



Hermes

Stress Injury Tracking and Prevention for Runners

PROBLEM AND SOLUTION OVERVIEW

Runners frequently experience pain or discomfort while running, and repetitive stress injuries are common. Unfortunately, runners often struggle to determine what aches or pains are appearing with regularity or in concerning patterns. Preventing stress injuries from developing once minor pain has begun also presents a challenge for these athletes. Injury/pain tracking is known to be an important method for the diagnosis and prevention of stress injuries; however, there currently does not exist an effective solution in this space targeted at amateurs. Hermes tracks pain in addition to standard workout metrics such as distance, time and elevation. Using this data, Hermes draws insights and shows users correlations between workout metrics and pain. Intelligent suggestions for specific injury prevention exercises are also offered to the user based on the collected data. Overall, we hope that Hermes will empower runners to develop a better understanding of identifying stress injuries and provide support for injury prevention.

DESIGN RESEARCH GOALS, STAKEHOLDERS, AND PARTICIPANTS

OVERVIEW

Our design research focused primarily on individual athletes who run on a semi-regular basis. We chose these particular participants because they could provide valuable insight into the attitudes and behaviors of athletes from a variety of backgrounds in relation to injuries. Additionally, we conducted interviews with other stakeholders such as a coach and a personal trainer to gain insight into how they deal with injured athletes. We used semi-structured interviews for our research. By not following a strict interview structure, we were able to be flexible in exploring the individual perspectives that each research participant brought to our research. Our interview plan focused on data tracking in relation to injuries that affect running/walking.

RESEARCH PARTICIPANTS

ALLIE

Allie is an athlete who is a senior Electrical Engineering major at UW. She ran in her high school's cross country team, but is not currently part of a team. Allie described her experiences with both major and minor injuries, describing how she handled both shin splints in high school and college and tearing her ACL in high school, which resulted in a mix of surgery and physical therapy. Allie currently does not track her injuries, but she enjoys using a Garmin watch to track other aspects of her workout.

JOE

Joe is an athlete who is a junior Informatics major at UW. Joe has experienced a wide range of injuries from soccer and basketball and has thus developed a lasting relationship with his physical therapist. In deciding when an injury is severe enough to seek out medical attention, Joe usually waits around a week and monitors if the injury gets any worse during that time. Joe doesn't track his injuries, but does use Strava on his phone to track his runs.

CHLOE

Chloe is a recent UW grad who rowed on the Women's Rowing Team. As part of her team workouts, she cross-trained by going on jogs and runs and had easy access to coaching and physical therapy through her team. She has had long-term tendonitis in her hips since high school, which has primarily been treated through steroids and physical therapy. Her team required that she record workouts, but outside of that she did not and does

not track her workouts or injuries, though she does understand why other athletes like doing so. If she did track workout and pain data on her own, she would prefer to keep that information to herself, with the possible exception of sharing with a physical therapist or other healthcare provider.

SAMANTHA (COACH)

Samantha has worked as a running and triathlon coach for over a decade. Her perspective helped us understand the role of a coach as it relates to injuries. In addition, as a semi-elite athlete who is now in her 60's, she offered valuable insights about how injuries have impacted the careers of many athletes whom she knew and about which types of athletes are more likely to get injured. She was enthusiastic about the idea of an injury tracking application; she feels that it would be well-received and helpful for many people.

DWAYNE (TRAINER)

Dwayne is an Assistant Athletic Trainer for UW's Men's and Women's Rowing Teams who works with Chloe. He serves as both a strength and conditioning coach and physical therapist for the Women's Rowing Team, helping athletes recover from injuries. He gave us valuable insights into what it is like to work closely with a group of athletes and shared thoughts about athlete motivation and trust.

DESIGN RESEARCH RESULTS AND THEMES

Our interviews helped us gain a better understanding of how athletes think and what types of tasks are relevant to them. One attitude shared among these athletes is that they take pride in their ability to understand their own body. Athletes preferred to draw on past experiences to help understand any pain they were dealing with, comparing the severity and type of pain to what they've experienced in their athletic career. More so, both athletes and coaches explained that athletes often don't want to admit that they are injured, fearing having to take time off from their workout routines to recover fully. The coaches noted that although this pride is ubiquitous, athletes vary greatly in other factors including their work ethic, how likely they are to injure themselves, and how responsibly they will handle their recovery process once injured. These findings indicate that athletes have a large amount of autonomy over their injury prevention and recovery, and that we need to build a system that complements this autonomy rather than providing diagnoses or prescribing treatment plans. Building on athlete's existing habits of self-treatment and seeking to understand their bodies is a more desirable approach.

One particularly common behavior we noted among the athletes was the use of workout tracking technology. Each of our athletes used some form of workout tracking, although they were each using a different platform: one used Strava, another used a Garmin watch, and the third recorded workout information on forms to give to her trainer. They all enjoyed the added insight that workout tracking gave them and stated that they appreciated how convenient it was to gather data. When asked about tracking pain or injuries, none of them did anything concrete. One had a trainer keep track of this data for her, while the other two simply kept mental notes and reflected on the pain as it got worse. All of them mentioned that they could see benefits to a pain-tracking system and would use one with their workouts if the barrier to entry and time commitment were low enough. The athlete who was using manual workout tracking mentioned how important it was to ensure the data is recorded close to the time of the workout, since she had experiences where she would wait too long and forget what she had done that day.

A final theme that emerged among our participants was varied views of privacy. Pride, as mentioned earlier, can play a role in whether or not an athlete wants to share their workout data with others. While one participant used social apps such as Strava and made his info available, another mentioned that sharing each workout would be embarrassing, fearing judgment for any session which was below her own goals. Although athletes had different opinions about sharing data socially, they all saw the value in sharing as much information as possible with health care providers. Those who worked with coaches and physical therapists in the past expressed a desire to be able to share more concrete data.

ANSWERS TO TASK ANALYSIS QUESTIONS

WHO IS GOING TO USE THE DESIGN?

Our design will target individual athletes, specifically runners and walkers, though the design may still be of interest to other athletes who cross train in those areas. Based on our research, one of the groups most prone to injuries is inexperienced and less conditioned athletes. As a result, we will likely focus on amateurs who are not part of a team and have little access to professional coaches and physical therapists. Those who do have access to such resources may still wish to use the platform; however, we are not designing specifically for them.

WHAT TASKS DO THEY NOW PERFORM?

Currently, our participants track data relating to their runs with external apps such as Strava, devices such as Garmin watches, or manually via pen and paper. Before they are injured, they educate themselves on possible injuries and prevention strategies using online resources and communicating with teammates. When dealing with pain, they use a holistic approach drawing on their past experiences to gauge the severity of the injury and make a decision about whether to pursue treatment. During this process, they tend to wait a couple days to see how the injury progresses.

WHAT TASKS ARE DESIRED?

In addition to support for their existing tasks, one thing our participants desire is an easy way to track injuries. They believe that it is important, but they do not have enough time to manually keep track of the extra data. In addition, they desire the ability to more easily understand what is wrong with them and what potential treatment strategies they could employ. They also expressed a desire to more accurately and easily share information with their trainers and doctors, although this was opposed by their reluctance to admit when they are injured.

HOW ARE THE TASKS LEARNED?

Tracking tasks was learned through trial and error with the workout tracking device of their choice (Strava, Garmin, or paper and pen), as well as the instructions of those products. Educating themselves about injuries and prevention strategies was performed using online resources and talking with other athletes, especially teammates and friends. Deciding when to pursue treatment and what treatment to pursue was learned either from their own running experiences or the advice of coaches and teammates.

WHERE ARE THE TASKS PERFORMED?

The workout tracking methods our participants used were real-time, so the task of tracking workouts is done where the workout is performed. Both of the digital devices (particularly Strava) require some configuration before and after the workout, but the primary focus is on use during the workout. The pen and paper method is a result of a mix of real-time tracking with help from coaches, and post-workout recording by the participant. Other tasks are performed around fellow athletes, including making decisions about treatment, and educating oneself about injuries and prevention strategies.

WHAT IS THE RELATIONSHIP BETWEEN THE PERSON AND DATA?

The primary relationship between our participants and data was through workout data including pace and mileage, which they used to reflect on their abilities and progress toward goals. Sample uses ranged from pacing themselves during workouts to using the data to gradually increase or decrease intensity. Data about injuries and pain help the athletes form decisions around seeking treatment and whether to continue exercising at the same intensity. Workout or injury data is often shared between athletes with the goal of giving advice, educating others, or simply bonding over a shared experience.

WHAT OTHER TOOLS DOES THE PERSON HAVE?

Our athletes have access to a variety of digital platforms (Garmin, Strava, etc), some of which they currently use to keep track of their workouts. Some athletes also keep track of this data manually through journaling. To educate themselves about injuries and treatments, athletes can use their social resources and find information online. They can also visit a doctor or physical therapist to stay informed or get advice.

HOW DO PEOPLE COMMUNICATE WITH EACH OTHER?

Athletes communicate with one another in person, either while exercising or spending time with teammates. There are also many social platforms for athletes to communicate. Some, like Strava, focus on communicating specifically around workout data, and can be used to share running routes, workout goals, and times. Samantha mentioned that sharing information about people during and immediately after a race is one of the most exciting aspects of running, and that it's fun to compete and share tips and stories amongst peers. There are also many online forums and websites where athletes can exchange advice on injury prevention and treatment.

HOW OFTEN ARE THE TASKS PERFORMED?

Workout tracking depends on the workout schedule of the athlete, and hence fluctuates depending on the person. Athletes interviewed indicated that they used their existing tracking systems consistently during a majority of their runs. Other tasks, especially those related to educating oneself about running routes, possible injuries, and workout strategies, are performed less regularly, and usually more frequently earlier in the runner's career. Tasks related to current pain, including keeping track of the injury as it progresses, looking up treatment options, and making decisions around how to handle the injury, are performed only when the athlete is currently managing an injury.

WHAT ARE THE TIME CONSTRAINTS ON THE TASKS?

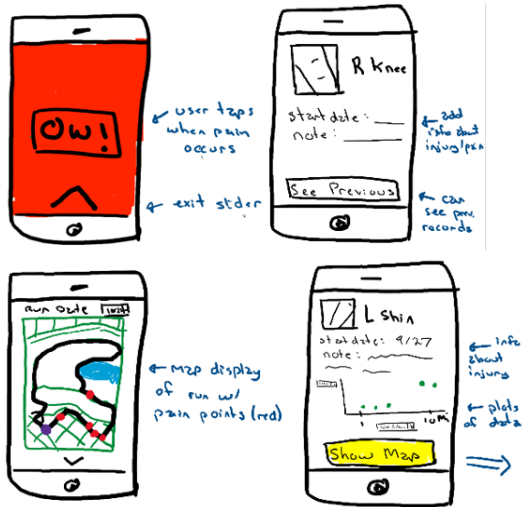
A concern our participants, especially Chloe, had was that the task of recording workout data needs to be immediate, or the information may be inaccurate. In addition, information needs to be recorded at multiple points during a workout to get useful data such as pace and mile splits. Tasks relating to existing pain should be performed promptly, otherwise the injury may get worse as the athlete delays in seeking treatment. The amount of time taken on the tracking tasks can be prohibitive, so the tasks should be as quick as possible to encourage frequent and consistent use. Performing the tasks more frequently gives more data, so more patterns and insights can be pulled from the workout data.

WHAT HAPPENS WHEN THINGS GO WRONG?

When a software or hardware error occurs, an athlete will not be able to track their workout in the same way they usually do. More generally, when an athlete fails to track their workout, they do not have access to data about that workout session and they lose some confidence in their ability to reflect on their progress. When things go wrong when researching injuries, an athlete may be misinformed and ultimately make decisions that worsen the injury or extend the time needed to recover. When an athlete continues exercising without treating a serious injury, they can permanently damage their body. If an athlete provides incorrect or incomplete information on their recent activity, their health care provider may not be able to properly diagnose their issue or help them.

PROPOSED DESIGN SKETCHES

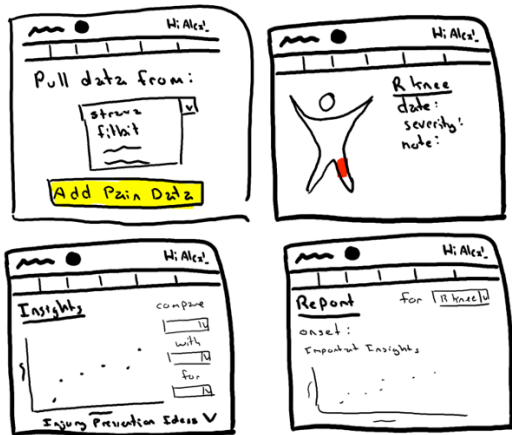
DESIGN A: REAL-TIME PAIN TRACKING



This design is a phone app. It automatically records relevant workout information such as route, mileage, pace, and elevation. When a user encounters some pain, they can easily indicate on the app the moment it occurs. The app will then keep track of the location and frequency of occurrence for a particular pain point and will be able to present this data visually in both maps and graphs. Based on this data, it will give suggestions for exercises and further resources. There is also a summary page with insights and trends that can be shared to a healthcare provider.

Figure 1. Sketches of Design A, a real-time pain tracking application.

DESIGN B: THIRD PARTY INTEGRATION



Design B is a web app that combines 3rd party app data with user-reported pain to provide insightful tips and workout suggestions. By pulling workout data from 3rd party workout apps such as Strava and Fitbit and letting the user input pain data, this web app is able to focus on providing insights into correlations between workout and pain. Once the data is pulled, it displays its findings in an “insights” page, which also provides resources for additional details about the injuries and how to best treat them going forward. The “reports” page, containing a summary of said data, can then be shared with healthcare providers if desired.

Figure 2. Sketches of Design B, pain tracking application that integrates with third party workout tracking applications.

DESIGN C: INJURY PREVENTION GROUPS

Design C (see figure 3 on following page) is a cross-platform phone and web app that lets users interact in a support group with other athletes who are dealing with the same injury. Together, they are able to share their own stories of how they are dealing with the recovery and provide advice and resources for others who may

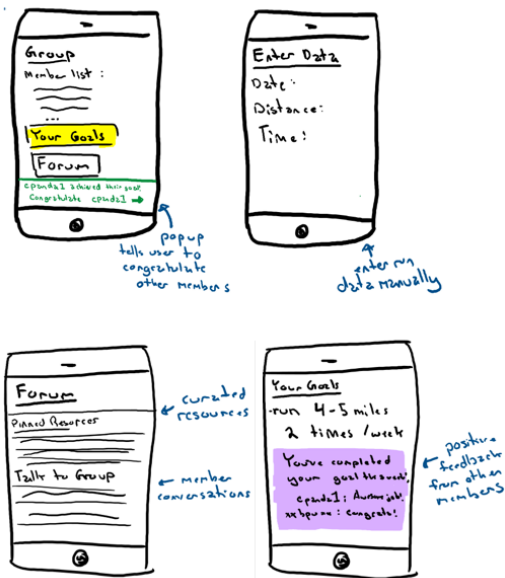


Figure 3. Sketches of Design C, social platform based on injury prevention groups.

be going through the same injury. The app will also allow users to input basic workout data such as distance and time ran so that others in the same support group will be able to encourage each other to overcome their injuries. In a group environment, users will be able to share and receive workout advice and pain management techniques from each other. Members will also be notified when a fellow group member completes a goal, which helps them provide positive feedback.

DESIGN AND TASKS CHOSEN

We chose to focus on Design A, the real-time pain tracking phone app. We will focus on Task 1 (Keeping track of recent workouts to reflect on own athletic ability and goals) and Task 3 (Seeking information about an injury once pain develops). Several factors influenced the decision to choose Design A. First, the app tracks injuries in real-time and combines this functionality with other tracking features that runners are known to use; concerns had been raised about the potential poor accuracy of data entered after a workout. This design also lets users use the app as their primary source for tracking both workout and pain data rather than needing two separate apps. Second, the app's mode of input for pain requires little effort to use; user research showed that simple, not time-consuming input is a priority. Third, the non-invasive and independent manner through which this app operates aligns closely with our target user's desire to not share their injuries publicly. Fourth, it allows users to visually see the relationship between workout and pain data through graphs and mappings. By providing users with data and analysis, the app will help users make more informed decisions and be more aware of ways in which they can/should handle pain or injuries. Task 1 was chosen because tracking is a core functionality of the app - it combines pain tracking, which we found is a desired feature, with workout tracking, which is a known behavior for runners. Task 3 was chosen because it focuses on the process of information-seeking without disregarding the athlete's own experiences or causing privacy issues. Together, tasks 1 and 3 encompass both data collection and reflection to help users make informed decisions about pain and injuries related to running.

WRITTEN SCENARIOS

TASK 1

Storyboard (Task 1) illustrates a scenario in which an individual athlete, Daniel, goes out on a run and reflects on it afterwards. First, Daniel opens up and starts the app on his phone before embarking on his run. In the second pane, he encounters some knee pain while running. In the third pane, he quickly taps his phone to indicate both the time and location of when this pain occurs; the phone app is tracking him via GPS, so it knows where our athlete is when he encounters pain. Daniel continues his workout, continuing to tap the phone when pain occurs. Upon completion, as shown in pane four, he examines the data collected from his run on his mobile phone. Afterwards, in pane five, our athlete is able to make certain observations and correlations based on the pain and workout data gathered.

TASK 2

Storyboard 2 (task 3) illustrates a scenario in which the athlete, Max, does some injury prevention exercises that the app suggests to her before her run. In the past, Max had experienced significant pain while running, as indicated by the many pain points she created by tapping on her phone during her previous runs. This time, before she embarks on her run, Max opens up the app on her phone to start tracking her run. Before she begins running, the app notifies her of some suggested injury prevention exercises based on data collected from her previous runs. Max selects one of those exercises, and the app guides her through the exercise. After the exercise is done, she embarks on her run. In the end, due to the exercise she did beforehand, Max is able to finish her run with fewer instances of pain.

STORYBOARDS OF SELECTED DESIGN

Storyboard 1

① Daniel turns on app before he goes on a run

② He experiences pain while running

③ He inputs a pain point into the app

④ After the run, Daniel looks at the data

⑤ ... and realizes something about his workout

Storyboard 2

① Previously, Max has recorded a lot of shin pain while running

② Prior to heading out on another run, she starts her app

③ The app suggests some exercises to help her shins

④ Max performs a chosen exercise before running

⑤ She finishes the run with less pain