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 3: Prototype"

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" 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. These concepts are visualized using the storyboards to showcase the efficacy of the solution through its interaction with stakeholders. In order to select the best concept for the high fidelity prototype, the three low fidelity prototypes are rated and ranked based on their design criteria, competition and practicality. In addition to the existing design criteria and customer needs, ease of prototyping and potential competitions for the low fidelity prototypes that have already been implemented or a variation of existing technology are identified. RecoveryBook aligned the best with all three considerations. After selecting RecoveryBook as our final design concept, 5 corresponding key activities are conceptualized and reflected using high fidelity prototypes and written scenarios. Specifically, two clickable high fidelity prototypes are created using inVision and a video prototype is filmed to reflect actual user experience with the clickable prototypes. The clickable fidelity prototypes are shared with the assigned critics to receive feedback using both the cognitive walkthrough and the heuristic evaluation. Ultimately, the feedback helped us improve the execution of design criteria to fit the needs of the potential customers.

Design Criteria

Based on research and interviews with injured recreational athletes, 4 key findings/desirables are reported: *convenience* - allowing injured athletes to use the solution more regularly to improve the rehabilitation process; *progress tracking* - providing the athlete with information of their recovery progress; *instruction* - keeping the athlete informed about their recovery process and encouraging them to keep progressing; and *return to activity* - making the athlete feel safe and confident when returning to activity.

Based on the key findings, we further evolved them into primary and secondary design 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

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.

Prototyping

Selecting a Final Design Concept

Before selecting the final design concept to ideate on, we revisited the three low fidelity prototypes we had proposed in the previous phase: ReoveryBook, MedAssistant, and RecoveryMate. RecoveryBook is a daily survey and journal system for injured recreational athletes to track their recovery progress using a mobile application. MedAssistant is a virtual medical appointment management platform to connect with doctors, physicians and other recovery specialists. RecoveryMate is an interactive mobile game that guides the recovery process of injured recreational athletes to motivate and encourage them to stick to a rehabilitation process. We first identified the low fidelity prototypes that have already been implemented or a variation of existing technology. We observed that in many remote areas, countries all over the world are using platforms like Cisco's Webex, Zoom and other tools to provide online medical consultation and hence dropped the idea of MedAssistant. We decided to pick the prototype that aligned most with our design criteria. We observed RecoveryBook aligned more with our design criteria compared to RecoveryMate. Additionally, RecoveryMate was designed to provide a generic routine to recover from injury and did not cater to individual injuries. Furthermore, we felt that the gamification of the recovery process does not address the actual problem of tracking the injury recovery process. Thus, we selected RecoveryBook as our final design concept.

Identify Key Activities for the Design Concept

Warning the user about their activity level

While users are going about their daily routine, the RecoveryBook app will send them a push notification to notify the user that they are being too active which could lead to longer recovery time or further injury. The activity level will be measured by the mobile device's pedometer, and the warming limit will be calculated based on the user's injury and daily self-assessment results. The user's activity is to view the notification and lower their activity level. This activity affects our primary stakeholder group of injured recreational athletes playing the role as the user of the RecoveryBook app. From our user research, we discovered that injured athletes have difficulty managing the recovery of their injury while maintaining a similar lifestyle to before the injury. Therefore, this activity demonstrates how our prototype shows the user that their activity level may lead to harm while still giving the user the freedom to go about their day however they seem fit.

Notification reminding user to do activity

The RecoveryBook reminds the users to keep active throughout the recovery process. We learned from our interview that the users tend to change their daily routine after injury, which leads to a confusion in terms of daily necessary activity. In the case if the user becomes sedentary, notification is sent to ask for a stretch and quick exercise. If the first notification is ignored, the RecoveryBook will continue reminding the user by sending more notifications. The pedometer will record the activity level. This activity affects the primary stakeholders in that it actively reminds the user to keep up with their daily goal. The secondary stakeholders are comparatively not involved in this specific activity.

Completing the daily self-assessment

Every morning, RecoveryBook notifies the user to complete a daily self-assessment to review the recovery progress of an injury. We learned from our interviews and our online research that our primary stakeholders, people suffering injuries, often fail to go to a followup doctor's visit for a variety of reasons. Because of this, they also have difficulty tracking what stage of recovery they are in. The activity of this prototype is aimed to help injured people track their recovery progress, and understand the physical limits of their injury so that they do not injure themselves further. This activity is done every day in the morning, so that the user can provide and obtain all the information necessary about their injury progress before "fully starting" their day. The prototype also affects the secondary stakeholders, doctors, since less patients will require followup visits to ask simple questions about their recovery. This allows for doctors to have more time for new first-time patients.

Recovery history, tracking and journal

The RecoveryBook uses the daily survey result, the pedometer reading, sleep cycle and pain meter to track the exercise history. We learned from our interview that the users would like to see a progression of their recovery, which would in turn motivate their activity. The users can easily track and visualize his or her recovery progress. In addition, it also serves as a platform for a recovery journal if the user elects to keep one, which would keep the user motivated whenever the users are reminded of their recovery goal. This activity affects the primary stakeholders in that it represents a visual method to interpret the recovery process. The secondary stakeholders such as doctors can also use the information to determine whether the treatment option/recovery method can be effective based on the activity trend.

Scenarios

Warning the user about their activity level

Bryan is an accountant who enjoys running at his local park for an hour every morning before work. Bryan does not like sitting at his desk at work for most of the day. He often walks to his coworkers' desks when needing to communicate with them rather than emailing them from his computer.

During one of his runs, he slipped and pulled a muscle in his left calf. After an initial doctor's visit, the doctor told Bryan that he should not be running for at least 3 weeks. The doctor recommended Bryan to download the RecoveryBook application on his mobile device to help track and manage his recovery process. The doctor also explains to Bryan the activity tracker functionality of the application. Bryan downloads the app when he gets home.

The next morning, Bryan takes the daily self-assessment in the RecoveryBook app. Based on Bryan's self-assessed pain levels for his calf injury, the application sets an activity level limit, measured by the pedometer on Bryan's mobile device, of when it should send Bryan push notification to tell him when he is being too active during the day.

During the first half of the day at worked, Bryan walked around to the desks of 12 other coworkers and gave a 15 minute presentation during a meeting. Before his meeting, Bryan received a notification from the RecoveryBook app stating that his activity level was increasing too rapidly. However, Bryan decided to ignore this notification. By noon, Bryan's calf was beginning to bother him more than it did before

work. At lunch, Bryan receives a notification from the RecoveryBook app letting him know that he's been too active recently. Bryan then decides to stay at his desk for the remainder of the day and communicate through email. By the end of work, Bryan's calf is hurting less. During the following weeks, Bryan is more conscious of his activity level while at work to make sure his injury is recovering properly.

Notification reminding user to do activity

Ben is a college student who enjoys occasional recreational and varsity basketball. During one of the varsity games he sprained his ankle and was immediately treated by the doctor. While he is recovering from the injury, the doctor recommends using the RecoveryBook to track and notify himself of some necessary activities for the improved recovery progress.

Because of the injury, Ben is far behind the class progress. While he is given the permission to study from home and is kindly helped by his classmates to share class notes, he finds himself spending quite a lot of time, struggling to self-study the materials. There is a tendency to become more sedentary and to forgo necessary exercise in the recovery process. RecoveryBook notices the change in Ben's schedule and tendency to ignore activities. Therefore, the app promptly sends notification to remind Ben that there is a certain amount of necessary exercise to complete for the best recovery progress. Additionally, for every hour of sedentary behavior, the app reminds Ben to stretch a little bit before continuing the work. The notification reminds Ben how many steps he still needs completing for the day and suggests the least amount of recommended exercise hours. If Ben elects to connect RecoveryBook with his personal health tracking device such as Fitbit or Apple Watch, RecoveryBook will collect the heart rate to adjust and recommend accordingly.

After completing the exercise of the day, RecoveryBook sends an automatic notification to congratulate Ben of his commitment to recovery. The progress in terms of amount of exercise is tracked and presented to Ben through an easy to read graph.

Completing the daily self-assessment

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 completes a self-assessment every morning through RecoveryBook. The self-assessment helps track her recovery progress, and also gives RecoveryBook a guideline for when to advise Lauren to stop being active in the injured area.

Lauren wakes up in the morning and receives a notification on her phone from RecoveryBook to fill out the daily self-assessment. Lauren clicks on the notification and is redirected to the RecoveryBook mobile application, where a short self-assessment survey appears. Each question is a simple multiple choice question, and only one question is displayed at a time. Lauren reads the first question and taps the screen to select the choice that best fits her answer. Then, she scrolls farther down the screen using a simple swipe motion to go to the next question. She does this for the remainder of the self-assessment until the app shows the end of the survey. RecoveryBook brings her to the Summary page, where the app shows a quick summary of all the questions answered and the responses for Lauren to review. Lauren realizes that she accidentally clicked the wrong choice for Question 3. Because this could mess with the recovery

progress tracking and also misinform RecoveryBook, she quickly selects Question 3. RecoveryBook takes Lauren back to the Question 3 page, where she selects her intended response. Lauren goes back to review the rest of her responses on the Summary page. After verifying all of her answers, Lauren submits the self-assessment.

After submitting the self-assessment, RecoveryBook gathers the data obtained. With this data, the app does some calculations and also compares the results with the recovery progress of previous days. The app displays a "Thank you" screen for completing the self-assessment. On this screen, it also tells Lauren to take no more than 3000 steps today. Lauren sees the number 3000 and continues on with her daily routine. Lauren will not need to manually count her steps, as RecoveryBook will warn her through notifications if she is reaching the 3000 limit.

Recovery history, tracking and journal

Three months ago, Lynda suffered from a severe ankle injury that prevented her from mobilizing and exercising as normal. Thanks to the RecoveryBook, she had a virtual friend keeping an eye on her recovery progress along the way to full recovery.

Indeed, the ease of use made RecoveryBook stand out. All Lynda had to do for the record is to take a daily survey of the level of pain and the level of activity. Based on the pedometer reading, the survey result is then analyzed and adjusted for the next day's projection. Everyday's reading and survey end up in the history tab of the app, so with a simple touch, Lynda was able to see her progress visually. Because of the interactive sensor and survey, the goal and result is constantly adjusting for the best recovery recommendation for Lynda. RecoveryBook essentially becomes the personalized trainer for Lynda's swift recovery from the ankle injury.

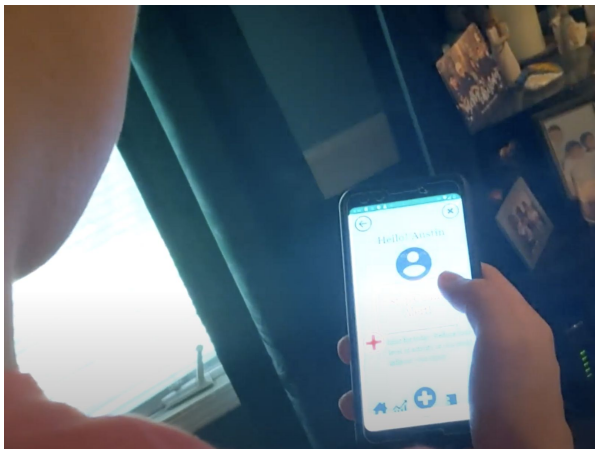
"Without the RecoveryBook, I wouldn't be able to recover so quickly from the injury, both mentally and emotionally," says Lynda while showing us the essential features of the RecoveryBook, "I was able to keep a recovery journal based on my current feeling, using the survey to assess my recovery progress, and set a proper goal for today's excersice. Without the RecoveryBook, I wouldn't even know where to start!" She then showed us more in detail what the survey is about. Based on the pain level and activity level, a new goal is projected for the day. The graphics show the number of steps taken and the pain meter shows the decreasing pain with the recovery progress. "Having this journal keeps me motivated," says Lynda, "and I just feel so much more confident with every step I take. Knowing that there is a record of where I was with respect to my progress pushes me to achieve the daily goal I have set every single day."

Higher Fidelity Prototypes

Video Prototype - Warning the user about their activity level

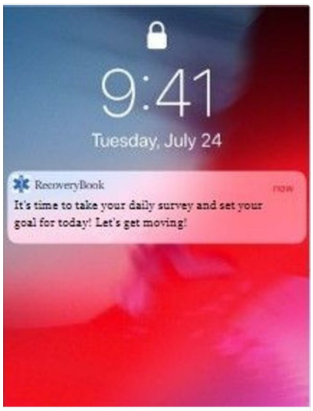
Link: https://drive.google.com/file/d/1RijLnJev33JoXyTkk-YZ0eZO1dP-6aoa/view?usp=sharing

The video prototype showcases the notification functionality of the prototype. The application can send notifications to remind users to exercise, take medicines and warn users of high physical activity. The user can turn on and turn off the notification in the Settings section of the app. The user can configure(we have not developed screens for the same in the prototype) and set the notifications based on the advice provided by the doctor or recovery expert in the previous consultation session.

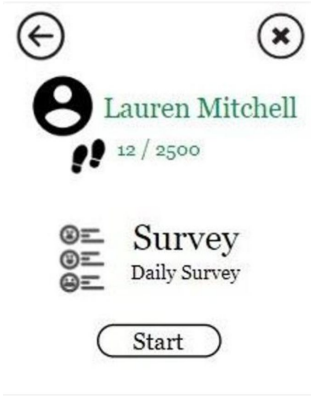



In this particular video, the user is playing with his dog and misses the first notification. The application sends a second high activity warning notification. The user clicks on the notification and is redirected into the application where more information about the warning is provided. The user heeds to the warning provided by the notification and settles down in a chair and continues to play with his dog.

Interactive Prototype - Completing the daily self-assessment
Link: https://projects.invisionapp.com/share/AZWQHTI3YCE#/screens

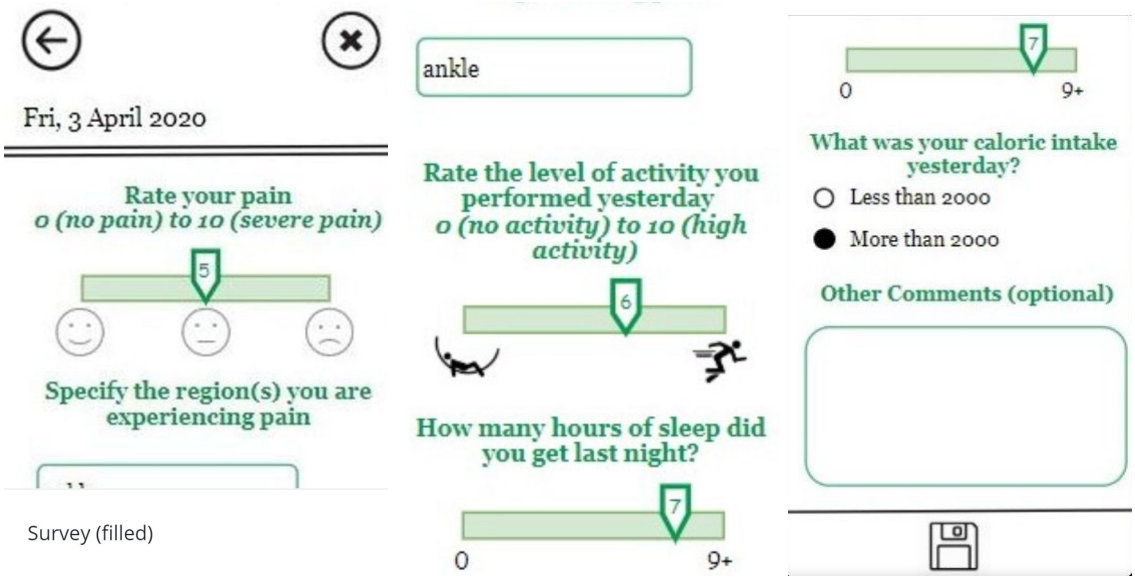


Notification



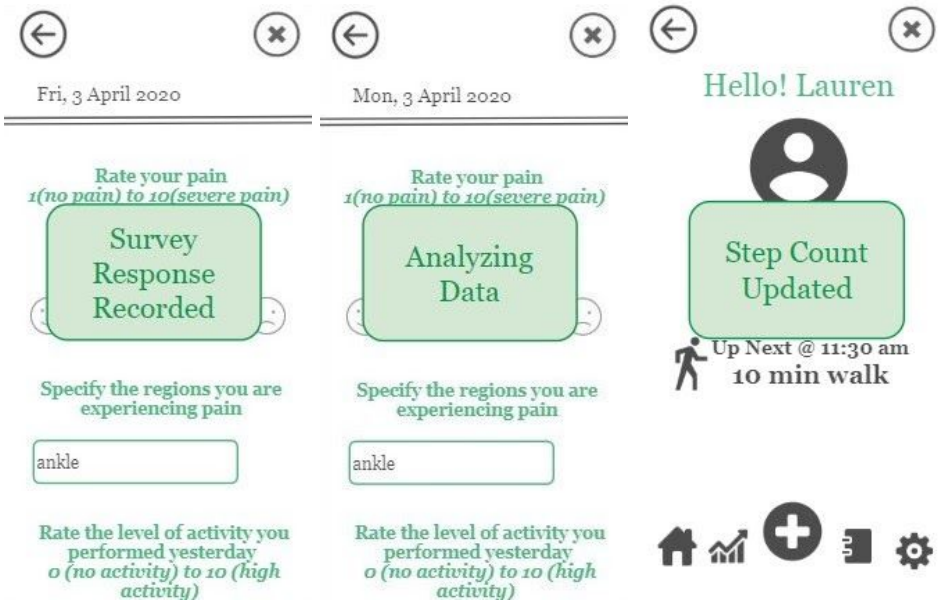
Survey Start

This clickable prototype focuses on taking daily self-assessment surveys. The control is consistent with the second clickable prototype. At a certain time of the day, the notification prompts the user to start taking the daily self-assessment survey, which would lead to the survey start in the app. By clicking the start button, the user begins filling the survey.



Survey (filled)

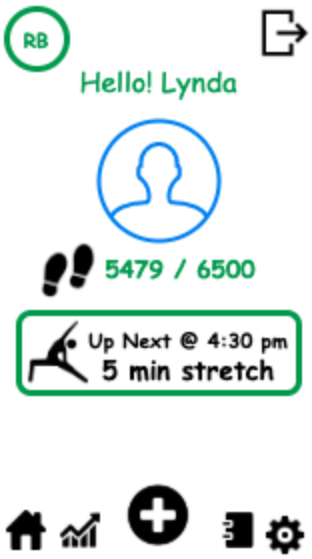
Here the user can input particular self-assessment of pain, activity, sleep and food intake levels using respective scales.



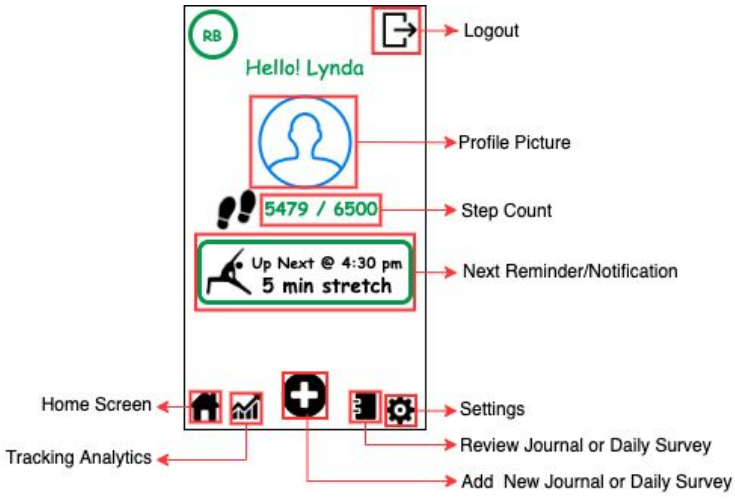
Then the new information is recorded, analyzed by the algorithm and updated to reflect the new step count and daily goal that would best serve as a recovery assistant.

Using this updated daily goal, the application reminds the user of their current status according to the step count which is recorded using the pedometer on the phone. If the user is approaching the daily goal faster than the algorithm determines, then a notification/warning would be issued to help the user balance activity level.

Interactive Prototype - Recovery history, tracking, and journal
Link: https://hciprojectgt.invisionapp.com/public/share/CR13I7PLGS



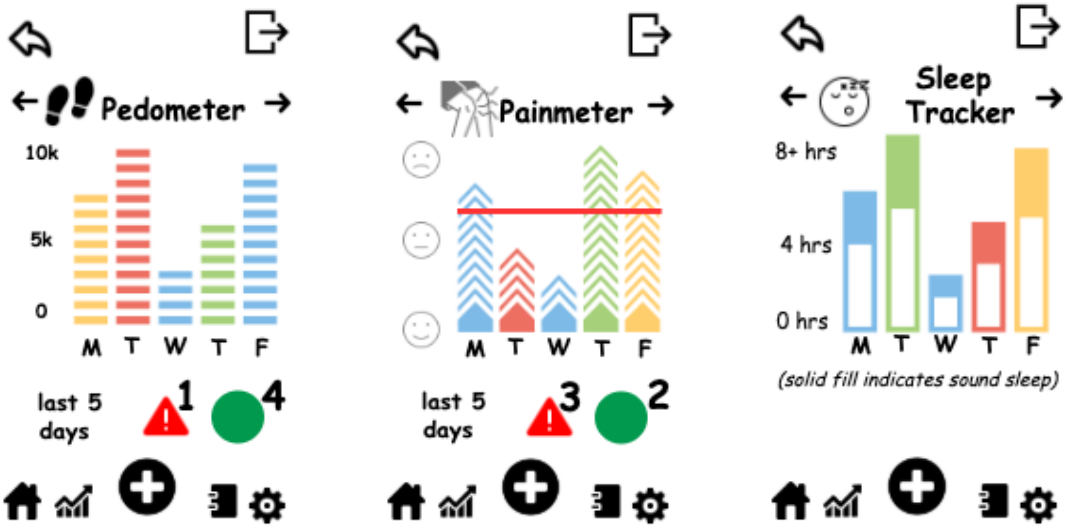
The prototype concentrates on highlighting the features concerning tracking and journaling the injury recovery of a recreational athlete.



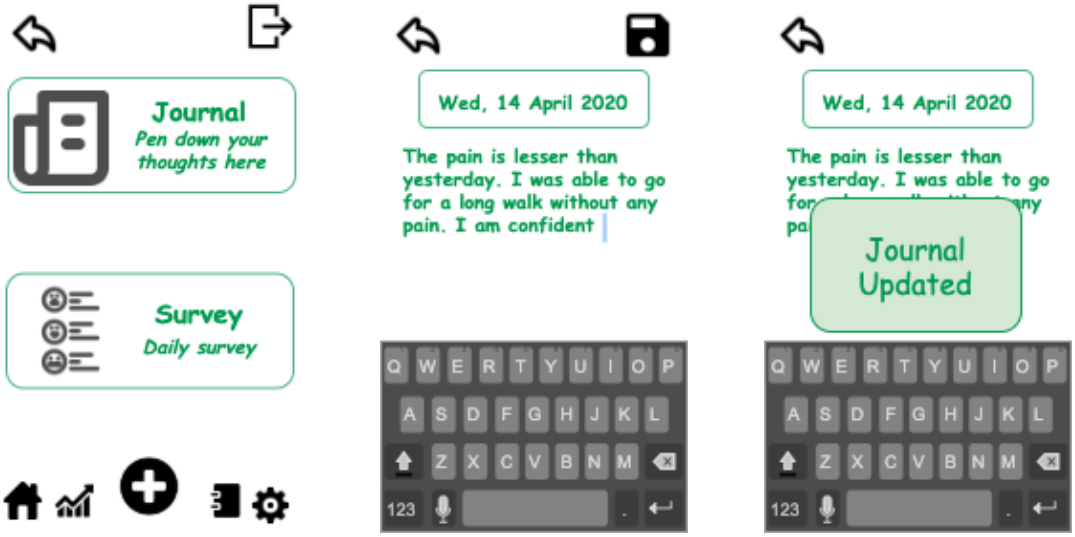
The number of steps taken by a user is a standard metric used by doctors to measure the amount of physical activity performed by a user daily with the assumption that the user has the phone on him for the majority of the day. Selecting the graphs in the button of the screen redirects the user to the analytics section of the application. The Pedometer(first graph) provides more details about the number of steps taken by the user in the last few days in the form of a bar graph. The Painmeter(second graph) displays the user reported pain level through survey covered in the other prototype. The Sleep Tracker(third graph) shows the amount of sleep the user had each day. The solid fill indicates the number of hours of the day the user had a sound sleep. Electromyography sensors in phones measure the muscle activity to determine

the sleep duration with the assumption the user sleeps with the phone in their pocket. The data may be obtained from smartwatches as well but not covered in our prototype.

Right below the chart, the warning sign indicates the number of days the user reported values higher than the specified threshold. The number next to the green circle shows the number of days when the user reported values less than the threshold.



Clicking on the plus sign on the home screen, redirects the user to another screen that allows the user an option to record the daily survey or record their journal. The journal is straightforward and will enable users to record their thoughts during the recovery process. The application allows the user to pick the date or will record the current date if the user does not specify the date. The floppy icon on the top right is used to save the current entry into the journal. The journal can be revisited by clicking on the book icon(fourth icon from the left in the bottom of the screen) on the home screen. The user is redirected to another screen where the user can view their daily survey responses as well as the journal entry. Clicking the specified date will allow the user to view that particular journal entry.



Design Team Evaluation Exercise

Our group decided that we wanted our two clickable prototypes to be used for evaluations because they were the best representation of our proposed solution. We thought that the cognitive walkthrough was the best technique to pair with the clickable prototypes because we could show the evaluators the exact order of the slides of the clickable prototypes to go through. However, we noticed that the heuristic evaluation provides a different type of feedback about our solution that would also be useful. Therefore, we decided to have the clickable prototypes also be evaluated using a heuristic evaluation.

We divided our 10 evaluators into two groups. One group was given a cognitive walkthrough, and the other group was given a heuristic evaluation. Both groups were given the two clickable prototypes to use for the evaluation.

Links to the 2 prototypes used for cognitive and heuristic evaluation -

1. https://hciprojectgt.invisionapp.com/public/share/CR13I7PLGS
2. https://projects.invisionapp.com/share/AZWQHTI3YCE#/screens

Images of the prototypes are provided in the previous section.

The cognitive walkthrough consisted of completing two tasks: “Add a journal entry and review it” and “Complete the daily self-assessment”. Because the prototypes were designed to each be specific to a task, each clickable prototype corresponded to one of the tasks in the cognitive walkthrough. For each step in the activities, the evaluators answer yes/no questions relating to the design of the prototype as well as provided notes.

The heuristic evaluation group was directed to freely explore the two clickable prototypes. After exploring the prototypes, the evaluators rated our solution based on 10 standard heuristics and 3 heuristics specific to our design using a 0 to 4 scale on severity of a usability problem. The 3 heuristics were created based on our design criteria, and they were: “Ease of interpreting information”, “Blends into daily routine”, and “Accessible from anywhere”.

Reading through the cognitive walkthroughs and heuristics evaluations that were completed by the evaluators, the comments and notes could be broken down into three distinct groups. Improvements on the functionality of our application, comments on the aesthetic of our design, and problems that were more due to the medium that we were using to exhibit our application than any issue with the actual workings behind the application.

For the first category, we got some extremely helpful notes on functionality that could help users better navigate our application, such as better signifiers because there’s no way for a user to know what each button does. One evaluator was unsure what the ‘plus’ icon does and that allowing a signifier to appear when hovering over a button would be useful. Another issue that cropped up multiple times was that there was no warning system when an evaluator prematurely left a journal entry or survey before saving. A solution would be a confirmation box that warns the user that any data entered will be lost. Multiple evaluators revealed confusion with the graphs section of our application, an information button in the upper right that explains everything could be integrated to assist with this. Another helpful insight into the

app's functionality is that 'Back' and 'Save' buttons should be in the same positions in each window of the application to prevent any confusion with users.

When looking at the aesthetic of our application, several of the evaluators pointed out that the logos in the two clickable prototypes didn't match, this inconsistency was just due to a miscommunication and would be easily fixed. Another issue was that certain notification messages would appear and disappear too quickly for the evaluators, this could be fixed by merely changing the timing of the pop up. An evaluator also pointed out that the font was difficult to read, which could be changed easily enough.

Then with the final category, a number of evaluators said that the wireframe would work more smoothly if the keyboard and text worked with the app. But unfortunately, InVision didn't have a feature that would allow us to integrate a keyboard interface and keyboard functionality is not an important part of our application. Therefore, this is something we found we didn't need to consider for our high-fidelity prototyping.

Reflection

The efforts performed in Project Assignments 1 and 2 greatly informed our activities in Project Assignment 3. Through Project 1 and 2, we were able to identify key activities and design prototypes for them which properly addressed our problem space and adhered to our design criteria.

Project 1 dealt with general research of the problem space and also user research. Although many of our team members have suffered physical injuries and visited doctors before, we only had the perspective from 5 individuals. Conducting further research online allowed us to verify our existing knowledge of the space of medical appointments. For example, many of our group members pointed out simple problems with doctor's appointments such as the lack of advice specific to your injury or difficulty setting up appointments due to time constraints. Online research and showed us that these problems with medical appointments were common occurrences. Our survey that was sent out to many people also showed us that there was great dissatisfaction in medical appointments. The user interviews we conducted gave us more anecdotal insights into why these problems are a big deal. After all of our research, we were able to identify key problem areas in our problem space and turn them into design criteria that we wanted to meet in our solution.

Project 2 asked us to think about these design criteria and turn them into ideas. At first, our ideas were all over the place. However, we were able to narrow down to better ideas that directly fixed major problems in our problem space. The final key activities that we eventually landed on in Project 3 were actually recurring themes that popped up in our ideation sessions. For example, one of our design criteria was "Safety" which describes injured people returning to physical activities too early and potentially hurting themselves further. Many of our 100 ideas constantly had a major feature which would warn the user if there was too much stress or activity on the injured area. This led to inspiration for one of the key activities of our RecoveryBook design concept where a user will receive a notification if reaching close to the step count limit for the day. Many of the other key activities we describe in Project 3 were also derived in a similar manner.

The lecture topics of Week 13 regarding low fidelity prototyping vs. high fidelity prototyping helped us prepare a lot for this project deliverable. Each of us in the group had already worked on low fidelity prototypes in Project 2 and Homework 2. With lecture videos such as the one from Clayton and the Coursera video from the University of Sydney, we were able to pinpoint what was important to showcase in the high fidelity prototypes we were making for Project 3. In addition, having to create low fidelity prototypes for our design concept in Project 2 gave us good insight on how to build off of the low fidelity prototype to create the high fidelity prototypes. More specifically in regards to the clickable prototypes we created, the video tutorials on Adobe XD provided us with good information on what direction we wanted to go in. They also gave us some inspiration for how we should structure and design the UI for our clickables.

The major areas in which our group desired more instruction to perform correctly were the video prototype and the evaluations. There was a lot of confusion in our group and also in the entire class about what the video prototype should cover. We ended up clearing a lot of our questions and uncertainties by using Piazza to look at questions our classmates had posted about the same concerns. The example video prototype posted on Piazza was very helpful in guiding our own. However, we were slightly confused before seeing the example video prototype. The heuristic evaluation and cognitive walkthrough were also an area in which we could have used better instruction. Our group believes that the best way to learn about these evaluations is to actually do them. After creating the templates for the evaluations, we felt

much more clear on the purpose and goals of heuristic evaluations and cognitive walkthroughs. Being on the other end of the spectrum and having to evaluate other teams' prototypes also gave our group a better understanding. Unfortunately, both of these aspects were part of Project 3 which had to be taught online due to the current circumstances. Had we learned these topics in person, our group may have felt more comfortable performing these tasks.

Appendix

If you have difficulty viewing the heuristic evaluation and cognitive walkthroughs, you can view the responses submitted by the evaluators in the following link:
https://drive.google.com/drive/folders/10Y9gLrpJ7dJ0iPzZbx7YERSPWO-eUvro?usp=sharing

Heuristic Evaluations
Evaluation 1

Heuristic	Severity Rating (0-4)	Comments
Visibility of system status	0	
Match between system and the real world	0	
User control and freedom	0	
Consistency and standards	2	It would be nice to always have the back and save buttons in the same area of the phone. It's almost always followed, except in the Settings page. Also, the logo in the 2 prototypes seemed to be different (this is minor).
Error prevention	1	When pressing back on a survey, it would be good to have a confirmation screen.
Recognition rather than recall	0	Good on you for using recognizable button icons, I knew what most icons meant and what action they would perform.
Flexibility and efficiency of use	0	It was great that I could perform most actions with few clicks.
Aesthetic and minimalist design	0	I liked the overall design.
Help users recognize, diagnose, and recover from errors	2	It would be good to have an Edit option in the journal entry; in case they make a mistake in their entry. I know this doesn't get covered in this activity, but an edit button in the journal entry would be great.
Help and documentation	0	Not really sure if this was present in this prototype.
Ease of interpreting information	1	I had some issue with the Red and Green buttons in Pedometer and Painmeter screens. I wasn't sure what they indicated.
Blends into the daily routine	0	The notification system worked great.
Accessible from anywhere	0	An app is a great way to have this accessible (almost) everywhere!

Evaluation 2

Heuristic	Severity Rating (0-4)	Comments
Visibility of system status	0	
Match between system and the real world	3	The logout button in the second prototype was "x". I was confused if that meant exiting the activity and going to home page. A better logout button would've helped maybe. I did not quit understand what the numbers under the graph in Pedometer activity denoted.
User control and freedom	0	
Consistency and standards	2	The icons seem to be different in both the prototypes. Not sure if this was done intentionally to signify different operating systems? The logos also were different. In the second prototype, Lauren only had the option of entering "Survey" and not "Journal".
Error prevention	0	
Recognition rather than recall	1	After Lauren filled out the survey, the messages on the screen seemed to have gone by fast. I'd prefer an option to manually dismiss them.
Flexibility and efficiency of use	0	No issues with this. Interactions were smooth and quick.
Aesthetic and minimalist design	0	I think there was just right amount of information on the screen.
Help users recognize, diagnose, and recover from errors	2	Maybe an option to edit. I understand that this might have been difficult to demonstrate in the prototype.
Help and documentation	1	It would be useful to provide a help button describing the numbers under the Pedometer graph.
Ease of interpreting information	0	
Blends into the daily routine	0	
Accessible from anywhere	0	I like that the App directly opened into the focused activity from the notification bar.

Evaluation 3

Heuristic	Severity Rating (0-4)	Comments
Visibility of system status	2	There are no signifiers for scrolling. I couldn't figure out where the "Save" button was until I tried scrolling.
Match between system and the real world	0	
User control and freedom	0	
Consistency and standards	0	
Error prevention	2	What happens when I start a survey and go back without saving it?
Recognition rather than recall	0	
Flexibility and efficiency of use	0	
Aesthetic and minimalist design	1	
Help users recognize, diagnose, and recover from errors	1	
Help and documentation	0	
Ease of interpreting information	0	
Blends into the daily routine	0	
Accessible from anywhere	0	

Evaluation 4

Heuristic	Severity Rating (0-4)	Comments
Visibility of system status	0	It's great to me. When I enter the app, I know where I am and what can I do. Moreover, the notification takes me to the proper place when needed.
Match between system and the real world	1	In the page where user get to see the day-to-day data changes, it would be better to titled 'step' instead of pedometer since 'step' is more intuitive to understand.
User control and freedom	0	It is easy for me to switch between different tasks at any point and I can undo the edit of my journal or survey and exit from them whenever I want to.
Consistency and standards	3	The logo in 2 prototypes aren't matched lol.
Error prevention	0	I like that you put a smile face or a sad face to indicate the survey response. which prevents the error.
Recognition rather than recall	0	The user interface is intuitive, and I get the meaning for every component in a glance.
Flexibility and efficiency of use	0	I can find whatever I want to perform in short time with few steps. I think this is great.
Aesthetic and minimalist design	2	I wish the front could be non-Italic, it would be easier to read.
Help users recognize, diagnose, and recover from errors	2	If the user input the wrong value into the survey, seems like she's unable to change the result or redo it.
Help and documentation	0	Can't tell from the prototype.
Ease of interpreting information	0	Very easy to understand the whole system.
Blends into the daily routine	0	The notification helps blending the app into user's daily life. I think it really does the job.
Accessible from anywhere	3	What if, the user doesn't carry the device with them? How can I still get the pedometer work? Would I be able to input my data through other methods?

Cognitive Walkthroughs
Walkthrough 1

	Will the user understand the task?	Are the controls conspicuous?	Will the users know the control is correct?	Was there feedback to indicate the task was complete or incomplete?	Were you able to complete the task?	Notes
Add a journal entry and review it https://hciprojectgt.invisionapp.com/public/share/CR13I7PLGS#screens/477143998						
Click the RB icon to access the home page	Yes	Yes	Yes	Yes	Yes	
Click the plus icon at the bottom of the screen	Yes	Yes	Yes	Yes	Yes	
Select "Journal"	Yes	Yes	Yes	Yes	Yes	
Imagine you type out the journal entry. Click the save icon in the top-right corner.	Yes	No	Yes	Yes	Yes	If there was a way to edit the text, it would have been a cleaner prototype
Click the back icon.	Yes	Yes	Yes	Yes	Yes	
Click the journal icon on the bottom of the screen.	Yes	No	No	Yes	Yes	There could be small indicators on what icon does what, in terms of hover or a line below the icon indicating its functionality
Select the April 14th, 2020 journal entry and review the entry.	Yes	No	No	Yes	Yes	There are two entries with different icons for april 14. If the icon also mentioned its functionality, it would've been easier to understand.

	Will the user understand the task?	Are the controls conspicuous?	Will the users know the control is correct?	Was there feedback to indicate the task was complete or incomplete?	Were you able to complete the task?	Notes
Complete the daily self-assessment https://projects.invisionapp.com/share/AZWQHTI3YCE#/screens						
Click the RecoveryBook notification	Yes	Yes	Yes	Yes	Yes	
Review the current activity limit (measured by a pedometer). Click the Start button	Yes	Yes	Yes	Yes	Yes	
Imagine you have filled out most of the survey. Scroll down to the bottom of the survey	Yes	Yes	Yes	Yes	Yes	
Select the "> 2000" option of the caloric intake question	Yes	Yes	Yes	Yes	Yes	
Click the save icon at the bottom of the survey screen	Yes	Yes	Yes	Yes	Yes	
Review the updated activity limit based on survey results	Yes	Yes	Yes	Yes	Yes	

Walkthrough 2

	Will the user understand the task?	Are the controls conspicuous?	Will the users know the control is correct?	Was there feedback to indicate the task was complete or incomplete?	Were you able to complete the task?	Notes
Add a journal entry and review it https://hciprojectgt.invisionapp.com/public/share/CR13I7PLGS#screens/477143998						
Click the RB icon to access the home page	Yes	Yes	Yes	Yes	Yes	
Click the plus icon at the bottom of the screen	Yes	Yes	Yes	Yes	Yes	
Select "Journal"	Yes	Yes	Yes	Yes	Yes	I feel like this could have been a one-step process
Imagine you type out the journal entry. Click the save icon in the top-right corner.	Yes	Yes	Yes	Yes	Yes	
Click the back icon.	Yes	Yes	Yes	Yes	Yes	
Click the journal icon on the bottom of the screen.	Yes	Yes	Yes	Yes	Yes	
Select the April 14th, 2020 journal entry and review the entry.	Yes	Yes	Yes	Yes	Yes	I feel like you can take inspiration from other journal apps. Like a list of journal entries maybe? Survey could be separate from journal too perhaps?

	Will the user understand the task?	Are the controls conspicuous?	Will the users know the control is correct?	Was there feedback to indicate the task was complete or incomplete?	Were you able to complete the task?	Notes
Complete the daily self-assessment https://projects.invisionapp.com/share/AZWQHTI3YCE#/screens						
Click the RecoveryBook notification	Yes	Yes	Yes	Yes	Yes	
Review the current activity limit (measured by a pedometer). Click the Start button	Yes	Yes	Yes	Yes	Yes	
Imagine you have filled out most of the survey. Scroll down to the bottom of the survey	Yes	Yes	Yes	Yes	Yes	
Select the "> 2000" option of the caloric intake question	Yes	Yes	Yes	Yes	Yes	
Click the save icon at the bottom of the survey screen	Yes	Yes	Yes	Yes	Yes	
Review the updated activity limit based on survey results	Yes	Yes	Yes	Yes	Yes	

Walkthrough 3

	Will the user understand the task?	Are the controls conspicuous?	Will the users know the control is correct?	Was there feedback to indicate the task was complete or incomplete?	Were you able to complete the task?	Notes
Add a journal entry and review it https://hciprojectgt.invisionapp.com/public/share/CR13I7PLGS#screens/477143998						
Click the RB icon to access the home page	Yes	Yes	Yes	Yes	Yes	
Click the plus icon at the bottom of the screen	Yes	Yes	Yes	Yes	Yes	
Select "Journal"	Yes	Yes	Yes	Yes	Yes	
Imagine you type out the journal entry. Click the save icon in the top-right corner.	Yes	Yes	Yes	Yes	Yes	
Click the back icon.	Yes	Yes	Yes	Yes	Yes	Would have liked to see a Return to Home type button in the "Journal Updated" popup
Click the journal icon on the bottom of the screen.	Yes	Yes	Yes	Yes	Yes	
Select the April 4th, 2020 journal entry and review the entry.	Yes	Yes	Yes	Yes	Yes	Didn't see an entry for the 4th but easy enough to navigate

	Will the user understand the task?	Are the controls conspicuous?	Will the users know the control is correct?	Was there feedback to indicate the task was complete or incomplete?	Were you able to complete the task?	Notes
Complete the daily self-assessment https://projects.invisionapp.com/share/AZWQHTI3YCE#/screens						
Click the RecoveryBook notification	Yes	Yes	Yes	Yes	Yes	
Review the current activity limit (measured by a pedometer). Click the Start button	Yes	Yes	Yes	Yes	Yes	
Imagine you have filled out most of the survey. Scroll down to the bottom of the survey	Yes	Yes	Yes	Yes	Yes	
Select the "> 2000" option of the caloric intake question	Yes	Yes	Yes	Yes	Yes	
Click the save icon at the bottom of the survey screen	Yes	Yes	Yes	Yes	Yes	
Review the updated activity limit based on survey results	Yes	No	No	No	Yes	Wasn't expecting to be taken automatically to this screen, and a little hard to know what I am looking at and what the changes were after adding the latest survey

Walkthrough 4

	Will the user understand the task?	Are the controls conspicuous?	Will the users know the control is correct?	Was there feedback to indicate the task was complete or incomplete?	Were you able to complete the task?	Notes
Add a journal entry and review it https://hciprojectgt.invisionapp.com/public/share/CR13I7PLGS#screens/477143998						
Click the RB icon to access the home page	Yes	Yes	Yes	Yes	Yes	
Click the plus icon at the bottom of the screen	Yes	Yes	Yes	Yes	Yes	
Select "Journal"	Yes	Yes	Yes	Yes	Yes	
Imagine you type out the journal entry. Click the save icon in the top-right corner.	Yes	Yes	Yes	Yes	Yes	
Click the back icon.	Yes	Yes	Yes	Yes	Yes	
Click the journal icon on the bottom of the screen.	Yes	Yes	Yes	Yes	Yes	I would have preferred to not have this step, just take me back to the screen when I'm done with my entry?
Select the April 14th, 2020 journal entry and review the entry.	Yes	Yes	Yes	Yes	Yes	

	Will the user understand the task?	Are the controls conspicuous?	Will the users know the control is correct?	Was there feedback to indicate the task was complete or incomplete?	Were you able to complete the task?	Notes
Complete the daily self-assessment https://projects.invisionapp.com/share/AZWQHTI3YCE#/screens						
Click the RecoveryBook notification	Yes	Yes	Yes	Yes	Yes	
Review the current activity limit (measured by a pedometer). Click the Start button	Yes	Yes	Yes	Yes	Yes	
Imagine you have filled out most of the survey. Scroll down to the bottom of the survey	Yes	Yes	Yes	Yes	Yes	
Select the "> 2000" option of the caloric intake question	Yes	Yes	Yes	Yes	Yes	
Click the save icon at the bottom of the survey screen	Yes	Yes	Yes	Yes	Yes	
Review the updated activity limit based on survey results	Yes	Yes	Yes	Yes	Yes	This was awesome, I actually really liked this and am pleasantly surprised. Why not give me the option to schedule when I want to do my activity but just check whether or not I do the activity just for convenience sake?

Walkthrough 5

	Will the user understand the task?	Are the controls conspicuous?	Will the users know the control is correct?	Was there feedback to indicate the task was complete or incomplete?	Were you able to complete the task?	Notes
Add a journal entry and review it https://hciprojectgt.invisionapp.com/public/share/CR13I7PLGS#screens/477143998						
Click the RB icon to access the home page	No	No	Yes	Yes	Yes	Because it was the first screen, I clicked on it instinctively. It would be much better if you add a button. Otherwise the user might wait there for a long time for a message
Click the plus icon at the bottom of the screen	No	Yes	Yes	Yes	Yes	The plus can be a little misleading as it can also mean adding an activity and not necessarily a journal entry
Select "Journal"	Yes	Yes	Yes	Yes	Yes	Clear instructions
Imagine you type out the journal entry. Click the save icon in the top-right corner.	Yes	Yes	Yes	Yes	Yes	Good feedback
Click the back icon.	Yes	Yes	No	Yes	Yes	The back action might be a bit redundant as after writing a journal entry. As the back button looks like undo and may be mistaken for that. Maybe a ok button would be more suitable.
Click the journal icon on the bottom of the screen.	Yes	Yes	yes	Yes	Yes	Clear instructions
Select the April 14th, 2020 journal entry and review the entry.	Yes	Yes	Yes	Yes	Yes	Great! Simple and easy.

	Will the user understand the task?	Are the controls conspicuous?	Will the users know the control is correct?	Was there feedback to indicate the task was complete or incomplete?	Were you able to complete the task?	Notes
Complete the daily self-assessment https://projects.invisionapp.com/share/AZWOHTI3YCE#/screens						
Click the RecoveryBook notification	Yes	Yes	Yes	Yes	Yes	Good
Review the current activity limit (measured by a pedometer). Click the Start button	Yes	Yes	Yes	Yes	Yes	Please consider displaying more information about current activity limit for a novice user
Imagine you have filled out most of the survey. Scroll down to the bottom of the survey	Yes	Yes	Yes	Yes	Yes	Good
Select the "> 2000" option of the caloric intake question	Yes	Yes	Yes	Yes	Yes	Good
Click the save icon at the bottom of the survey screen	Yes	Yes	Yes	Yes	Yes	Good feedback
Review the updated activity limit based on survey results	Yes	No action is required by user	No action is required by user	Yes	Yes	Good design. I accidentally clicked the close button mid survey and the application closed. Maybe consider going back to home screen when close button is pressed, so user isnt closed out of the app