Sport Injury Rehabilitation of Recreational Athletes

Karthik Nama Anil
Kyle Andrade
Sean Lu
Luke Austin Passmore
Xiaoliang Yan

Investigating the pain of recreational athletes in sport rehabilitation and the void in the rehabilitation treatment process

"Project Assignment 2: Ideation"

Table of Contents

Executive Summary

Physical injuries from sports, degenerative wear, and common accidents have always been significant burdens to our daily routine. This is especially true for any injuries that pertain to mobility, such as a knee dislocation or ankle sprain. After significant research in the problem space through interview, survey and secondary research, we discovered that these injuries, while inconvenient, are completely treatable with full recoveries as long as appropriate advice is given. However, due to the lack of knowledge on recovery progress, overgeneralization of the doctor's advice and mounting cost and time commitment to the recovery process, patients typically find themselves struggling through the prolonged recovery process. In order to resolve these issues, corresponding design implications are summarized. With these problem insights in mind, primary and secondary design criteria are constructed. It is believed that the primary features of our solution must be "informative," "safe," and "convenient"; it would also be good to have a solution that is "highly learnable," "empowering," "fun", and requires "low cognitive load" from the users. Following the design criteria, 100 ideas are proposed with their respective categories, problem-solutions and implementation difficulties. Multiple rounds of convergence using the above criteria reduced the ideas down to 3 distinct concepts: "RecoveryBook," "MedAssistant" and "RecoveryMate," with each emphasizing different customer needs. Finally, these concepts are visualized using the storyboards to showcase the efficacy of the solution through its interaction with stakeholders.

Problem Insights and Design Criteria

Iteration on Key Findings as Themes

There are four key findings from our initial user research: Injured recreational athletes are struggling to follow the rehab process because of time and inconvenience; recovery progress is hard to assess; medical advice can be too general; and lack of confidence and certainty make it hard to return to normal activity.

Convenience

First, recreational athletes who suffer from mild physical injuries spend most of their time recovering at home or at work/school due to a decrease in mobility and activity. Busy work/school schedules can make it difficult to follow all the rehab instructions provided by medical professionals. Therefore, the solution should be designed to be easily used in the home, at work, and at school. Designing the solution in this way will allow injured athletes to use the solution more regularly in times of convenience in the hopes of improving the rehabilitation process.

Progress Tracking

Second, Injured recreational athletes are unsure of their recovery progress. Often, the only indication they were able to base their progress on was their level of pain. However, the level of pain to an injury can vary daily, and this makes it difficult for an athlete to assess the progress of their recovery. This uncertainty was reported to lead to low confidence, low motivation, and cases of depression which can all lead to the athlete not following through on their recovery regimen. Therefore, the solution should be designed to allow the injured athlete to reliably assess their recovery progress on their own. Designing the solution in this way would provide the athlete with information of their recovery progress to keep confidence and motivation high in order for the athlete to follow through on their recovery regimen.

Instructions

Third, it was reported that injured athletes had poor experiences during their initial visit with a medical professional after suffering the injury. The first appointment often involved little face-to-face time with the doctor, and the rehab information provided to the recreational athlete was too general. This would cause the recreational athlete to view this appointment as a waste of time, money, and effort. Additionally, the initial visit would sometimes end with a referral to a rehabilitation specialist. Therefore, the solution should be designed to allow the injured recreational athlete to easily receive the more general medical information without the need to make the initial appointment while also providing a more direct way to receive the information that would be given during a visit with a rehabilitation specialist. This design implication is meant to keep the athlete more informed about their recovery process, to encourage the athlete to seek a consultation with a specialist, and to save the athlete time and money.

Return to Activity

Finally, when returning to activity, injured recreational athletes reported to still have some pain or not be 100 percent healed. Additionally, the recreational athletes had uncertainty about their physical ability when returning and had fears of reinjury. Their decision to return to activity was self-informed. Therefore, the solution should be designed to safely guide recreational athletes back to playing their sport. This design implication is meant to make the athlete feel safe and confident when returning to activity as well as lowering the chances of reinjury.

Design Criteria

In order to create and decide what the best solutions are for our problem, we needed to first determine what design criteria was most essential; not just to us but what mattered most to our users and stakeholders. To do this we analyzed our key findings listed above and further evolved them to create our design criteria. The determination was that there should be two levels to our criteria; primary level, objectives that our idea is required to achieve in order to be further prototyped and secondary level, objectives that make the product more ideal for the user, but aren't necessary for the product to help the user heal.

Primary Design Criteria
Informative
To do this we looked at what mattered most to people based on their motivations, desires, concerns, and frustrations. For our primary criteria, it was clear that the most important thing we were trying to accomplish with this stage of ideation was to educate our users and impart knowledge about their healing process. So, we needed our solution to be "informative"; the general information pertaining to the user's injury recovery must be easily available, accurate, and comprehensible. They should be able to seek expert knowledge when they do not have access to the relevant information in an interpretable manner.

Safety
Next, we determined that "safety" had to be a necessary part of this product. We are trying to help people with injuries heal, and the last thing we want is for our product to injure the patient any further. The solution must guide recreational athletes through the recovery stage so they can return to their sport once they have healed sufficiently. Looking at our product from this angle is important because we're working in the scope of the medical field, safety is important not just to the patients but also to the doctors and medical technicians who we need the support and confirmation of for our product to be successful. There should be no possibility of danger for the users of our product.

Convenience
The final criteria as part of our primary design level was "convenience", for a product to be fully accepted by a population it needs to make our lives easier, if it's putting more strain on us, then why would anyone adopt this as a solution to their problems. This criterion is especially important in solving the problem of people recovering from injuries because the biggest issue created by injuries is that they make our lives inconvenient. We must learn new ways of doing what were once basic tasks, any type of movement could result in inflaming the injured area, and oftentimes the equipment used to help a person heal can be clunky or heavy. Our solution needs to not only be convenient to use, but also help negate some of the inconvenience of injury. It needs to be easy to use and thereby promote mobility during recovery.

Secondary Design Criteria
Learnability
Our secondary level of design criteria while focused on important attributes dealt more with things that will help to increase our products popularity and use, but are not required in every ideation in order to be

a success for our users. First, we found that "learnability" would be an ideal attribute to any product we designed. A lot of the issues that people have with doctor's appointments and physical checkups is that many are unable to correctly follow the instructions provided by the doctors. A product should help to simplify the language and clarify the doubts of any recreational athletes suffering from an injury to understand their situation better. And it shouldn't require significant if any previous knowledge for a user to learn how to use it. The reason why we didn't classify this as primary design criteria is that while learnability is important, everything in this day and age has a learning curve and so it's rare that complexity will turn people away from a certain product. For example, smartphones came to mind when we discussed this attribute, they have a significant learning curve and with constant OS updates can be quite difficult for people to figure out at first. But their functionality was so powerful that its complexity did not detract from its popularity and eventual adoption by the everyday person.

Fun

The final secondary design criteria that we thought to integrate into our ideation process was the concept of "fun" and gamification of the recovery process. Of course this is the medical field that we're developing our problem and solution in, so to be frank the concept of creating a video game exclusively for injured people isn't needed. But it elevates a therapeutic service beyond something merely educational and turns recovery into a game and thus causes the user to be more invested and involved in the product. Looking at solutions through this scope can push us to think unconventionally and be more creative.

Developing Concepts

Describing the Ideation Process

Our ideas were developed over three ideation sessions after much discussion and deliberation. We used Google Sheets to document our ideas during the ideation process. Google Sheets real-time collaboration was beneficial for our team.

First Ideation Session

The first ideation session was during class hours on 24th February 2020, Monday. In this session, we mostly focused on determining the main themes of ideas we obtained from our design implications. We listed a few ideas in the index cards provided to us during class. The session was short and gave us an idea of how to proceed with the ideation process.

Second Ideation Session

We met at Room 6126 in Crossland Library between 1 pm to 3 pm on 2nd March 2020, Monday. This session was more organised compared to previous one. We formalised the themes or categories we were intended to explore and ideate upon. The themes or categories were obtained from the design implications developed in P1B. We investigated three broad categories - (1) difficulty of the recreational athlete to track recovery progress (2) clarity of information or instructions the patient receives from a doctor or recovery expert (3) cost/time/transportation/logistics visiting doctors and recovery experts. We created a fourth category titled "miscellaneous" to accommodate ideas that do not fall into the three broad categories we came up earlier.

We ended up with few unrealistic ideas during the session, but it was productive since we were able to come up with fifty-odd ideas by the end of the session. We did not constrain ourselves during the ideation process and let everyone openly share their thoughts. We performed brainstorming during the entire session. We initially discussed ideas where the solution would make the “problem obsolete.” Few ideas include "play sports where you never get injured" and "go into an alternate dimension where you never get injured." Then we proceeded to perform the "slice and dice" operation on both the categories and the recovery process. We were able to identify the pain points where we could potentially ideate on. We then proceeded to use the SCAMPER technique to determine the next set of ideas. For example, from R(reverse or rearrange) of SCAMPER, we discussed the possibility of the doctor visiting the patient or having an online consultation(generally, the patient visits the doctor for consultation). Next, we discussed a few ideas that involved the "gamification" of the recovery process. We discussed the feasibility of incorporating AR and VR technologies to aid the recovery process. We also discussed about mobile applications that could help in tracking recovery processes but be presented to the user in the form of a fun and interactive game. We applied these ideation strategies to the three broad categories we have mentioned in the previous paragraph.

Third Ideation Session

We held our third ideation session in Room 230 in Kendeda Building from 4:30 pm to 6:00 pm on 5th March 2020, Thursday. The ideation session was mostly categorised by "reframing" the existing ideas and discussing variations of existing ideas. Additionally, we identified a few more broad themes to ideate on.

The new themes were - (1) recreational athlete's return to activity, (2) motivation for the recreational athlete. Motivation ideas revolved around having professional athletes sharing their experiences during the recovery process and have social media platforms for recovering recreational athletes.

The ideas we came up during the session were more realistic and at the same time, a better version of some of the ideas discussed in the previous session. We picked a broad category and started writing down the ideas we had wrt to the category. When we felt that we do not have any more ideas for a particular category, we moved on to the next category. We repeated the process until we arrived at a hundred ideas.

100 Ideas

Idea 1
Provide a user friendly user interface that explains the problems to the patients in a simple and expressive language.

Idea 2
A message bot that sends out a notification warning in case the user is overstressing the injured area.

Idea 3
An application that clarifies the instructions the doctor has given.

Idea 4
WiiFit - Virtual tool that will guide the recreational athlete through a recovery process(rehabilitation exercise through game).

Idea 5
Patient can schedule a virtual appointment with an athletic trainer from a college team or professional team to check progression of injury recovery.

Idea 6
Mechanical brace that controls your rehab exercise or stretching.

Idea 7
E-commerce platform for injury specific equipment(suggests equipment based on injury).

Idea 8
Motivation/reminders app with notifications regarding injury progress.

Idea 9
Nutritional mobile app that tells you foods to consume during the injury recovery process.

Idea 10
Virtual assistant for questions and clarification about injury and injury recovery.

Idea 11
Use of visuals and videos to improve understanding of injury and recovery process.

Idea 12
Tracks your sleep to make sure you get the right amount of sleep that is needed for recovery.

Idea 13
An app that tells you what activities you can do with your injury and what you can't during the recovery process.

Idea 14
An app where the doctor can give you instructions daily.

Idea 15
Video database of patient visits with similar injuries to doctors and recovery experts during the recovery patients.

Idea 16
Recording the doctor appointment and replaying it at later for reference.

Idea 17
Database that has details about the recovery process/routine of collegiate/professional athletes with similar injuries.

Idea 18
A database that gives instructions on how to prevent an injury from occurring again.

Idea 19
A website that shows you ergonomic posture/poses that are ideal for the recovery process.

Idea 20
Sport specific suggested progressive training/practices for athletes coming back from injury.

Idea 21
An app that shows family members and friends things that they can do to help the injured person.

Idea 22
Connect a person who already recovered from a particular injury to a person who is going through the recovery process. The experienced person can guide the person going through recovery.

Idea 23
An app that provides the estimated schedule for recovery and doctor visits.

Idea 24
Robot doctor or robotic assistance of doctors.

Idea 25
An app that locks you out of your phone unless you do the survey and will not give you access until you have completed the rehab exercise.

Idea 26
Exoskeleton for motion assist for the person undergoing recovery.

Idea 27
Play sports where you never get injured.

Idea 28
Go into an alternate dimension where you never get injured.

Idea 29
Tender caring love of family. Research has shown that individuals recover faster when they have the love and care of family and friends.

Idea 30
The injured person experiences the sport or activity in virtual reality so that they do not miss the sport.

Idea 31
Pair two people undergoing recovery to act as support for one another.

Idea 32
A reward system for doing stretches and hitting certain recovery goals.

Idea 33
Face off - two people recovering from the same injury compete against each other to complete their rehab exercises and other instructions given by doctors.

Idea 34
Communities of people with similar injuries to talk about their experiences - improve confidence and motivation of these individuals.

Idea 35
Fast fashion for people recovering from injury.

Idea 36
Daily motivational webinar for people undergoing recovery.

Idea 37
Daily pictures of the user's injury to see the progress the user has made.

Idea 38
Community forum for users to post progress on their injury recovery

Idea 39
An app that finds motivational songs for you to listen to during the recovery process.

Idea 40
An app that finds podcasts about injuries and motivation for users to listen to.

Idea 41
A system where professional athletes can send motivational messages to recreational athletes recovering from injury.

Idea 42
Injury specific food delivery bundle deal.

Idea 43
An app that changes your phone lock screen/wallpaper to show a before and after picture of a professional athlete who went through an injury recovery.

Idea 44
A social media platform where people can interact with others recovering from injuries.

Idea 45
A service to connect with people of similar injuries to play the sport together (e.g. basketball game where everyone has a recovering twisted ankle).

Idea 46
Standard set of activities to check the pain level of the user and determine if its safe for the user to come back to playing the sport.

Idea 47
A gym where people recovering from injury can go to get back in there sport with a "lifeguard" on duty.

Idea 48
A gym specifically for injured people with certain equipment to help perform activities while recovering.

Idea 49
A brace/support that changes color (or other indicator) to tell you when you have been too much activity for your injury level.

Idea 50
Airbag ankle brace where airbag activates before injury happens.

Idea 51
Obstacle course where the amount the user progresses indicates recovery stage of the user.

Idea 52
Delivery service for medical supplies or devices.

Idea 53
App for temporary employment for people recovering from injury.

Idea 54
A website that helps you find the best doctor for your injury and price you may pay.

Idea 55
A website that shows the user to construct a brace or other type DIY equipment from household items.

Idea 56
Doctor wears a VR headset, the patient points their phone to the injured area, and the doctor can see the internal recovery and condition of the wound.

Idea 57
Virtual checkup by video if patient can't make it to the clinic.

Idea 58
Portable x-ray machine that can send results electronically to doctors.

Idea 59
Injury specific Uber service(transport them properly).

Idea 60
Online store for used medical devices/braces (sanitized/cleaned).

Idea 61
Self-driving car for injured people (rental service).

Idea 62
A system where a person who feels they aren't progressing through the recovery process enough can remotely get the advice of a medical professional of whether another visit is necessary to check for a more serious injury.

Idea 63
Recovery house for the same injuries(similar to halfway house for parolees).

Idea 64
An online community where a recovering user can leave reviews about the doctors they were treated by and the reviews are visible to the public.

Idea 65
Cost of consultation and examination estimate for a particular injury.

Idea 66
Website for potential patients to look at different doctor's schedules online instead of having to call to check for available appointment times.

Idea 67
A database that helps you find the best insurance based on your salary.

Idea 68
Pre-check system to see if you actually need to visit a doctor. Describe your injury and it will give feedback and suggestions.

Idea 69
A centralised system that has complete details about the patient and their previous history. It will help the doctors make better judgement.

Idea 70
An app with a QR code for your medical record so that a doctor can quickly pull it up easily.

Idea 71
Group rehab session with people of similar injury(split the cost among group members).

Idea 72
Online community where people who have gone through a specific injury's rehab process can become "experts" and guide the rehab process (replacing rehab specialist / doctor visits).

Idea 73
Workplace doctor/rehab specialist visits ; doctor visits the user’s workplace.

Idea 74
Public transportation discounts for injured people.

Idea 75
Monitor physical exercises remotely by video by experts.

Idea 76
Brace attached to your leg or ankle that measures the injury.

Idea 77
An app that has you take a daily survey to analyze and track recovery.

Idea 78
Patch(sensor) + Mobile app that tracks the recovery.

Idea 79
A sticker that changes colour that indicates the stage of healing of the physical injury.

Idea 80
A progress schedule for how many days you walk, till you can jog, how manys days you jog, till you can play a sport.

Idea 81
Flexible sensors for recovery monitoring.

Idea 82
Pressure sensors in shoe soles for pressure distribution of your feet.

Idea 83
A diagnostic software that takes in the picture of the wound to tell the user the type and severity of injury.

Idea 84
App where a patient takes daily pictures of the injured area to provide updates to the doctor.

Idea 85
Gait analysis software - tracking the way the user walks during the different stages of recovery.

Idea 86
Develop an infrared sensor to measure temperature around the injured area.

Idea 87
An electronic journal where a patient reports their daily activities for their doctor to review.

Idea 88
Based on the number of steps taken, recommend the proper amount of exercise, or warn if too much exercise.

Idea 89
An app where the doctor can create checkpoints and when the patient reaches those checkpoints, it will be marked. Opportunity to track the progress. Upload other docs and proofs for doctors to review.

Idea 90
Stem cell regeneration for fast recovery of injury.

Idea 91
Nanobots in the bloodstream to enhance the recovery process.

Idea 92
Provide alternatives to suggested crutches or sling etc.

Idea 93
Inject testosterone into the bloodstream to speed up the healing process.

Idea 94
Sensory deprivation device that will reduce pain during the recovery process.

Idea 95
Cold spray - immediately freeze the injured area to prevent further damage.

Idea 96
Dietary supplements that cause your injuries to heal faster.

Idea 97
Device that numbs nerve endings so pain can not be felt.

Idea 98
A brace that is integrated with ice pack functionality controlled by app and bluetooth.

Idea 99
A brace that can also massage the injured knee or leg.

Idea 100
Large stretching machine where users strap themselves to do exercises as per doctor's instructions.

Converging: Idea Selection

Describing the Converging Process

We were under the impression that coming up with 100 ideas was the hard part. However, we spent more time on narrowing down the ideas. We adopted different strategies at each stage to arrive at our top three ideas. We extensively used Google Sheets during the idea selection process(idea converging process).

We came up with ideas based on the broad themes or categories that we obtained from the design implications. These categories served as the initial clusters for the elimination of ideas.

To shortlist ideas for further discussion, each team member was given the option to vote for or against a particular idea. We create new columns in the Google Sheet where each user put a "1" next to the idea to select it and a "0" to reject the idea. We counted the votes for each idea and sorted the ideas with most votes to least votes. While we were voting, all of us had a good laugh reading some of the ideas we had written down in the sheet.

We initially pulled out all the ideas that had five votes. We were a team of five, and if an idea got five stars, it indicated that all of us were in favour of the idea. Only 9 out of 100 ideas received five votes in total. We discussed the nine ideas in detail and felt that we must have a look at the ideas with four votes to see if we could combine them into the nine shortlisted ideas. For each idea, we discussed "what do we like about the idea?" and other "comments" we had on the idea. We evaluated each idea based on the number of design criteria they met and how well do they align with the design criteria. We did not want to miss out on other good ideas that may have received fewer votes due to our personal biases. We quickly reviewed the ideas with three votes and found that two more ideas could be considered for further discussion. We were down to 38 ideas at this stage.

We started grouping ideas that shared a common theme or could be implemented together. Additionally, we dropped 13 ideas during the grouping process. These ideas were dropped because they did not completely align with the design criteria. After regrouping, we had 25 ideas remaining that were divided into six categories or groups based on functionality and idea implementation. After much discussion and deliberation, two categories were merged, and we were left with five categories. We used different colours to highlight different categories.

The ideas were categorised under the following labels - (1) notification, warning and tracking (2) virtual platform for communication/knowledge (3) gamification and instruction (4) community forums (5) physical entities. We dropped ideas in the "community forums" category since we felt that the current social media platforms could have many features we have discussed and did not make sense for us to proceed on the idea. The ideas termed as "physical entities" were dropped because their implementation was injury-specific, and we did not have sufficient knowledge to execute those ideas. The discarded categories were marked red for our reference. From the three remaining categories, we combined similar ideas into three coherent ideas that are discussed in the further sections. This is the process we adopted to select three ideas from the initial pool of 100 ideas.

Summary of 3 Different Ideas

RecoveryBook

RecoveryBook is a daily journal system for injured athletes to track the progress of their rehabilitation process in the form of a mobile application. The application would include a daily checklist of rehabilitation activities such as stretches/exercises to perform, icing sessions, and medicines to take, and the user would receive reminder notifications throughout the day when an activity needed to be completed. The journal would also include a self-assessment/survey to assess the athlete's pain and feelings about their injury. This information would be used to determine a suggested activity level for the athlete for that day. The application would measure the user's activity level through pedometer readings and send push notifications to warn the user that their activity level is too high. The user would be able to view their progression history for each day, aided by visuals and graphs, and type out any comments, thoughts, setbacks, and milestones achieved each day.

MedAssistant

MedAssistant is a medical appointment managing mobile application for injured athletes. This application is meant to make appointments more convenient for injured athletes by making them virtual. The user would be able to connect with 3 types of medical professionals: sports medicine physicians, rehabilitation specialists, and athletic trainers from college and professional teams of various sports. The freedom to make a virtual appointment with different types of medical professionals can allow the appointment to be catered to the user's specific need, whether it is for assessment of injury, to learn about rehabilitation exercises, to be guided through rehabilitation exercises, or to be cleared to return to their sport. These appointments can also be catered to sport specificity. Users will have a video call with the medical professional, and the application will store a video of the appointment for users to review at a later time. This keeps the user from having to remember every piece of information given to them during their appointment.

RecoveryMate

RecoveryMate is an interactive mobile game that guides the recovery process of injured athletes for the purpose of motivating the user athlete and encouraging them to stick to a rehabilitation process. A virtual instructor will guide users through various rehabilitation activities that are injury-specific through demonstrations and words of encouragement. The mobile game will provide the user with daily checkpoints, keep track of daily streaks and milestones, and track the user's recovery progress. The user will be able to unlock various items for their online avatar and virtual assistant as they accomplish goals and milestones. The game will have optional virtual reality components to increase the interactivity and fun of the game while being a way to provide more guidance for the rehabilitation activities. The game will also include leaderboards to motivate the user to stick to their recovery plan. The game will be focused on rewarding the player for daily activity and not focus on having a challenging difficulty or having competition between users.

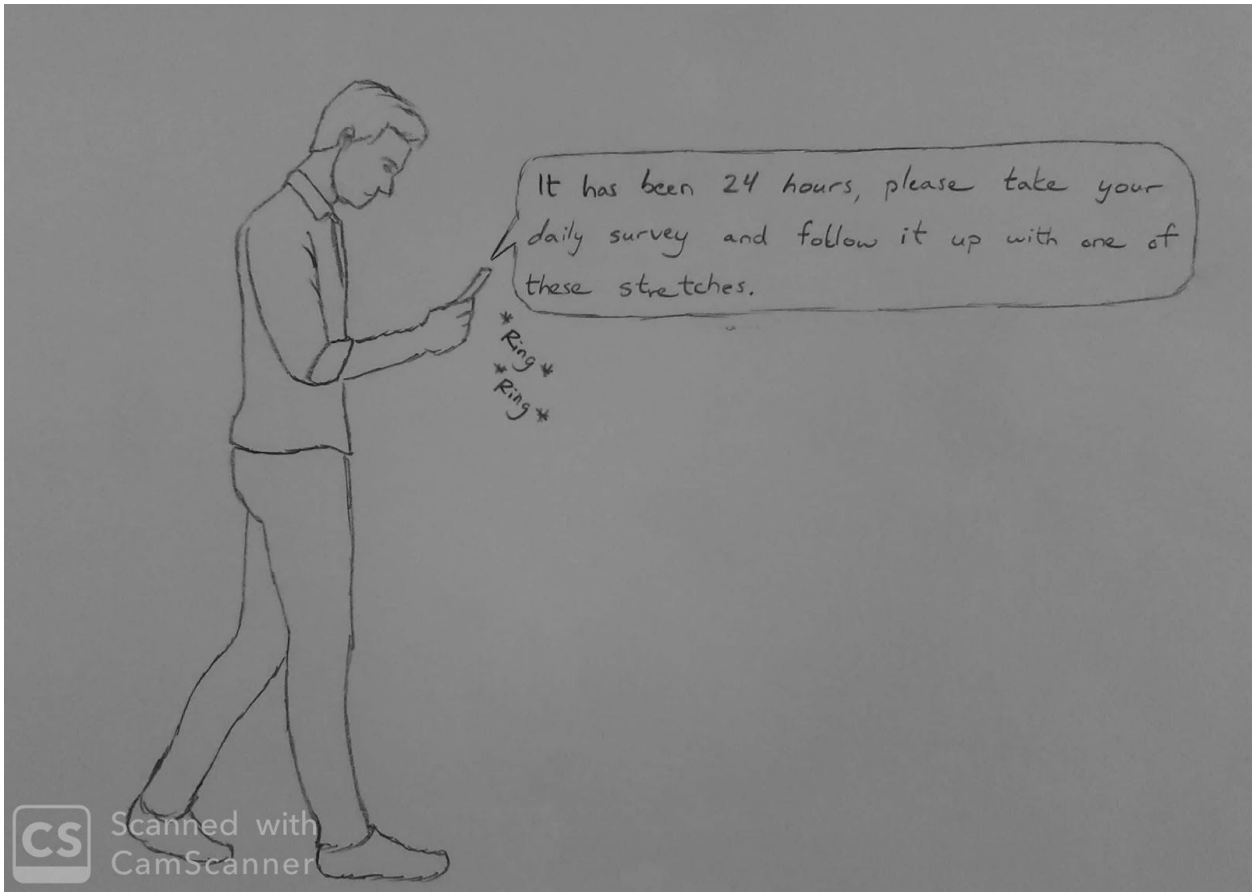
Design Concepts and Low-Fidelity Prototypes

RecoveryBook

Description

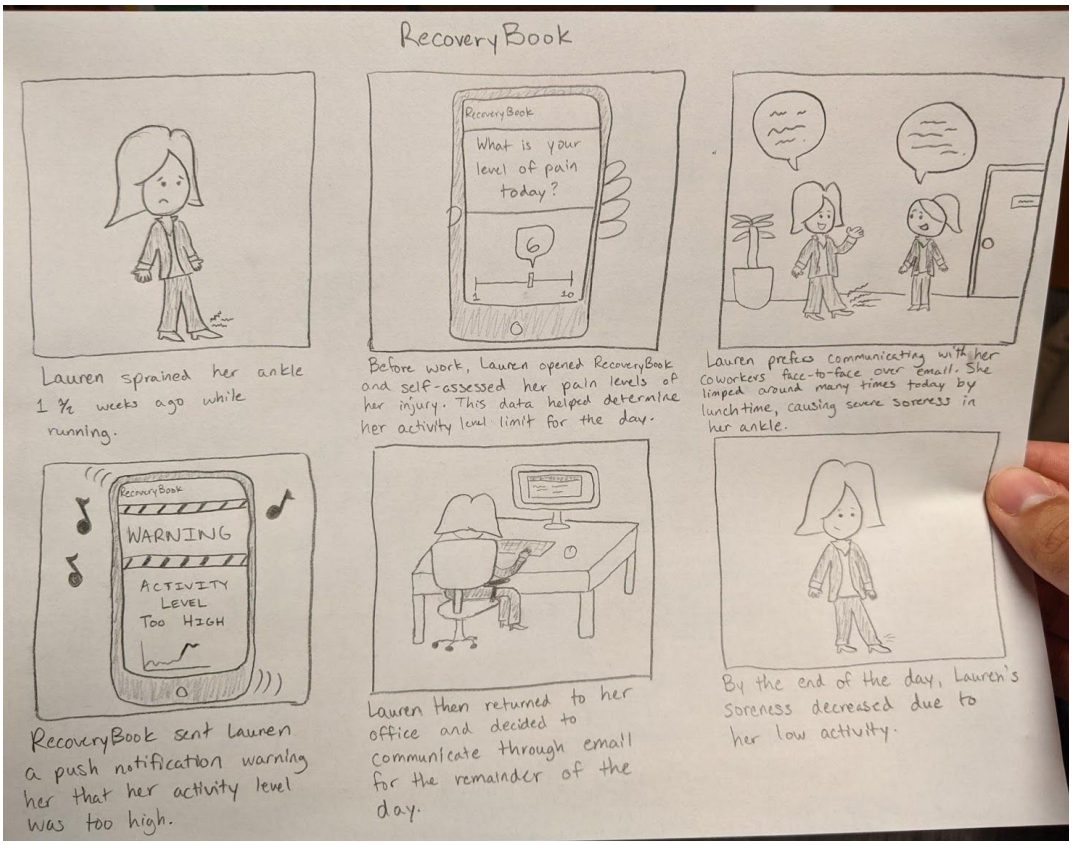
RecoveryBook focuses on being an informative, safe, and convenient solution to the problem space of rehabilitation for recreation athletes, as according to the design criteria. This solution is targeted at keeping the injured recreational athlete, which is the primary stakeholder group, on track daily with a rehabilitation process. This mobile journal system provides the athlete with a recovery plan, informs the user on when to complete rehabilitation activities, warns the user of having overly high activity levels, and allows the user to track their progression of recovery. This solution enables the athlete to have a better understanding of the process of safely returning to sport.

Sketch



The user in the above sketch is going about his day when his phone rings through his RecoveryBook app to complete a daily survey that asks him about how his injury is feeling and takes note of anything else that might be important. It then provides a series of stretches for him to choose that will exercise his injured area without straining it.

Storyboard



Scenario

Lauren is a realtor who enjoys going on casual runs with her husband in the evenings. Unfortunately, she recently sprained her ankle and can no longer do so. While she is recovering, from injury, she uses RecoveryBook in order to be reminded of daily tasks to complete in order to recover properly.

Lauren wakes up and sees a push notification from RecoveryBook asking her to take a self-assessment for the injured ankle. Lauren fills out a quick questionnaire in a few minutes. Using the information provided by Lauren, RecoveryBook tracks the progress of the injured ankle and compares it to data from previous days. With this information, RecoveryBook sets a pedometer limit on how many steps Lauren should take at maximum in order to keep her from hurting her ankle more. After the self-assessment is completed, RecoveryBook reminds Lauren to ice her ankles during two separate 5-minute sessions today (once after lunch, once after dinner).

Lauren continues her morning with a normal daily routine. Soon, it becomes 1 PM, and RecoveryBook sends out another notification to Lauren's phone. Lauren conveniently pulls her phone out from her pocket and checks the notification. This time, it is to remind her that she should ice her ankle for 5 minutes. Lauren acknowledges the notification and follows the instructions given. Later in the day during dinnertime, Lauren receives the same notification and reminder when it is time for her to ice his ankle

again for the second and final time for the day. Since Lauren is eating dinner, she is not focused on her mobile phone and misses the notification. The system is able to tell that Lauren did not look at or acknowledge the notification, so it pushes another notification 10 minutes later. This time, Lauren sees the notification and ices her ankle for a second time.

An hour after Lauren ices her ankle for the second time, she receives another notification from RecoveryBook. “This is weird, I already completed my two tasks for the day,” Lauren thought to herself. She looks at the notification and sees that the RecoveryBook pedometer count has almost reached the maximum number of steps suggested for the day. Lauren puts her phone away and keeps in mind to limit her steps for the rest of the day in order to prevent further hurting the sprained ankle.

MedAssistant

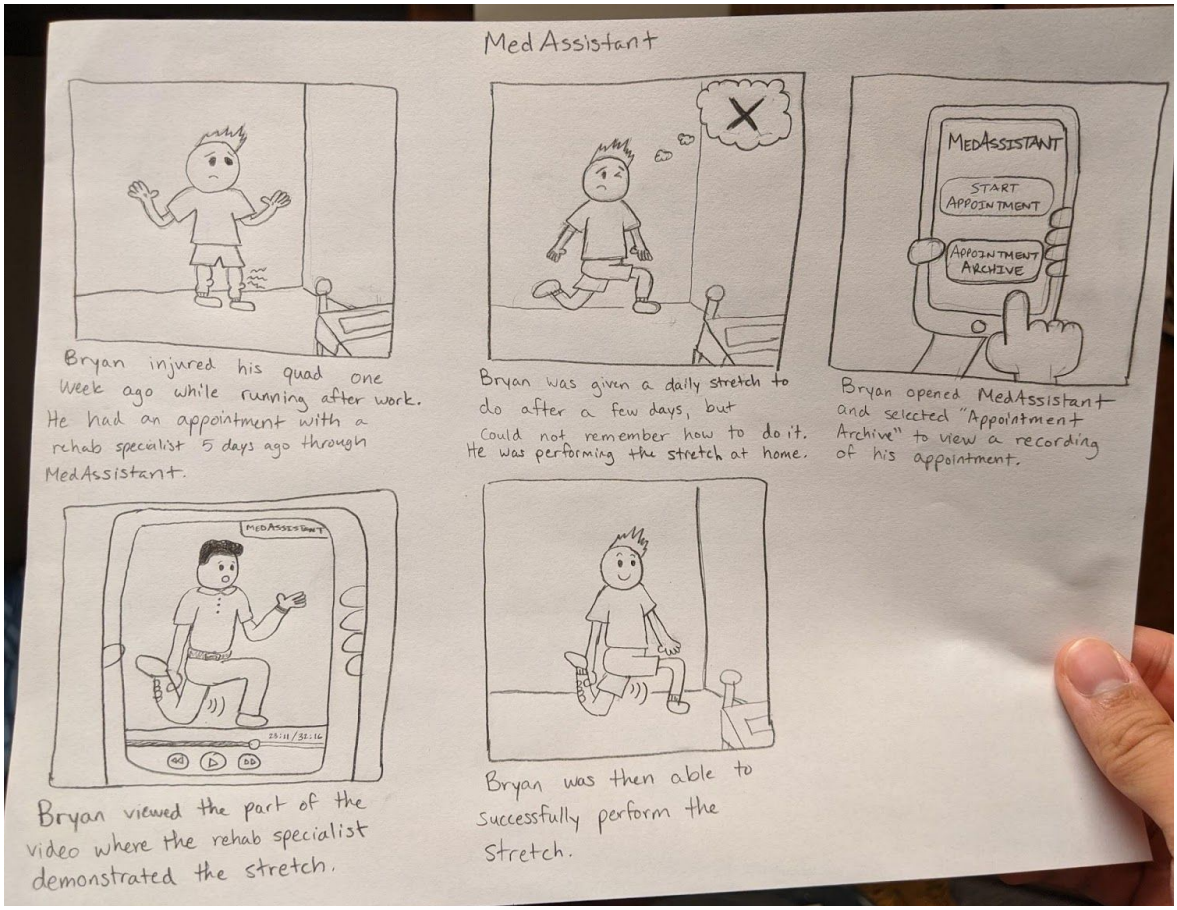
Description

MedAssistant focuses on being an informative, safe, and convenient solution to the problem space of rehabilitation for recreation athletes, as according to the design criteria. This solution is targeted at injured recreational athletes, which is the primary stakeholder group, and allows the user to easily manage and review appointments with medical professionals, the secondary stakeholder group. This application allows users to easily connect with various types of medical professionals to cater the appointment to the user’s needs without the time and cost of physical appointments. The ability to review recordings of past appointments allow the recovering athlete to guarantee that the rehabilitation information given to them during their appointments is clear requires no memorization.

Sketch

The user above was unable to meet with his doctor in person due to his sprained ankle, so he has scheduled a video appointment with his doctor to update him and get any advice moving forward with his recovery.

Storyboard



Scenario

Bryan is an accountant who works a typical 9-5 job for 5 days a week. He recently injured his quad while running after a work day. Given that he is at his workplace for a majority of the weekdays, it is very difficult for him to attend a doctor's appointment without taking time off of work. Previously, he would have to use a vacation/sick day to attend a doctor's appointment, or ask for a few hours out of the day from his manager. Either option is a tedious and undesired process which causes inconvenience for getting a medical checkup.

Bryan's doctor recently introduced him to a mobile application called MedAssistant. Using MedAssistant, Bryan can have a virtual doctor's visit from anywhere as long as he has access to the internet and his mobile phone. As a result, Bryan can conveniently "attend" a virtual doctor's appointment during his lunch break or even at his desk at work. Although more serious medical appointments that include

immunization shots or getting blood drawn still require Bryan to physically go to a doctor's office, quick check ups about general health can be completed through MedAssistant.

One day at work, Bryan feels pain in his thigh while walking up the stairs, and suspects he hurt his quad. Bryan sets up a virtual appointment with his doctor using MedAssistant. A few hours later, Bryan is at his work desk and talking to the doctor virtually through the application. The appointment goes as a normal in-person appointment would go. The doctor asks Bryan about any Bryan's injury, and the doctor suggests some treatment. In the matter of 20 minutes, Bryan has received all the information he needs about how to treat his injury. Most importantly, Bryan did not need to go through the hassle of leaving work and driving to the doctor's office. After the virtual appointment, Bryan continues on with his workday normally, as if no interruptions had even been made.

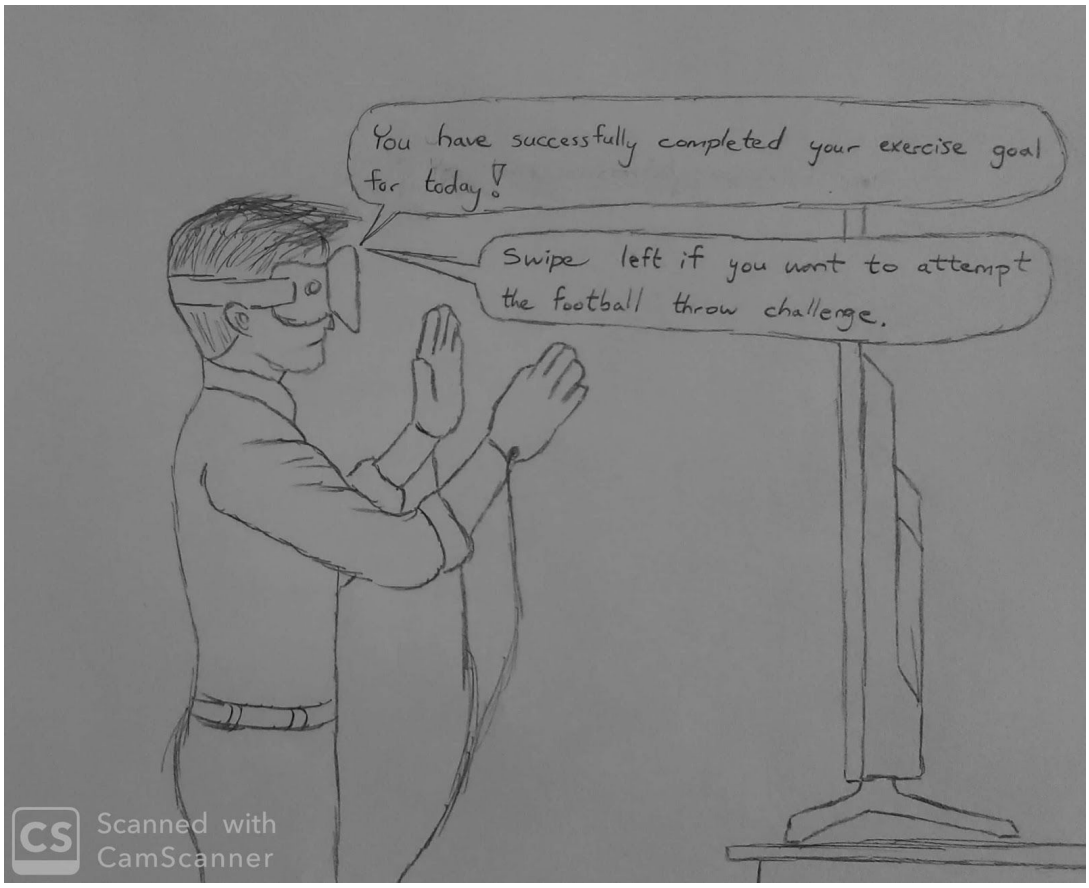
In the evening when Bryan has returned home, he feels pain in his leg again. It was an extremely busy day at work with many client meetings. As a result, Bryan has forgotten a lot of the advice and information that the doctor had provided during his appointment. Using MedAssistant, Bryan accesses the video database containing recordings of his past appointments. He is able to rewatch the appointment from earlier in the day, seeing that the doctor advised him to keep pressure off of his injured leg and to ice it every few hours.

RecoveryMate

Description

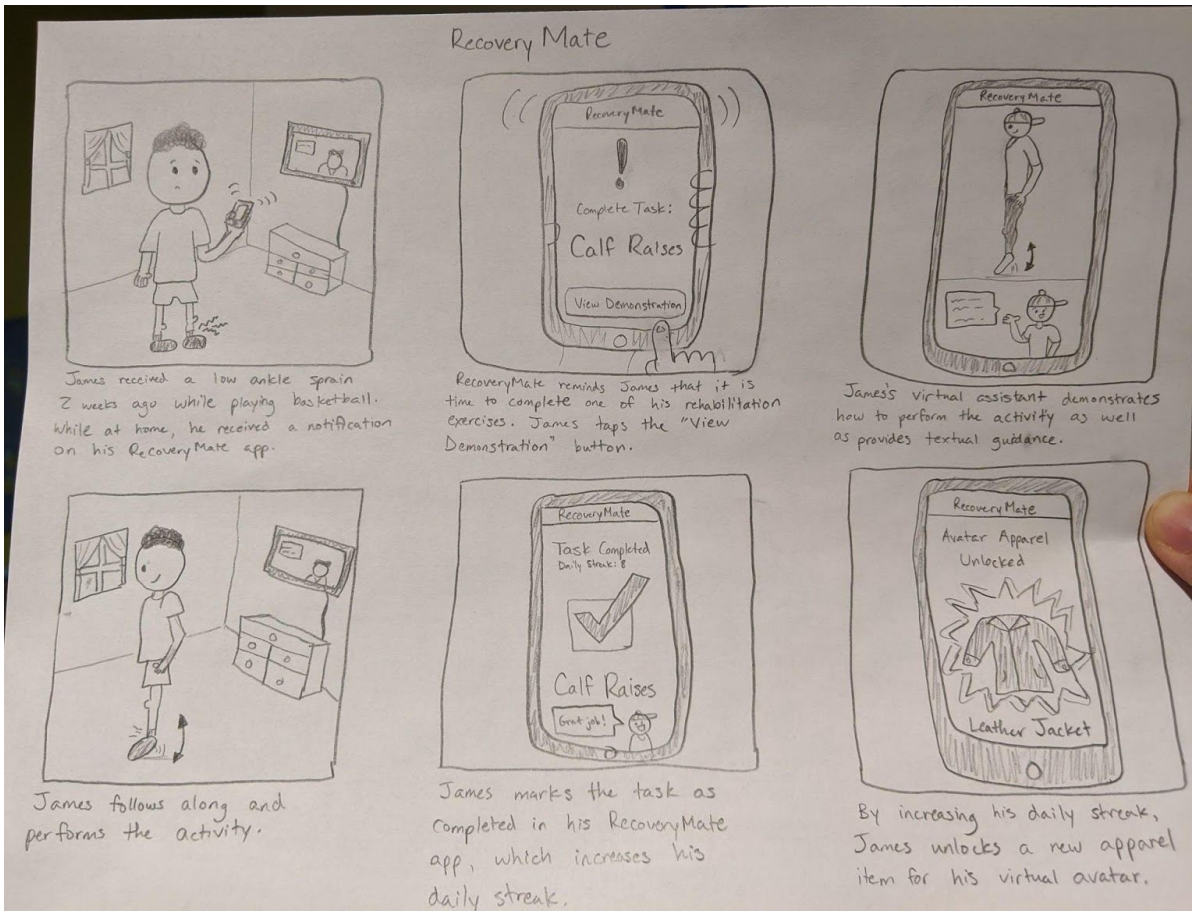
RecoveryMate focuses on being an informative, safe, convenient, learnable, and fun solution to the problem space of rehabilitation for recreation athletes, as according to the design criteria. This solution is targeted at injured recreational athletes, which is the primary stakeholder group, and allows the user to interact with a virtual assistant that guides them through the rehabilitation process in a safe and fun way. This application is focused on keeping the athlete motivated towards their recovery through a mobile video game with in-game rewards.

Sketch



The user who is a football player purchases the game RecoveryMate and plays through the exercise goals for his injury. The game also has sports games and achievements, such as football which the user is getting ready to play.

Storyboard



Scenario

Jake is a college student who often goes to the communal gym to play pickup basketball when he has free time from studying. Last week, he pulled his hamstring while going for a rebound. The injury has prevented him from playing basketball. More importantly, it has also impacted his mobility when walking from class to class around campus. In order to minimize the amount of inconvenience caused by the injury, Jake strives to do the most he can to recover quickly.

The day after the injury happened, Jake came across a mobile application game called RecoveryMate and began using it. RecoveryMate suggests exercises and stretches based on certain injuries, and also provides a virtual instructor who shows the user how to properly do the activities. There is also a daily streak for completing the activities, which in turn reward the player with in-game customization. Jake is currently on his 5th day of completing the recommended activities. Through a user error misclick, Jake accidentally selects the 6th day instead of the 5th day. Luckily, RecoveryMate knows that it is only the 5th day in the routine, so the Day 6 screen only shows the activities, but does not provide videos of the virtual instructor performing the exercises. The Day 6 screen also reminds Jake that he is currently only on Day 5.

Realizing his mistake, Jake goes back to the main menu and selects on the correct day. For today, Jake's task is to do 10 leg curls on his injured leg. Jake carefully watches the video recording of the virtual instructor correctly doing leg curls. The instructor provides tips and notes important aspects of the exercise to keep in mind. Once Jake is ready, he performs the 10 leg curls, following the lead of the instructor. Once the 10 curls are completed, Jake lets the game know that the activities for today are complete. Jake's streak extends to 5. Proud of his streak but still looking to continue progressing, Jake checks the public leaderboards. The first place player has a daily streak of 16. Determined to both reach such a level and recover from his injury as fast as possible, Jake motivates himself to continue the streak by doing the suggested exercises every day.

Appendices

Our 5 stage ideation process is captured in the Google Sheets. Each stage of the process is in its own sheet, which can be navigated through using the tabs at the bottom bar. The link is mentioned below -

https://docs.google.com/spreadsheets/d/1fvZk_UzyqJ7IWJkPQJr4U5DaBUWW-vhwOAcREnL5HIc/edit?usp=sharing

We have additionally submitted an Excel sheet version of the same for your reference.