



Getting the Design Right

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Meet the Team

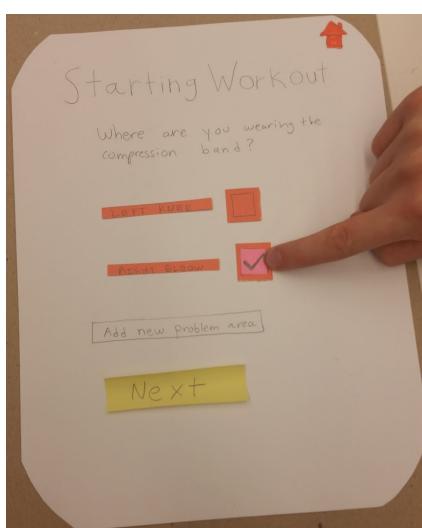
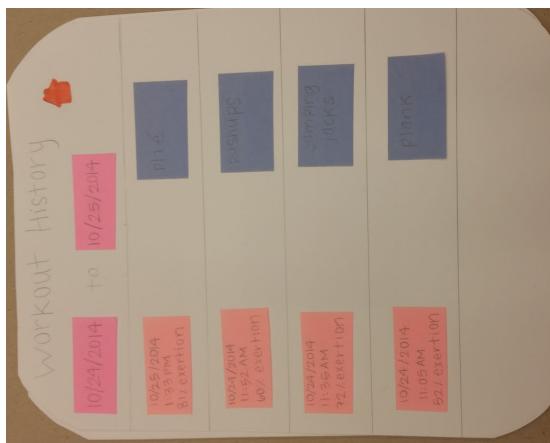
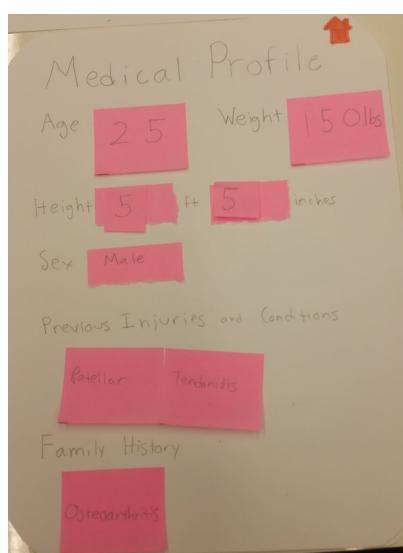
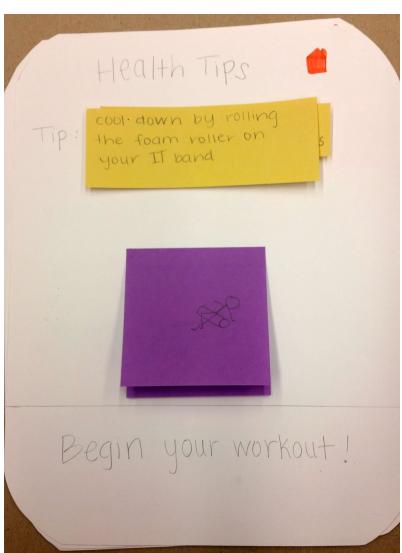
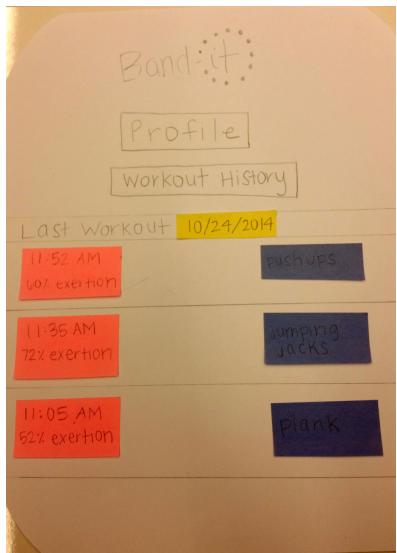
- Mackenzie Miller: Project Manager
- Daniel Luna: Research Coordinator
- Saloni Parikh: User Interface Designer
- Ben Tebbs: Editor

Problem and Solution Overview

We are tackling the problem of joint pain and activity tracking. It can be very hard for people with an active lifestyle to track down exactly what specific activity in their day to day routine is causing pain. We aim to help people track those activities that cause them pain or injury. We are specifically looking at people who have isolated injuries in problem areas. Our target audience is athletes, a group of people who are far more health conscious than the general population. Our proposed design involves a wearable band that will detect the amount of exertion in a specific area and warn the participant when they overexert by contracting gently. This will let the participant know what activity will cause injury and pain, and allow them to adjust their workout accordingly.

First Paper Prototype

The first version of our paper prototype had five screens in the mobile app, and a strip of cloth to represent the band hardware. The app included a home screen from which to navigate and view a synopsis of the most recent workout. It had the Medical Profile page where participants can enter their health information to receive tips, band location accuracy, and influence their programmed over-exertion threshold. There is a two-screen process of selecting where the band is worn after putting it on, and then viewing a health tip and being told to begin your workout. Lastly there is a workout history log that's reachable from the home screen to view the full log and specify a date range if desired.



Testing Process

For our first test, We interviewed a female dancer in Meany Hall. We chose this participant because they fit into our target audience. We asked her to use the app/band to examine her exertion levels after a workout. Daniel was the facilitator, Mackenzie was the computer, Saloni was an observer, and Ben was a greeter/videographer. For our second usability test we interviewed a female biker and marathon runner. We met her in the Allen Center on one of the landings due to the convenience for all of us to meet there. Ben and Mackenzie kept their roles as videographer and computer, but this time Saloni facilitated and Dan took notes. We found our third usability testing participant in the IMA by the cafe. He is a swimmer and water polo player. This time Mackenzie was computer, Ben facilitated, Saloni took notes, and Dan was videographer.

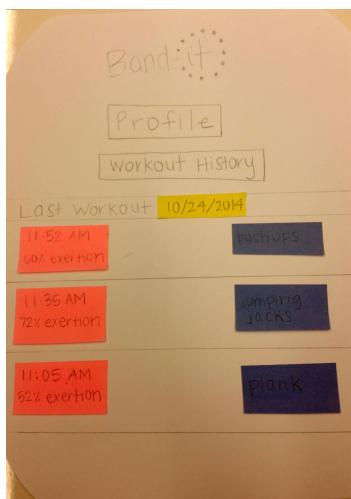
We learned that we needed to give the participants a more intensive task. Our first usability test was very short and fairly uneventful. For our next tests, we made the task a bit tougher, and as a result received more helpful feedback. By making the task tougher, we forced the user to spend more time working with the app. This increased the likelihood they would locate problems with it. Another thing we learned is how to keep the participant talking about their thought processes. By prompting the participant to talk more we got more of an understanding of what was wrong with our design. We also could get more of an understanding on what was right, because there were some things that were obvious enough that the participant didn't have to think about them.

Testing Results

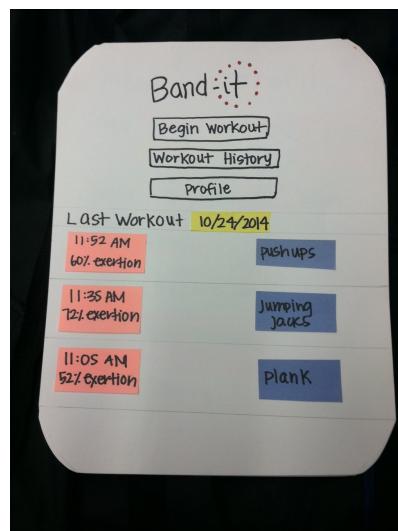
During our first heuristic evaluation, the first version of our design required the user to put on the band in order for the mobile app to switch to a “Begin Workout” page. This was very unclear to the participant and caused confusion looking through the app for signs of how to start a workout. To fix this, we added a “Begin Workout” button to the top of our home page. A second issue was our participant being unclear that to completely end the workout, they had to take off the band. Our participant had finished their workout, and tried to move on within the mobile application, but failed because the app would not continue until sensing the band was removed. We added a message saying “Remove the band when your workout is complete” to the “Begin your workout” page. Our design included a screen which displayed health tips once a workout had begun. However, our participant actually wanted to go to the previous screen and change the injured area they had selected to place the band on. We did not have a way to go back, and fixed this by including a back button to this page and other pages where applicable. The first heuristic evaluation is represented by the following table and images.

Issue ID	Issue	Severity	Fixability
A	Unable to begin task (need to put on band is unclear)	4	3
B	Unable to end (need to take off band is unclear)	3	3
C	Lack ability to go back from 'health tip' screen if selected wrong body part	3	4

Issue A Before



Issue A After

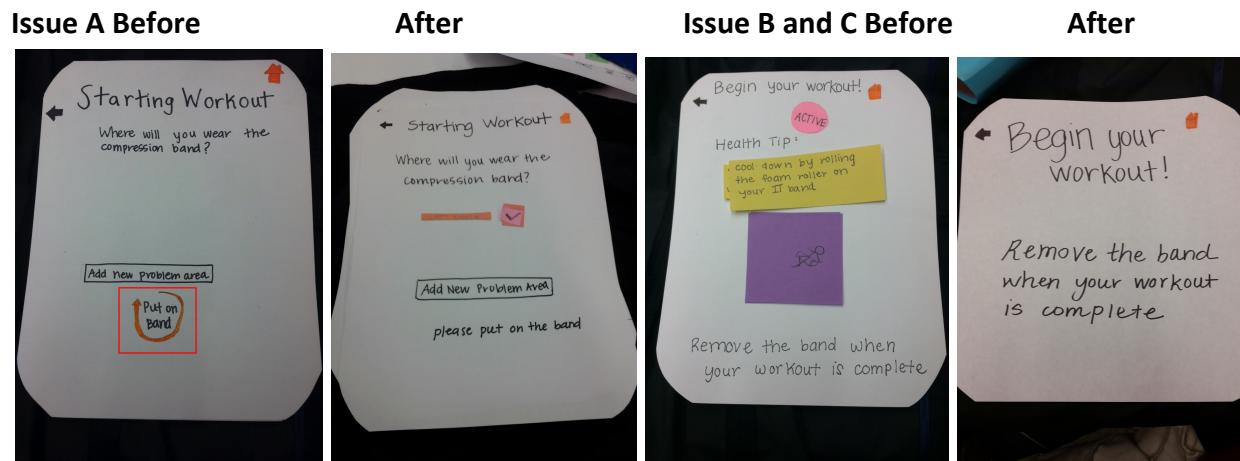


Our second heuristic evaluation was conducted after our first usability test. By this point, we had refined parts of our design. The first issue had our participant returning to the home screen while actually in the process of working out. When they did this, our application had not updated the home screen based on their current workout. Our participant wanted to see such data involving the current workout. We ended simply updating our application in real time so the user will always see the most recent band compression data. The second issue was that our participant noticed we had back buttons on every page. This was odd because we also have a home button on every page, and most of our pages had the back button also return home. We decided to leave the back buttons because we wanted a uniform design throughout.

Issue ID	Issue	Severity	Fixability
A	Tried to return to home screen during workout, screen wasn't updated	2	2
B	Back buttons in certain places were confusing	2	3

During our first usability test, our first incident was that the participant thought the “Put Band On” prompt was something she needed to press. This didn’t result in any real problems. The prompt turns into a button after the band is placed on, so she simply pressed a non-existent button, nothing happened, then she put on the band anyway. The next incident was that she had a little trouble getting past the help tips screen. She also had trouble with the active indicator, which looked like another button to her. To pass the screen, you have to put on the band, but she took about 45 seconds to figure it out. She had to read the entire screen. The two things the participant had the most trouble with were both on the Health Tips/Begin your Workout screen. The screen was too cluttered, she was not too sure if the active indicator was a button, and was confused by the health tips. We decided we would consider moving the health tips to the home screen, and we removed the active button.

Issue ID	Incident	Severity	Fixability
A	Our participant would try to click on the “Put on Band” visual	1	3
B	Participant unsure how to progress from Begin Your Workout screen	2	3
C	Participant unsure what the active indicator meant, or if it was a button	2	4



For our second usability test, the participant also made the mistake of pressing the “Put on the band” instruction graphic as if it were a button, and made sure to fix this. A second incident included our participant clicking the post its on the workout history area with the description of the workout. We thought about this functionality and decided to allow our user to change the workout, due to the possibility of our hardware being wrong when detecting a specific workout.

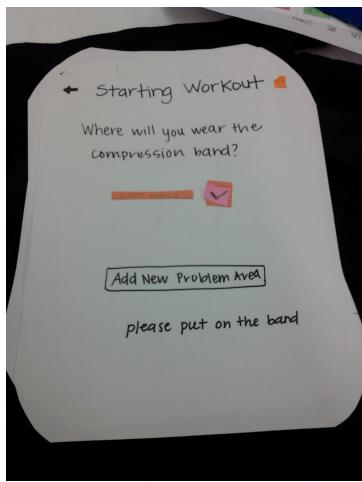
The participant also expressed confusion and about what the exertion threshold is and how it is determined. She asked whether it was something set by her doctor or herself or if the medical profile informed the calculation of it. We hadn't thought of any of these things relating to the exertion threshold, but after reflecting have decided to have data from the medical profile influence it.

Issue ID	Incident	Severity	Fixability
A	Pressed "Put on Band" graphic	1	3
B	Confused about over-exertion threshold	3	3
C	Unclear whether "workout history" is static or requires input	2	1

Issue A Before



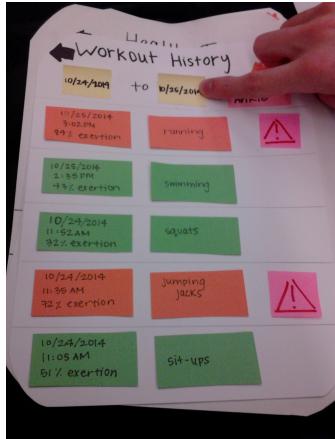
After



Issues B and C Before



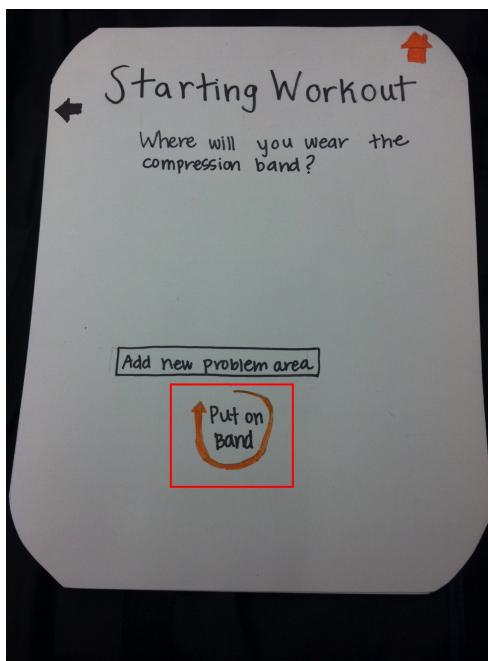
After



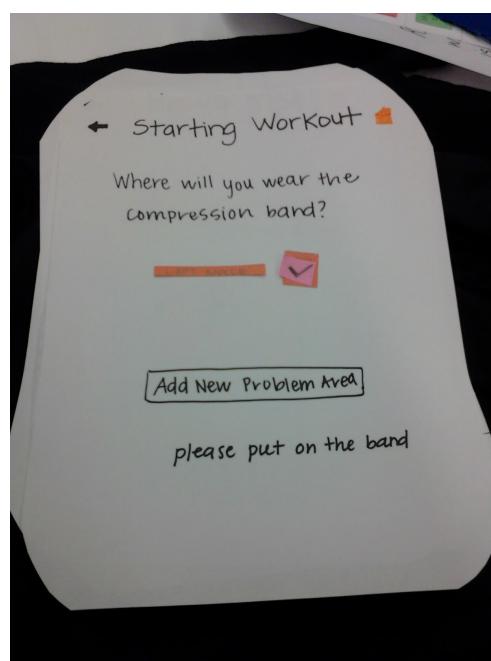
For our third usability test, the participant got hung up on the “Starting workout” screen as well. He later informed us that this was because he assumed that in the scenario he was already wearing the band. We assume this is a fault of the simulation set-up, because we made sure to specify this time that the band is something to be worn, and had it placed in front of them. He left the screen and returned to it, and got stuck enough that we had to give him a hint as to how to proceed. He also pressed the “Put on Band” area, as others did.

Issue ID	Incident	Severity	Fixability
A	Unsure how to begin workout	2	4
B	Pressed “Put on Band” graphic	1	3

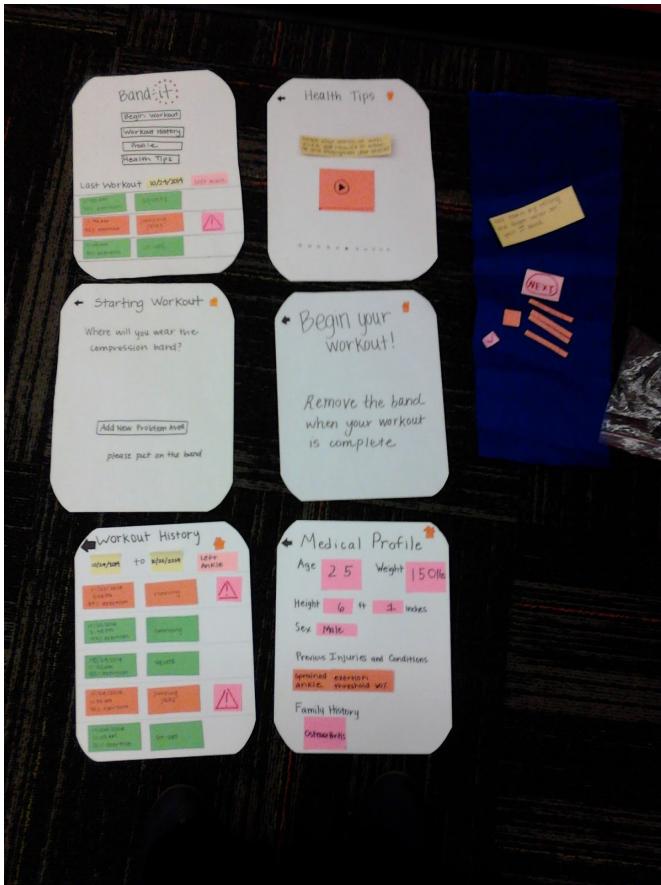
Issues A and B Before



After



Final Paper Prototype



We added an explicit “Begin Workout” button to the home screen. Before, we had it so that putting on the band would cause the app to go to the workout setup screen. However, the person performing a Heuristic Evaluation found this difficult to figure out, so we added the explicit button. We also made it so that the workout setup screen prompted the participant to put on the band before beginning their workout. Similarly, we added text telling the participant to remove the band to end their workout onto the screen that shows during the workout. This was obviously integral to our design, because if the participant cannot figure out how to begin their workout, they cannot really do anything with the app.

On the home screen, we have a section that shows the exertion levels of the participant’s last workout. Our participant for our second usability test found this confusing, because while they would get squeezes for certain exertion levels that exceeded a threshold, there was no indication of which parts of their workout were causing the squeezes on the home screen. It was hard to tell what exertion levels were a problem and what were normal or good. To solve this, we added an exclamation mark by the parts of the workout that caused the band to squeeze. This way, it is easy for the participant to look back and reflect on the parts of their

workout that caused a problem. This is important to our design because it allows the participant to reflect in a much more efficient and easy way.

We decided to take out the health tips which were present at the bottom of the home page. During our usability tests, our participants were at times confused or felt like the home page was overburdened by the health tip section. In response to this, we decided to make a separate page for the health tips. We have now removed them from the bottom of the home page, and instead included a button to access the tips. This page will be completely dedicated to the health tips so that the participant may focus on fewer points at a time. It will help our home page feel less cluttered as well, allowing the participant to feel more confident about its function.

Digital Mockup

We made some cosmetic changes to the paper prototype when we created the digital mockup. Our final paper prototype had red list items to indicate overexertion and green list items to represent an exertion level below the threshold. As we started creating the digital mockup, we realized the red-green color combination did not look visually appealing. Additionally, the green color did not add too much functional value as the focus of our design to indicate overexertion. The red color coding was enough to distinguish overexertion and normal exertion. Another limitation we noticed in our paper prototype was selection of dates. The text entry to specify dates in the workout history screen now pops up a date picker widget in order to avoid having the user manually type in dates.

We then made some changes to initial design of the digital mockup in response to critique. The buttons and icons were changed to make the interface more attractive. Making the buttons have a black background gives the screen more contrast so that there is some division between the elements and it is not a whitewash. Due to feedback, we also made some small changes to the Medical Profile page and the Workout History page in regards to layout and emphasizing editable fields.

For the first task, which is recording exertion data and reflecting on it after a workout, you would touch Begin Workout. Then, you would touch left ankle, put on the band, and press continue. Then you would workout. After working out, you would remove the band, and look at your exertion levels. For the second task, you would touch Medical Profile. Then you add your new injury to the profile, and view the exertion threshold for that problem area. Then you can navigate to the health tips via the Home page, and view health tips related to your updated Medical Profile data.

The image displays six screenshots of the Band-it mobile application, arranged in a 2x3 grid, showing various features of the app.

- Screenshot 1: Home Screen**

Band-it logo at the top. Navigation menu with four items: Begin Workout, Workout History, Medical Profile, and Health Tips. Below the menu is a "Last Workout" summary for Nov 16 2014, Left Ankle. It lists activities with exertion levels:
 - 12:20pm Hamstring Stretch: 12% exertion
 - 11:55am Tennis: 70% exertion (warning icon)
 - 11:52am Squats: 51% exertion
 - 11:35am Jumping Jacks: 72% exertion (warning icon)
- Screenshot 2: Begin Workout**

Navigation back arrow and home icon. Question: "Where will you wear the compression band?" with radio buttons for Left Ankle and Right Shoulder. A "Add New Problem Area" button. Below is a reminder: "Please put on the band" with a "CONTINUE" button.
- Screenshot 3: Workout in progress!**

Navigation back arrow and home icon. Main message: "Workout in progress!" Below is a reminder: "Remove the band when your workout is complete".
- Screenshot 4: Medical Profile**

Navigation back arrow and home icon. User info: Age 25, Weight 150 lbs, Height 6 ft 1 in, Sex Male. Previous Injuries and Conditions table:

Injury	Over-exertion Threshold
Sprained Ankle (Left)	60%
Dislocated Shoulder (Right)	40%

Family History buttons: Osteoarthritis and Flat Feet. A red plus sign button is at the bottom.
- Screenshot 5: Health Tips**

Navigation back arrow and home icon. Tip: "Start your warm up with pliés and relevés to warm up and strengthen your ankles". Below is a video thumbnail showing legs performing exercises.
- Screenshot 6: Workout History**

Navigation back arrow and home icon. Date range: Nov 10 2014 to Nov 17 2014. Filter: Left Ankle. Two sections of workout history:
 - Sun Nov 16 2014:** Activities and exertion levels:
 - 12:20pm Hamstring Stretch: 12% exertion
 - 11:55am Tennis: 70% exertion (warning icon)
 - 11:52am Squats: 51% exertion
 - 11:35am Jumping Jacks: 72% exertion (warning icon)
 - Wed Nov 12 2014:** Activities and exertion levels:
 - 2:05pm Specify Exercise: 32% exertion
 - 1:55pm Ankle Flexion: 60% exertion (warning icon)
 - 2:05pm Plank: 40% exertion

Discussion

We learned that the iterative design process really helps the project make progress quickly. After making a change in response to a usability test, we were able to receive feedback about the change. This ensured that the changes we made according to our feedback did not swing too far in the other direction and that the changes satisfied the need for the change. Using iterative design, we made some pretty major changes to our design. We pulled the health tips out of the workout process entirely, and tried a couple of ideas before settling on giving it its own page.

The tasks did not change much as a result of the usability testing. Our tasks are very simple and our app does not require a large variety or range in tasks. One thing we changed was the phrasing of the task. During the first usability test, the participant moved through the task very quickly and stopped after finishing her fake workout. For the following tests we rephrased the task, making it less vague and incorporating reflection as a part of the task. This helped the participant spend more time with the device. We also made sure to make the band as prominent as possible in later tests so the participant would realize it was not just there for show, and that we want them to interact with it. Our first two participants got this quickly, but the third told us he thought he was supposed to imagine wearing it from the start of the test.

The number of designs we went through was a good number, but we should have added more usability tests in between the changes. While updating our design between the tests was very useful, depending so much on the opinion of one individual may not have been the smartest decision. One participant may completely disagree with another on the same topic, and we will only know by presenting the same design to multiple people. If we were to change the number of iterations, more would probably be better. Sometimes participants don't know what they want, and we often ran into situations like this:

Participant: "if i click on this does something happen."

Facilitator: "no, but what would you like to see happen when you click there?"

Participant: "uhmmm... I don't know... maybe a chart?"

Facilitator: "What kind of information does it show?"

Participant: "I don't really know"

These moments told us that there might be opportunity for expand upon the reflection experience, but we could not come up with what experience was desired just by asking the participant. With more iterations we could present different potential experiences or solutions to participants before settling on a change.

Appendix

Task Description: Measure your exertion levels during a workout using the band and app, then reflect on the measured results.