

A clickable prototype was developed based on the wireframes. As Smith (2019) defines, a prototype is an early sample of a designed product. He explains that prototypes are utilized to test user interactions and gather feedback. Smith notes that clickable prototypes simulate an actual user experience and are an excellent method for evaluating user flows. The prototype created by the author of this thesis is available on Figma[1].

[1] Clickable prototype: https://www.figma.com/proto/pWuHxTlrRY0YPKssEcEC1E/Recoverit?node-id=55-16&p=f&t=3AoDNt3uhSwfNPyE-1&scaling=min-zoom&content-scaling=fixed&page-id=39%3A222&starting-point-node-id=55%3A16.

6. Feedback and Discussion

This chapter introduces the usability testing method used and its results. The testing was conducted to gather initial feedback on the designed prototype and to highlight improvement opportunities. Additionally, it discusses the challenges faced by the author throughout the process and explores future development possibilities.

6.1 Testing Structure

Usability testing is a key component of User-Centered Design. This testing was conducted using a pluralistic walkthrough. Or *et al.* (2024: 179) define this method as a usability evaluation where a group of people, such as usability experts or end users, find usability problems. The authors outline that participants complete defined tasks on a prototype, and it is followed by a discussion of potential issues. Or *et al.* identify three evaluator groups: target users, product designers and developers, and usability experts. In this testing, the evaluator group consists of three target end users.

The testing used materials defined by Or *et al.* (2024: 179-180). The tasks for the participants were predefined, and a clickable prototype was provided. The authors emphasize that the screens are organized in a structure that mimics the user experience. The clickable prototype follows this structure, and participants were given five tasks to complete.

This testing followed the steps provided by Or *et al.* (2024: 180-181), which were simplified. The participants were asked for informed consent before taking part in the testing. They received instructions, guidelines, and tasks to complete on the clickable prototype (See Appendix 4). Instead of having participants write down their actions for completing the tasks, the moderator observed how they interacted with the prototype. After they completed their tasks, the moderator noted whether they did it correctly or not. Following this, the correct answer was provided, and the evaluator asked for feedback on the difficulty or confusion they encountered. This simplified structure helped streamline the process and allowed for initial user feedback.

6.2 Testing Results

All the participants completed the five tasks provided in the clickable prototype on their first try. This can indicate that the core navigation and flow of the prototype were intuitive for the participants.

Their feedback after each task highlighted several improvement opportunities while also providing positive insights. Firstly, regarding customization, Jay suggested adding a customizable profile feature during the sign-in process (e.g., profile picture, height, weight). Chad proposed customizable UI elements, such as hiding certain functionalities.

Secondly, Jay also suggested the ability to log data for previous days for logging improvements. Sofia pointed out that the logging could be improved by creating quick logging options similar to the one used in the training section (See Figure 22).

Thirdly, regarding design, Chad and Sophia praised the clean and minimalistic user interface. Jay appreciated the color scheme but had comments about the balance component. Currently, it uses variations of orange, but a more apparent distinction would be better (e.g., green for good, red for bad) (See Figure 19).

Fourthly, regarding the recovery plan and sessions, Sofia greatly appreciated this functionality as it was captivating and motivating. Jay also suggested adding the functionality that users can add tasks to the recovery plan.

In summary, the testing resulted in positive initial feedback and valuable insights. The key takeaway is that the core navigation and functional flows were intuitive and understandable for the participants. The design and color choices were well-received, and the functionalities were praised. The suggestions provided highlight opportunities for refining the app to better meet user needs. The testing reflects the benefits of applying UCD principles. Including users from the start of the process, the user voices were heard, and the decisions were based on their feedback.

6.3 Challenges

During the process of this thesis, the author encountered several challenges. The first challenge was identifying the right competitors for analysis. There were not many sports recovery apps available to all users. To address this, the author expanded the search to include a broader range of apps, such as AI journal apps. This problem helped to demonstrate the need for sports-specific recovery apps and the potential impact of creating one.

The second challenge was data analysis. The author conducted interviews and a survey, resulting in rich data. To fully understand the data collected and the participants' goals and pain points, the author needed to find the correct methods for analysis. This process involved transcribing interviews, identifying recurring themes and categories, and performing

descriptive statistics. This challenge highlighted the importance of understanding all the data collected, which is central to User-Centered Design.

The third and most significant challenge was structuring the personas and their journeys. These personas were crucial for developing the wireframes and prototype. The personas needed to highlight the users' empathy based on the research and the functionalities required for the recovery app. It took a lot of time and careful thought to ensure that the personas accurately represented real users and were not just stereotypes. This work established a clear structure for the wireframes and main features. This challenge taught the author how to interpret data and turn findings into practical design decisions.

The final challenge was the design process itself. The author needed to figure out how to incorporate all the functionalities and how they should be visualized. This challenge ultimately sparked the author's confidence and became an enjoyable process. Through creating and refining, the author gained valuable knowledge of Figma, learning how to turn ideas into reality and support the user's expectations.

6.4 Future Development

The prototype has several improvement opportunities, which were identified by both the author and user testing. Feedback from user testing is discussed in Chapter 6.2.

The first area to improve would be the customization settings. These screens need to be fully designed and expanded so that users can personalize their experience even more based on their needs. Customization was also discussed in user testing feedback.

Another improvement would be creating a goal-setting feature. Currently, users can write a short sentence about their goals in their profiles. However, adding a dedicated goals screen for setting daily and long-term goals would allow the AI to generate even more meaningful insights. This would increase customization and give users more control, which aligns with Spiel *et al.* (2018: 7), who highlight that the app should allow users to tailor it to their unique needs.

Finally, adding mindfulness features to make the app even more holistic. The recovery plans already offer various activities that support mental health, but deeper mood tracking and features like mindfulness could bring more value and support for mental health.

Future research could explore how personalization and mindfulness features affect mental well-being, engagement and performance outcomes. Additionally, it could examine how AI insights and recovery suggestions evolve over time based on user data and logs.

Conclusion

The goal of this thesis was to create a prototype for an athlete recovery app[2]. The application simplifies recovery tracking and provides smart insights using artificial intelligence. It was designed to encourage athletes to integrate recovery into their daily routines. The prototype relied on the principles of Behavioral Design and User-Centered Design.

A competitor analysis was carried out, and the stakeholders were identified. Surveys and interviews were conducted for the user research. The data was analyzed using mixed methods. Based on the analysis, the user personas and their journeys were mapped. A clickable prototype and wireframes were created in Figma. The application allows users to track their data, receive personalized insights and recovery plans, and earn rewards. The functionalities were based on data analysis and personas. This ensured that the app focused on the athlete's goals, pain points, and desired features. The clickable prototype link can be found in Chapter 5.4.1, and the detailed wireframes and functionalities can be found in Chapter 5.3.

Initial user testing was conducted using a pluralistic walkthrough with three end users. This method gathered valuable feedback for improvements and identified opportunities for future development. The testing results highlighted that the core navigation of the prototype is understandable and intuitive for the testing participants. It reflected the benefits of using User-Centered Design principles from the beginning, as the testing users completed all the tasks successfully.

Through this thesis, the author learned the value of involving users from the start. The main challenge was creating accurate personas and user journeys to reflect user needs. The author gained skills in competitor analysis, transforming data into insights, and developing representative personas. They also learned to visualize features and build a clickable prototype, applying knowledge from both studies and work experience.

This thesis successfully created a prototype of a recovery app that allows athletes to track their recovery easily and provides helpful insights using artificial intelligence.

[2] Clickable prototype: https://www.figma.com/proto/pWuHxTlrRY0YPKssEcEC1E/Recoverit?node-id=55-16&p=f&t=3AoDNt3uhSwfNPyE-1&scaling=min-zoom&content-scaling=fixed&page-id=39%3A222&starting-point-node-id=55%3A16.

References

Aditya Sai Srinivas, T., David Donald, A., Thippanna, G., Madiletty, C., & Thanmai, B. T. (2023). Exploring the Uncharted: A Research Problem Statement. Recent Trends in Androids and IOS Applications, 5(3), 11–14. doi: https://doi.org/10.5281/zenodo.8214100

Altini, M. (2013). HRV4Training [mobile application]. Application found in the AppStore.

Annet, K. A. (2025). Psychology of Color: Its Influence on Marketing and Design. Eurasian Experiment Journal of Arts and Management, 7(2), 9-12. Retrieved March 8, 2025, from https://kiu.ac.ug/assets/publications/3462_psychology-of-color-its-influence-on-marketing-and-design.pdf

Brannen, J. (2005). Mixed Methods Research: A Discussion Paper. ESRC National Centre for Research Methods. Retrieved March 5, 2025, from https://www.researchgate.net/publication/251776164_Mixed_Methods_Research_A_Discussion_Paper

Budiu, R. (2017). A Checklist for Registration and Login Forms on Mobile. Nielsen Norman Group, June 4. Retrieved March 21, 2025, from https://www.nngroup.com/articles/checklist-registration-login/

Canva (2013). Canva [online platform]. Retrieved April 25, 2025, from https://www.canva.com/

Clear, J. (2018). Atomic habits: tiny changes, remarkable results : an easy & proven way to build good habits & break bad ones. New York: Avery, an imprint of Penguin Random House.

Coorevits, L., Schuurman, D., Oelbrandt, K., & Logghe, S. (2016). Bringing personas to life: User experience design through interactive coupled open innovation. Persona Studies, 2(1), 97–114. Retrieved March 11, 2025, from https://search.informit.org/doi/10.3316/informit.968441438714746

Cullen, M. L., Casazza, G. A., & Davis, B. A. (2021). Passive Recovery Strategies after Exercise: A Narrative Literature Review of the Current Evidence. Current Sports Medicine Reports, 20(7), 351–358. doi: https://doi.org/10.1249/JSR.0000000000000859

Daily Labs, LLC (2024). AI Journal & Diary - Reflectr [mobile application]. Application found in the AppStore.

Elvitigala, D. S., Karahanoğlu, A., Matviienko, A., Turmo Vidal, L., Postma, D., Jones, M. D., Montoya, M. F., Harrison, D., Elbæk, L., Daiber, F., Burr, L. A., Patibanda, R., Buono, P., Hämäläinen, P., Van Delden, R., Bernhaupt, R., Ren, X., Van Rheden, V., Zambetta, F., … Mueller, F. F. (2024). Grand challenges in SportsHCI. Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems (CHI '24). Honolulu, May 11–16 (pp. 1–20). New York: ACM Digital Library. doi: https://doi.org/10.1145/3613904.3642050

Figma, Inc. (2016). Figma [online platform]. Retrieved April 25, 2025, from https://www.figma.com/

FontForge. (n.d). Best Font Pairings For Abril Fatface. Retrieved March 9, 2025, from https://fontforge.io/best-pairings/abril-fatface/

Gibbons, S. (2018). Journey Mapping 101. Nielsen Norman Group, December 9. Retrieved April 20, 2025, from https://www.nngroup.com/articles/journey-mapping-101/

Glaser, B., & Strauss, A. (1967). The Discovery of Grounded Theory: Strategies for Qualitative Research. doi: https://doi.org/10.4324/9780203793206

Grammarly. (2025). Grammarly (April 21 version) [Large language model]. Retrieved April 25, 2025, from https://www.grammarly.com/

Grover, R., & Vriens, M. (Eds.). (2006). The handbook of marketing research: uses, misuses, and future advances. Sage. Retrieved March 9, 2025, from https://books.google.ee/books?id=RymGgxN3zD4C&lpg=PP1&hl=et&pg=PP1#v=onepage&q&f=false

Gupta, J. (2020). Colors: The emotions and impressions they evoke. International Journal of Advanced Research, 8, 1324-1330. doi: https://doi.org/10.21474/IJAR01/11402

Halson, S. L. (2013). Recovery techniques for athletes. Sports Science Exchange, 26(120), 1-6. Retrieved November 15, 2024, from https://www.gssiweb.org/docs/default-source/sse-docs/sse120-recoverytechniquesforathletes-halson_sse.pdf?sfvrsn=2

Harley, A. (2014). Icon Usability. Nielsen Norman Group, July 27. Retrieved March 24, 2025, from https://www.nngroup.com/articles/icon-usability/

Heikkilä, H., Markkanen, P., Mustaniemi, T., Pakarinen, K., Piironen, J., Torkkeli, L., & Väisänen, J. (2023). UX GUIDE-Getting to grips with user experience terminology. Retrieved March 21, 2025, from https://www.theseus.fi/handle/10024/802896

Huotari, K., & Hamari, J. (2012). Defining gamification: a service marketing perspective. Proceeding of the 16th International Academic MindTrek Conference (MindTrek '12). Tampere, October 3-5 (pp. 17–22). New York: ACM Digital Library. doi: https://doi.org/10.1145/2393132.2393137

Interaction Design Foundation - IxDF. (2016). The Rumble in the Board Room – Mobile Splash Screens What Clients Want and What They Should Get. Interaction Design Foundation - IxDF, May 29. Retrieved March 29, 2025, from https://www.interaction-design.org/literature/article/the-rumble-in-the-board-room-mobile-splash-screens-what-clients-want-and-what-they-should-ge

Jansen, B. J., Salminen, J., Jung, S. G., & Guan, K. (2022). Data-driven personas. Switzerland: Springer Nature. Retrieved February 26, 2025, from https://books.google.ee/books?id=h4lyEAAAQBAJ&lpg=PR1&ots=SSgVTSAxdv&dq=what%20are%20personas&lr&pg=PR7#v=onepage&q=what%20are%20personas&f=false

Jun, G., Carvalho, F., & Sinclair, N. (2018). Ethical Issues in Designing Interventions for Behavioural Change. C. Storni, K. Leahy, M. McMahon, P. Lloyd & E. Bohemia (Eds.), Design as a catalyst for change - DRS International Conference. Limerick, June 25-28 (pp. 2653-2662). DRS Digital Library. doi: https://doi.org/10.21606/drs.2018.498

Kaplan, K. (2023). User Journeys vs. User Flows. Nielsen Norman Group, April 16. Retrieved March 30, 2025, from https://www.nngroup.com/articles/user-journeys-vs-user-flows/

Keating, A. (2016). Active or passive? An examination of the relationship between the valence of work experiences and choice of recovery strategy. Master's thesis. University of Tennessee at Chattanooga, Psychology study program. Retrieved December 7, 2024, from https://scholar.utc.edu/theses/460/

Kellmann, M. (2010). Preventing overtraining in athletes in high-intensity sports and stress/recovery monitoring. Scandinavian Journal of Medicine and Science in Sports, 20(SUPP/2), 95-102. doi: https://doi.org/10.1111/j.1600-0838.2010.01192.x

Kellmann, M., Jakowski, S., & Beckmann, J. (Eds.). (2023). The Importance of Recovery for Physical and Mental Health: Negotiating the effects of underrecovery. London: Routledge. doi: https://doi.org/10.4324/9781003250647

Kendrick, A. (2020). Mobile-App Onboarding: An Analysis of Components and Techniques. Nielsen Norman Group, June 21. Retrieved March 29, 2025, from https://www.nngroup.com/articles/mobile-app-onboarding/

Khandelwal, P., & Chaudhary, N. (2023). The Psychology of Colors in UI/UX Design. National Conference on Data Science and Network Security (NCDSNS). Jaipur, December 5-6 (pp. 1-4). Jaipur: Pratibodh. Retrieved March 8, 2025, from https://pratibodh.org/index.php/pratibodh/article/view/154/165

Kuniavsky, M. (2003). Observing the User Experience: A Practitioner's Guide to User Research. San Francisco: Elsevier. Retrieved January 30, 2025, from https://books.google.ee/books?id=1tE4Skp9pI8C&lpg=PP1&dq=Kuniavsky%2C%20M.%20(2003).%20Observing%20the%20user%20experience%3A%20a%20practitioner's%20guide%20to%20user%20research.%20Elsevier.&lr&hl=et&pg=PR9#v=onepage&q&f=false

Lally, P., & Gardner, B. (2011). Promoting habit formation. Health Psychology Review, 7(Sup. 1), 1–22. doi: https://doi.org/10.1080/17437199.2011.603640

Laubheimer, P. (2024). Menu-Design Checklist: 17 UX Guidelines. Nielsen Norman Group, June 7. Retrieved March 24, 2025, from https://www.nngroup.com/articles/menu-design/

Li, A. (2017). Date-Input Form Fields: UX Design Guidelines. Nielsen Norman Group, January 22. Retrieved March 25, 2025, from https://www.nngroup.com/articles/date-input/

Li, S., Kempe, M., Brink, M., & Lemmink, K. (2024). Effectiveness of Recovery Strategies After Training and Competition in Endurance Athletes: An Umbrella Review. Sports Medicine - Open, 10(55), 1-19. doi: https://doi.org/10.1186/s40798-024-00724-6

Liiv, R. (2018). Vastupidavussportlaste treeningjärgsed füsioterapeutilised taastumismeetodid. Bachelor’s thesis. University of Tartu, Physiotherapy study program. Retrieved December 7, 2024, from https://core.ac.uk/download/pdf/328848402.pdf

Likert, R. (1932). A technique for the measurement of attitudes. Archives of Psychology, 22 (140), 55.

Longhurst, R. (2016). Semi-structured interviews and focus groups. N. Clifford, M. Cope, T. Gillespie & S. French (Eds.), Key methods in geography (pp. 143-156). Sage. Retrieved March 5, 2025, from

https://books.google.ee/books?id=1qu1EAAAQBAJ&lpg=PA168&ots=UGtELUdPF_&dq=info%3AH8_rdwffhTgJ%3Ascholar.google.com&lr&pg=PA168#v=onepage&q&f=false

Lowdermilk, T. (2013). User-Centered Design: A Developer's Guide to Building User-Friendly Applications. O'Reilly Media, Inc. Retrieved December 7, 2024, from https://books.google.ee/books?id=XiX5bNJjW0kC&pg=PA5&hl=et&source=gbs_toc_r&cad=2#v=onepage&q&f=false

Majumdar, A. (2021). Designing the Digital Experience: Exploring the Vital Role of Graphic Design in User Interface (UI) Design for the Modern Era. Proceedings of International Conference on “Innovation in Visual Arts” (ICIVA’23). Noida, October 17 (pp. 90-94). New Delhi: Excellent Publishing House. Retrieved March 9, 2025, from https://www.researchgate.net/profile/PradeepJoshi/publication/379512457_Proceedings_for_International_Conference_on_Innovation_in_Visual_Arts_ICIVA'23/links/660d19b9f5a5de0a9ff68e9d/Proceedings-for-International-Conference-on-Innovation-in-Visual-Arts-ICIVA23.pdf#page=100

Marsden, N., & Haag, M. (2016). Stereotypes and Politics: Reflections on Personas. Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16). San Jose, May 7-12 (pp. 4017–4031). New York: ACM Digital Library. doi: https://doi.org/10.1145/2858036.2858151

Müller, H., Sedley, A., & Ferrall-Nunge, E. (2014). Survey research in HCI. J. S. Olson & W. A. Kellogg (Eds.), Ways of knowing in HCI (pp. 229-266). Springer. doi: https://doi.org/10.1007/978-1-4939-0378-8_10

Myndarc, LLC (2021). Athlytic: AI Fitness Coach [mobile application]. Application found in the AppStore.

Neusesser, T. (2024). Competitive Usability Evaluations. Nielsen Norman Group, January 5. Retrieved April 22, 2025, from https://www.nngroup.com/articles/competitive-usability-evaluations/

1Fit, LLC. (2025). 1Fit - Fitness and Recovery [mobile application]. Application found in the AppStore.

Or, C. K., & Chan, A. H. (2024). 7 Inspection Methods for Usability Evaluation. C. Stephanidis & G. Salvendy (Eds.), User Experience Methods and Tools in Human-Computer

Interaction (pp. 170-192). Boca Raton: CRC Press. Retrieved March 31, 2025, from https://books.google.ee/books?id=nuMTEQAAQBAJ&lpg=PA170&dq=pluralistic%20walkthrough%20evaluation&lr&hl=et&pg=PA175#v=onepage&q&f=false

Price, D. (2021). Laziness Does Not Exist. New York: Atria Books. Retrieved March 6, 2025, from https://books.google.ee/books?id=FvztDwAAQBAJ&lpg=PP1&hl=et&pg=PA15#v=onepage&q&f=false

Recover Athletics, Inc. (2020). Recover Athletics [mobile application]. Application found in the AppStore.

Rämmer, A. (2014). Valimi moodustamine. Sotsiaalse Analüüsi Meetodite ja Metodoloogia õpibaas. Tartu Ülikool. Retrieved January 30, 2025, from https://samm.ut.ee/valimid/

Seifi, A., & Moshayeri, A. (2024). The Influence of Color Schemes and Aesthetics on User Satisfaction in Web Design: An Empirical Study. International Journal of Advanced Human Computer Interaction, 2(2), 33-43. Retrieved March 9, 2025, from https://www.ijahci.com/index.php/ijahci/article/view/21/17

Smith, Q. (2019). Prototyping user experience. UXmatters, January 7. Retrieved March 31, 2025, from https://library.parenthelp.eu/wp-content/uploads/2021/03/www.uxmatters.com_.pdf

Spiel, K., Kayali, F., Harrer, S., Horvath, L., Sicart, M., Penkler, M., & Hammer, J. (2018). Fitter, Happier, More Productive? The Normative Ontology of Fitness Trackers. In Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems (CHI EA '18). Montreal, April 21-26 (pp.1-10). New York: ACM Digital Library. doi: https://doi.org/10.1145/3170427.3188401

Stawarz, K., Cox, A., & Blandford, A. (2014). Don't Forget Your Pill! Designing Effective Medication Reminder Apps That Support Users' Daily Routines. Conference on Human Factors in Computing Systems - Proceedings. Toronto, April 26 - May 6 (pp. 2269 - 2278). New York: ACM Digital Library. doi: https://doi.org/10.1145/2556288.2557079

Stawarz, K., Cox, A. L., & Blandford, A. (2015). Beyond Self-Tracking and Reminders: Designing Smartphone Apps That Support Habit Formation. Proceedings of the 33rd annual

ACM conference on human factors in computing systems. Seoul, April 18-23 (pp. 2653-2662). New York: ACM Digital Library. doi: https://doi.org/10.1145/2702123.2702230

Strava (2025). Strava: Run, Bike, Hike [mobile application]. Application found in the AppStore.

Theobald, A., & Dennis, J. (2022). Sports Injuries and Their Lingering Long-Term Effects: Proposing the Addition of Injury Prevention Programs within Athletics. Journal of Student Research, 11(4), 1-6. Retrieved February 20, 2025, from https://www.researchgate.net/publication/370054817_Sports_Injuries_and_Their_Lingering_Long-Term_Effects_Proposing_the_Addition_of_Injury_Prevention_Programs_within_Athletics

Tobias, R. (2009). Changing Behavior by Memory Aids: A Social Psychological Model of Prospective Memory and Habit Development Tested With Dynamic Field Data. Psychological Review, 116(2), 408–38. doi: https://doi.org/10.1037/a0015512

Wang, H. H. (2024). Homepage Design: 5 Fundamental Principles. Nielsen Norman Group, March 15. Retrieved March 22, 2025, from https://www.nngroup.com/articles/homepage-design-principles/

Weatherly-White, M., Hunt, J., & Neville, V. (2012). The Science of Recovery: A fresh perspective to training for performance. Soccer Journal, 57(1), 38-40. Retrieved November 15, 2024, from https://research-ebsco-com.ezproxy.utlib.ut.ee/linkprocessor/plink?id=e6ec979a-36fa-36ac-96d9-33c6649851de

WhisperTranscribe B.V. (2022). WhisperTranscribe [computer software]. Retrieved April 25, 2025, from https://www.whispertranscribe.com/

WHOOP, Inc. (2025). WHOOP Performance Optimization [mobile application]. Application found in the AppStore.

Wilson, F., Ng, L., O'Sullivan, K., Caneiro, J. P., O'Sullivan, P. P., Horgan, A., Thornton, J. S., Wilkie, K., & Timonen, V. (2021). 'You're the best liar in the world': a grounded theory study of rowing athletes' experience of low back pain. British Journal of Sports Medicine, 55(6), 327–335. doi: https://doi.org/10.1136/bjsports-2020-102514

Yoo, J., & Pan, Y. (2014). Expanded customer journey map: interaction mapping framework based on scenario. HCI International 2014-Posters' Extended Abstracts: International

Conference. Heraklion, June 22-27 (pp. 550-555). Switzerland: Springer International Publishing. Retrieved March 11, 2025, from https://link.springer.com/chapter/10.1007/978-3-319-07854-0_96

Appendices

I. Survey Questions and Consent Form

Appendix 1 contains the survey conducted in this study, which was designed to gather insights into athletes' training and recovery habits, as well as their preferences and expectations for a recovery app.

A Prototype for an Athlete Recovery App

Hello! My name is Roberta Solom. I'm a third-year computer science student at the University of Tartu, and for my bachelor's thesis I am designing a prototype for an athlete recovery app.

Purpose of this study:

This survey aims to gather information about your training and recovery habits, as well as your opinions and preferences about recovery apps.

Your role in this study:

If you agree to participate, you will complete a short survey to share your experiences and preferences related to training and recovery. The estimated time to complete the survey is 5-7 minutes.

Risks of participating in this study:

There will be no cost of participating in this study other than investing your time. There will be no foreseeable risk of participating in this study.

Privacy:

Your information will be not shared with anyone outside this study. All responses will be used only for the purpose of this research. You are free to quit this study at any time.

Contact Information:

In case of any questions, concerns or feedback please feel free to reach out on email provided below: Roberta Solom | roberta.solom@gmail.com

If you give your consent to participate in this study. Please select 'Yes'.

If you do not wish to participate. Please select 'No'. (Yes, No)

Age Verification

Before we begin, please verify that you are over 18 years of age. Note: people under 18 do not meet the criteria for participation. **I am over the age of 18.** (Yes, No)

1. General Background

- **What is your gender?** (Male, female, other)
- **What is your age group?** (18-24, 25-34, 35-44, 45 and above)
- **What is your athletic background?** (Professional, semi-professional, recreational, other)
- **How often do you train typically in a week?** (Less than 3 days, 3–5 days, 6–7 days)
- **What sports do you do?** (Open-ended)

2. Pain Points

- **What are the biggest challenges you face in recovery?**
    - Managing soreness or pain
    - Tracking recovery progress
    - Finding effective recovery methods
    - Balancing recovery with training
    - Mental health and stress management
    - Other
- **How often do you feel that lack of recovery affects your performance?** (Scale: 1 = Never, 5 = Always)

3. Technology use

- **How often do you use technology (apps, trackers, etc.) in your fitness routine?** (Scale: 1 = Never, 5 = Always)
- **Do you currently use any apps for recovery?** (Yes, No)
- **If yes, which app(s) do you use?** (Open-ended)
- **How helpful do you find recovery apps in general?** (Scale: 1 = Not helpful at all, 5 = Extremely helpful)
- **What features do you find most useful in recovery apps?**
    - Soreness or pain tracking
    - Personalized recovery plans
    - Progress tracking
    - Smart reminders
    - Integration with fitness trackers (e.g., Apple Watch, Fitbit)
    - Other

4. Preferences and Expectations

- **What would motivate you to use a recovery app?**
    - Easy-to-use interface
    - Quick and efficient training/recovery logging with AI assistance
    - Seamless integration with my current fitness apps/devices
    - Accurate progress tracking
    - AI-driven recovery suggestions based on your training data
    - Personalized insights and feedback
    - Fast and intuitive user experience
    - Other
- **What role do you expect AI to play in a recovery app?**
    - Recommending exercises based on data
    - Efficient training and recovery logging
    - Offering feedback on recovery
    - Creating personalized recovery plans
    - Other
- **How important is gamification (e.g. achievements, badges, streaks) in motivating you to use a recovery app?** (Scale: 1 = Not important, 5 = Extremely important)
- **How important are social features in a recovery app?** (Scale: 1 = Not important, 5 = Extremely important)
- **If you could change one thing about your current recovery method, what would it be?** (Open-ended)
- **What is your most important goal when it comes to recovery?**
    - Prevent injuries
    - Improve performance
    - Reduce soreness
    - Track progress
    - Improve mental health
    - Other
- **Is there anything else you'd like to share about your recovery experience or needs?** (Open-ended)

II. Interview Questions and Consent Form

Appendix 2 contains the interview questions asked from three athletes to gain a deeper understanding of their goals, pain points and desired features for a recovery app. Additionally, it contains the participant consent form.

Participant Consent Form

Project title: A Prototype for an Athlete Recovery App
Researcher: Roberta Solom
Address: The University of Tartu Delta Centre, Narva mnt 18, 51009 Tartu
Method of Study: Qualitative study through interview

Purpose of the study

This interview is conducted as part of the bachelor thesis “A prototype for an Athlete Recovery App”. The purpose of this study is to gather information about the participants training and recovery habits, as well as their opinions, preferences, and expectations about recovery apps. The information gathered will help design and functionalize a prototype for a recovery application for athletes' needs.

_____

Please read and confirm your consent to participate in this user study by signing and dating this form.

1. I confirm that the purpose of the study has been explained to me and that I have had the opportunity to ask questions about the research and have had these answered satisfactorily.
2. I understand that my participation is voluntary, and that I am free to withdraw at any time without giving any reason.
3. I am allowing the researcher to audio record me as part of the study. The recordings will be transcribed. I understand that anonymized images and quotes may be used in presentations or publications stemming from the research but not in any way that might allow for identification of individual participants.
4. I understand the data will be kept confidential at all times.
5. I understand that if I have any concerns or difficulties I can contact the researcher.
6. I agree to take part in this study.

Name of participant:

Signature:

Date:

Interview

Hello!

My name is Roberta Solom. I'm a third-year computer science student at the University of Tartu, and for my bachelor's thesis I am designing a prototype for an athlete recovery app.

Thank you for agreeing to participate in this interview! Your insights are important for understanding user needs and preferences.

This interview will take approximately 30 minutes and will be recorded with your consent. Your responses will remain anonymous and will only be used for research purposes.

Before we begin, do you have any questions about the interview process?

Current recovery process:

1. How often do you do recovery?
2. Can you walk me through your typical recovery routine after training?
3. What tools or methods do you currently use for recovery?
4. How do you decide which recovery techniques to use? For example advice from physio, internet or coaches
5. Do you feel your recovery practices are effective? Why or why not?
6. What's your most important goal when it comes to recovery?

Pain Points:

7. What challenges do you face when balancing recovery with training stress?
8. What's the hardest part about maintaining a consistent recovery routine?
9. Are there any aspects of your current recovery routine that you wish were different?
10. Have you ever felt that poor recovery negatively impacted your performance? Can you give an example?
11. How do you feel when your body struggles to manage the stress from training? What impact does this have on you physically and emotionally?

Technology:

12. Have you ever used a recovery app? If yes, which one? What did you like or dislike about it?
13. If you haven't used a recovery app, what has stopped you from trying one?
14. Do you use any other fitness or health apps? If so, how do they help you?
15. What types of data do you think a recovery app should track to help improve your recovery? For example sleep, soreness, trainings

Preferences:

16. If you were to use a recovery app, what features would be most useful for you?
17. What would the ideal user interface look like for you? For example simple, colorful, intuitive
18. How often would you like to interact with the app? For example daily, weekly, only when needed
19. What role would you like AI to play in a recovery app? For example easy training/recovery logging, insights, recommendations
20. How do you feel about gamification features to motivate you? For example streaks, badges, achievements
21. Would social features, like sharing progress with friends, appeal to you? Why or why not?
22. What would motivate you to use a recovery app consistently? For example easy to use, fun experience, accurate insights

New Ideas:

23. If you could create a completely new feature in a recovery app, what would it be?
24. What's one feature you think a recovery app absolutely must have?

III. Grounded Theory Themes and Categories Table

Appendix 3 presents the full table created during the grounded theory analysis. It shows the 14 key themes identified with their categories. Additionally, it includes examples of quotes that illustrate how the categories emerged.

Themes	Categories	Quotes
Recovery methods	Stretching, rolling, massage, cold plunge, sauna, massage gun	Alex: *"It varies between the different practices, but most basic is we end practice, we do a cool down and then I get into the cold tub and after the cold tub I go straight into sauna. After that I [..] wrap up and go home and then the foam rolling, stretching and the machine gun work is also an option depending on how I feel."*
Recovery planning	Own methods, physio, Internet, and AI	Taylor: *"I once used a physio's help, probably. Right now, I just listen to my body and try to act accordingly. If I feel that my back hurts, I just roll that spot. […] I don't search much on the internet either."*
Effectiveness	Effective when done, but consistency is a challenge	Survey answers: *"I should put more focus on recovery, currently its a background task."* *"I feel that I need constant reminders to focus on my recovery. I need to be more consistent."* *"I should be more consistent and take time for proper recovery after every workout."*
Goals	High performance, injury prevention, stress relief, reducing soreness	Taylor: *"Release my body from muscle tension."* Jordan: *"Just feeling good. As in, I want to feel that my body is ready for the next training session and overall avoiding injuries that prevent me from training. Because all the training time that you are missing out, it's gonna affect you in the long run and limit your absolute ceiling where you can reach if you're going to reach it."*

Challenges	Lack of motivation, inconsistency, not a priority, managing soreness, balancing recovery with training stress	Jordan: *"The main issue is that I like training too much and I don't like recovering and doing nothing. So yeah, maybe just listening to my body […]"* Taylor: *"I should do that more. Otherwise my body gives up and I can't do anything anymore."*
Negative effects of poor recovery	Cramps, tiredness, poor performance, soreness	Alex: *"Let's say maybe after game day I'm feeling more sore and I go to practice next day, then I'm not that energized and if I'm like feeling muscles soreness, then […] my performance on court is very lower 'cause I don't move as well and I like can run as fast."*
Recovery app usage and awareness	Little to no knowledge of recovery apps	Alex: *"I don't think I have (used a recovery app). I, well I, I can't say that I have looked for a recovery app, but I for sure haven't seen one that would like invite me to use one."*
Technology and data tracking	Logging training, tracking fatigue, sleep, soreness	Alex: *"Yeah, I would say sleeping for sure. Then of course fatigue and how tired or sore you are from different practices. I think it should also like track how hard are the practices."*
Desired features	Reminders, insights and recommendations, tracking, helpful data, recovery plans, integration with fitness trackers, intuitive design	Taylor: *"If it would remind me to pull myself together and it is time to do recovery."* Jordan: *"Because I'm very poor at having a schedule for entering data, then an app that would pair with my or whatever fitness tracker someone is using […] The kind of app I would like that has a lot of automatic features. And the less I have to do myself, I can enter some data or like subjective feelings, etc. But the less I have to do, the better."*

UI preferences	Calming and simple (pastels, green, blue, purple), interactive and customizable, easy to use	Jordan: *"I think the color schemes that usually work well are kind of not too bright, like green and blue work very well and usually in the health field and it's commonly used. […] It should have maybe like let's say the main user interface is quite simple, but it has a lot of options for customization and if you want to make it more complex, you should be able to."*
Interaction frequency	Daily or after every practice	Alex: *"If I was to use one, I would for sure like to use it every day after every practice. That's that. In that way it would be used for me."*
Role of AI	Smart insights and recommendations, learning from user data, simple logging, personalized recovery plans	Alex: *"The insights and recommendations would be good, but everything that's easier is always good. You know, if it, if it's, if it can make the tracking or logging easier, then it feels very nice"*
Gamification	Streaks, achievements, but optional	Jordan: *"It's funny because they sound gimmicky, but they do actually work because human psychology is so easily trickable. […] They would be a good addition but again, like, they should be customizable. Like if somebody doesn't like them, you should be able to turn them off. And if somebody wants them, then yeah, they can be there."*
Social features	Not important	Alex: *"For me personally, it doesn't really matter because I'm doing recovery for myself and for my own performance and I don't feel like that's, that sharing it with other friends will be, will benefit me in some way"*

IV. User Testing Instructions

Appendix 4 contains the instructions provided for the user testing participants. It includes the rules participants needed to follow and five tasks they needed to complete.

Pluralistic Walkthrough Instructions

This prototype is developed for an athlete recovery app. It helps users track important recovery data such as sleep, soreness, and offers smart insights and personalized recovery plans using AI.

In today's testing session, **you will act as a user** of this app. You will be given **five tasks** that represent key functionalities of the app. You will be asked to complete these tasks on a clickable prototype in Figma.

Instructions:

- Complete one task at a time
- Do not move to the next task until the current one is finished
- A moderator will observe your actions during each task
- After completing a task:
    - Announce that the task is completed
    - You will be shown correct solution
    - We will then discuss your approach: what steps you took, if anything was unclear and your feedback

Five tasks:

1. Sign in to the app and get familiar with the onboarding screens
2. Log your training from the home screen and navigate to the Achievements page
3. From the Home page, log your soreness and navigate to Insights page
4. On the Insights page, start a Recovery session and complete it
5. Navigate back to the Home page, log your sleep, then navigate to the Calendar view.

These tasks are not meant to be completed perfectly the first time. After each task, feel free to share any thoughts or suggestions you might have outside the task as well.

License

Non-exclusive licence to reproduce the thesis and make the thesis public

I, **Roberta Solom**,

1. grant the University of Tartu a free permit (non-exclusive licence) to reproduce, for the purpose of preservation, including for adding to the digital archives of the University of Tartu until the expiry of the term of copyright, my thesis **A Prototype for an Athlete Recovery App** supervised by **Dr. Velvet Spors**
2. grant the University of Tartu a permit to make the thesis specified in point 1 available to the public via the web environment of the University of Tartu, including via the digital archives, under the Creative Commons licence CC BY NC ND 4.0, which allows, by giving appropriate credit to the author, to reproduce, distribute the work and communicate it to the public, and prohibits the creation of derivative works and any commercial use of the work until the expiry of the term of copyright;
3. am aware of the fact that the author retains the rights specified in points 1 and 2;
4. confirm that granting the non-exclusive licence does not infringe other persons' intellectual property rights or rights arising from the personal data protection legislation.

Roberta Solom

15/05/2025