Final report
Human - computer interaction
DAT420/TIG095

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1 Introduction and problem statement

Cycling, also called biking is a great way to exercise, commute or to just have fun. But cycling also has it's disadvantages, one of them being the potential injuries. This report will discuss and find a solution to prevent the injuries, especially complications after an injury occurs.

When biking alone there's always the fear of injuring yourself. This fright becomes an even bigger problem when you're biking in remote places, where no one can help you. Eliminating the fear of being injured in a place where no one can help and with no help on the way might improve the biking experience in remote places and motivate more people to bike off-road. The aim of this project is to find a solution to this problem and to make a prototype.

1.1 Problem statement

In the text below a problem statement will be specified, which later will be used to find a solution. The problem statement was specified by first brainstorming problems around cycling and then voting. A time plan was created as an aid in the project and a plan of how data from potential user should be collected.

1.1.1 Early problem statements

Below are the different problem statement ideas:

- Theft. The goal is to solve the problem of stolen bikes and bulky bike locks, by finding a way to make the bike lock smarter and more functional.
- Crashing in places where no one is around to help. This is the idea at the base of the project presented in this report. It will be explained further in section 1.1.2.
- Various problems surrounding having no biking lane and having to share the lane with people or motorized vehicles. This could be a safety hazard and discourage potential bikers.

1.1.2 Selected problem, goals, and intended users

Among the earlier ideas considered, one was deemed particularly interesting : "crashing in places where no one is around to help".

The target group is bikers that bike in remote places, for example, mountain bikers and off-road bikers. A person that uses the bike in the city may feel safer because if something bad happens there will most likely be someone in the area to help them out if they are hurt. Instead, a person who bikes outside the city (off-road bikers, maybe on difficult paths such as mountains) could need a secure way to communicate with someone if they need help.

In general, if you are alone, severely harmed, or unconscious it can be difficult to let someone know that you need help, especially if no one knows where you are.

1.1.3 Planning

The main goal is to make the cyclists feel safe by aiding them after a crash has occurred. The idea is to give the cyclist the possibility to communicate with someone in order to ask for help, even if they are not able to directly use his/her phone to call someone. In order to gather the data related to the user group, two methods have been chosen:

- Questionnaires (For all kinds of users)
- Interviews (For specific users).

These methods make it possible to consider the aspects of both quantitative and qualitative research [1]. The questionnaires provide a more general point of view while the interviews provide a more personal insight.

Table 1: Timeplan.

Week	**Assignments**	**Dates**
Week 2	• Problem statement	January 29
Week 4	• Gather data, create a persona, have interviews	February 9
Week 5	• Initial prototype	February 12
Week 6	• Pilot evaluation plan	February 19
Week 7	• Draft of Project Report	February 26
Week 8	• Final Project Report	March 10

2 Tools

In this section, the tools and programs used during this project will be discussed. These are tools that have supported the development of this project, for example of how ideas were shared. Regarding the pandemic, certain precautions have been made. Every meeting has been done via Zoom[1], an online video-call program. Sketching and brainstorming have been done via Miro[2], which is a big whiteboard where each member can collect and write down thoughts at the same time. Figma[3] has also been used, it's a program similar to Miro but specifically used for making interactive prototypes. A questionnaire and questions for an interview were also made and done online. The restrictions of the pandemic haven't considerably hindered the project. Except for testing the prototypes since this was tricky doing from a distance. An interactive storyboard was therefore made using Twinery[4]. Together with the storyboard and the interactive prototype, the user experience could be evaluated in different environments.

3 Design Approach

The design process began by brainstorming problems surrounding cycling. Three main problems were selected and a mind map was made. After another brainstorming session, the main problem was chosen. Data about the problem was gathered through questionnaires and interviews targeting mountain bikers. The questions in the interview and questionnaire can be find in appendix A. Afterwards, the questionnaire and interviews were evaluated by creating personas[2] and scenarios[3]. These can be find in appendix D.

From this data, there was a clear understanding of the needs for a solution to the problem. Each group member individually presented two ideas each and then together chose which idea to proceed with.
An interactive prototype was made using Figma and evaluated through a controlled setting where the participant was given a scenario and tasks. During the evaluation, the tester was urged to think out loud while testing the prototype.

4 Initial design prototypes

The prototype process began with everyone in the group sketching their own ideas, either by hand or using a sketching software, such as Miro or Figma. When the sketching session was done, each group member presented their ideas in miro and had a discussion about which of the prototype ideas should be the main focus. After a collective voting, a sketch was chosen and different designs were made in Figma. Figma was a great tool since each member could work on the same screen, get inspired, interact and familiarize themselves with the idea as well as sensing the final outcome. The initial sketches can be found in appendix B.

4.1 Understanding the user

Earlier data gathering showed that when biking, the intended user group did not carry many objects with them. Due to this, an app was found the most fitting, as most people always bring their phones with them. The application is meant to be used in the background and not cause a distraction, so by having fewer objects and icons on the screen, the user would less likely be overwhelmed.

4.2 Initial prototypes

This design is implemented as an app on an Android or IOS device. By tracking the user's movement, the app can predict when they're unconscious. By calling or aiding to call an emergency number, the application will help according to the problem statement: "the user has crashed where no one is around to help".
A few of the different prototype designs can be seen in appendix C. The goal was to merge the designs and functions of each idea until the group members were satisfied with the end product.

[1] https://zoom.us/
[2] https://miro.com/
[3] https://www.figma.com
[4] https://twinery.org/

5 Pilot evaluation plan

5.1 Aim

Getting information about how easy the product's usability is, considering both the interface and the design of the application and how the application works practically (in terms of actions and functionalities).

5.2 Methods

The chosen methods are the following:

- Controlled settings[4]: in consideration of the pandemic, it is not possible to meet in person. The idea is to provide a controlled environment to the user, in which the group members guide them in how to interact with the prototype.
- Creating scenarios and giving users tasks to see their actions: the idea is to describe a situation to the user in which they would need to use the application and to get feedback from the way they interact with it.
- Think aloud[5]: the user should tell what they are thinking while interacting with the product, in order to allow the members to gain more information about the product's advantages and disadvantages.

5.3 Users

- Five users will be chosen from another group in this course, to test the app.
- The five users will be recruited remotely.

5.4 Procedure

The user will receive the consent form to be signed by email. Then the rest of the evaluation will be carried out on Zoom.

1. The user signs the consent form and joins a Zoom meeting (the user will be asked to enable the video and the microphone and to share the screen).
2. The user is provided with a story, to help them to imagine a possible context in which the application would be used and the link of the prototype on Figma.
3. The user will read the story and interact with the prototype in the same way as they would interact with the application in the context described by the story. In doing this they will talk about what they are doing and what are their feelings about the application.

5.5 Data collection

The aim is to collect data about the usability of the application. The main focus would be how much time the user needs to understand the use of the application and the time needed to complete a task, as well as the impressions about the aesthetics of the application (readability, appearance, etc). The systematic approach is observing and listening to the user's impressions of the application and writing them down. This procedure should not take too much time, considering that the prototype created is minimalistic and simple to use. 10/15 minutes per person should be enough. If more time is required, it would mean that the prototype's usability can be improved and parts of the prototype's concept should be modified.

6 Pilot Evaluation

To start the evaluation process a prototype with all the wanted functionality was needed. The different prototypes (figure 7) were put together and a new design was conceived (figure 8).

6.1 Data collection

As specified in the evaluation plan, the users interacted with the prototype and were urged to think out loud about what they were thinking and their decisions. The users were given a story and tasks to see how they would interact with the application in a way that simulates a more natural environment. The user's thoughts and decisions were noted down to be further analyzed later. At the end of the procedure, the users were allowed to talk more freely about the prototype and their overall thoughts on the design.

6.2 Data analysis

The main objective of the data analysis was to identify problems that were reported in several user tests. These problems were given priority when working on the refined prototype. The largest problem identified were the formatting of the timer, it was unclear if it was in minutes or hours. Another problem was that not all users were familiar with the abbreviation "ICE". A problem that was not as common in the user tests was that the settings were not recognized as buttons and therefore the user did not press them.

Suggestions for improvements were made by the test users, these included adding a “snooze” button for the pause and allowing multiple emergency contacts. These suggestions were taken into consideration as the work on the refined prototype began.

7 Refined prototype

The main function of the prototype is the tracking feature. When you start a ride the application will track the user's location and if they have been idle for too long it will contact your emergency contact. If the user wants to take a break there is an option for them to pause the tracking. The pause can be set to a predefined time, so they don't forget to unpause, or they can choose to unpause when they want. When the pause is over the user will get notified, this is to prevent unnecessary contacting to the emergency contact if the user did not realise that the pause was over. If the connection is lost during the ride, the user's emergency contact will be notified. To motivate users to use the application there is a statistic section where they can see how much they have biked and for how long. The prototype can be seen in figure 8. From the data analysis the following improvements were identified and implemented:

- Changing the format of time to include hours, minutes and seconds for clarification
- Notifying the user when they are moving during a pause to prevent them from forgetting to unpause
- The option to extend a pause once it was over was added
- Improved the affordance of the different settings by adding arrows when a button press would take you to a new screen
- Option to add multiple emergency contacts
- Explaining ICE
- Option to change language

The redefined prototype can be seen in figure 9.

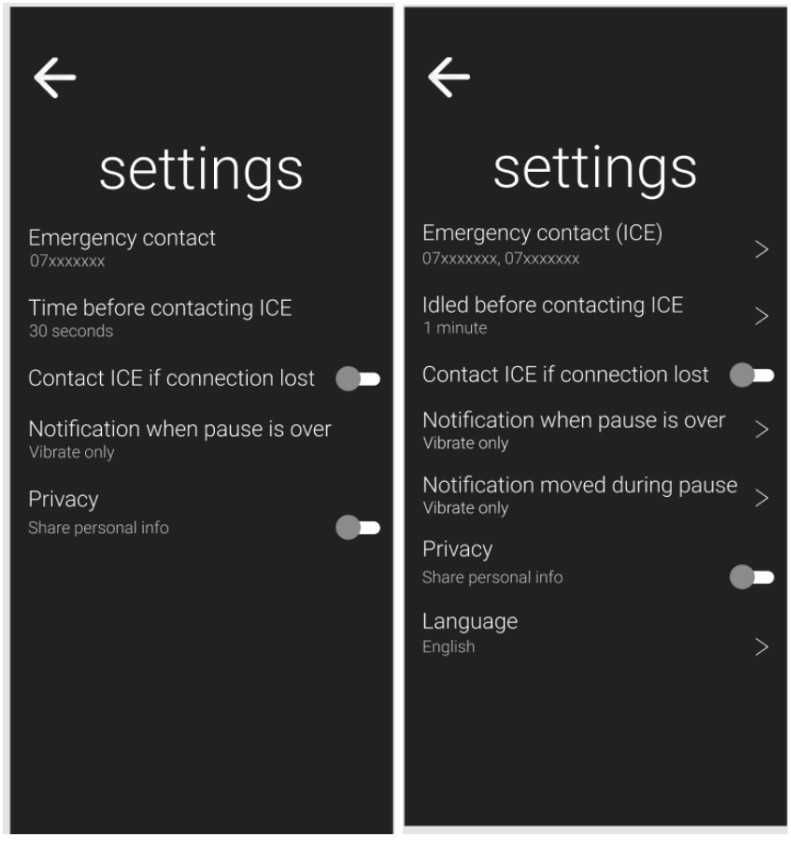


Figure 1: Settings in the app before(left) and after(right) refined according to suggestions made by evaluation.

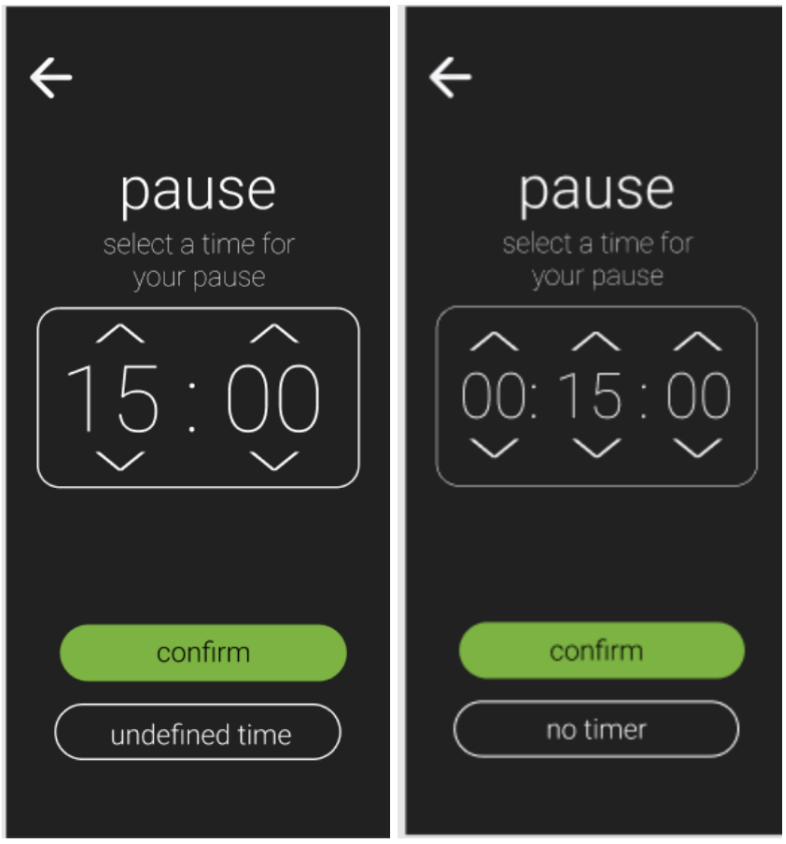


Figure 2: Pause in the app before (left) and after (right) refined according to suggestions made by evaluation.

8 Conclusions and future work

The main goal with this design idea was to make people feel safer and more secure in isolated situations. By approaching this project with these goals in mind, every step in the design process was centered around the users potential needs. This approach was new to all the group members but throughout the project was found most suitable. By using user-centered approach the group was able to develop a product that reflects the needs of the user. The final users were questioned during different phases: before the development (in order to have a feedback about the central theme of the product) and during the development (in order to have feedback about how the product was being implemented).

There is always room for improvement and further development, so if the group would go further with this project there would be more testing of the prototype to collect more data and to further improve the prototype. These tests could be done on the phone, so the user gets a more natural look and feel of the application. Things such as button placement, text size and gestures can be difficult to test on a computer screen, this would be a more natural environment to observe the user in. It could also be relevant to expand the current prototype and add more screens such as the different settings and other minor things that gives the user the ability the explore the application as a whole.

The group is pleased with the outcome of the project as a whole. The problem considered (help isolated bikers in case of emergency) was approved by the interviewed users. The final prototype came out nice and the users found it easy to understand and to use. The aim of this project was to give a higher feeling of safety to the bikers, even knowing that this is not the only problem that bikers have.
The future may be unpredictable but one can always try and make the world a safer place.

References

[1] H. Sharp, *Interaction Design: Beyond Human-Computer Interaction*. Newark: John Wiley Sons, Incorporated, 2015, p. 229.

[2] ——, *Interaction Design: Beyond Human-Computer Interaction*. Newark: John Wiley Sons, Incorporated, 2015, p. 291.

[3] ——, *Interaction Design: Beyond Human-Computer Interaction*. Newark: John Wiley Sons, Incorporated, 2015, p. 332.

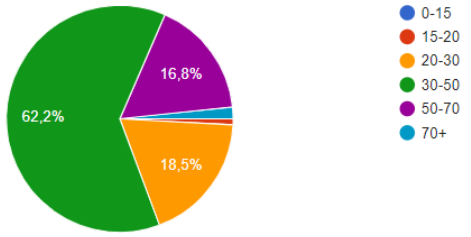
[4] ——, *Interaction Design: Beyond Human-Computer Interaction*. Newark: John Wiley Sons, Incorporated, 2015, p. 369.

[5] ——, *Interaction Design: Beyond Human-Computer Interaction*. Newark: John Wiley Sons, Incorporated, 2015, p. 383.

9 Appendix A Questionnaire and interview questions

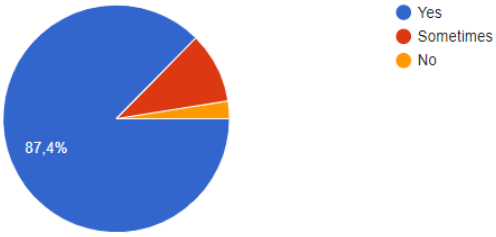
How old are you?

119 svar



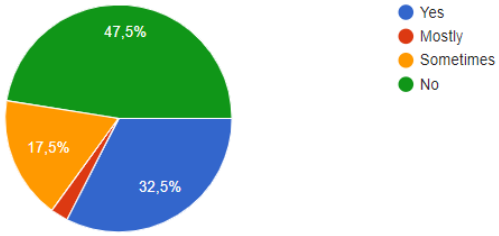
Do you have your phone with you when you bike?

119 svar



When cycling, do you bring a first aid kit or something alike?

120 svar



Do you have your phone with you when you bike?

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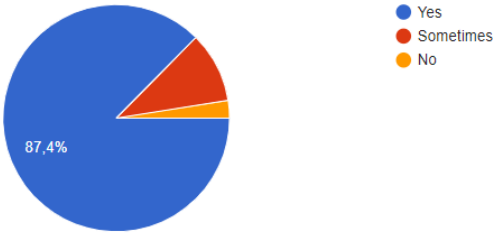
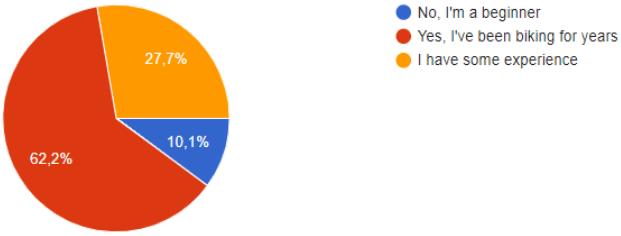


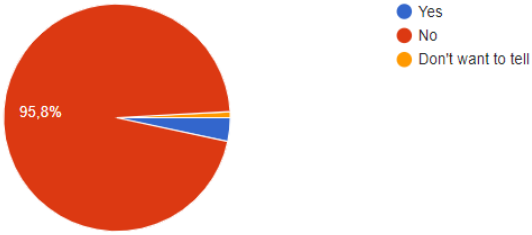
Are you an experienced biker?

119 svar



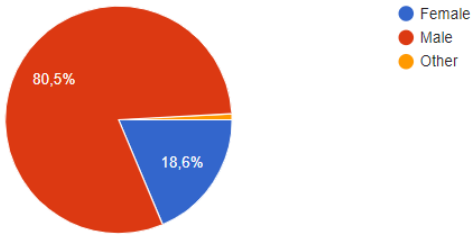
Do you have any type of disabilities?

119 svar



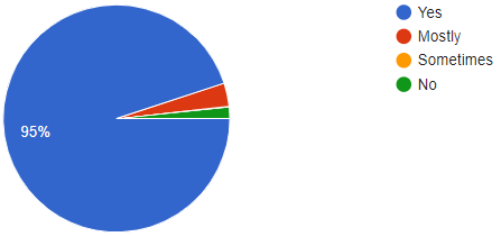
What gender are you?

118 svar



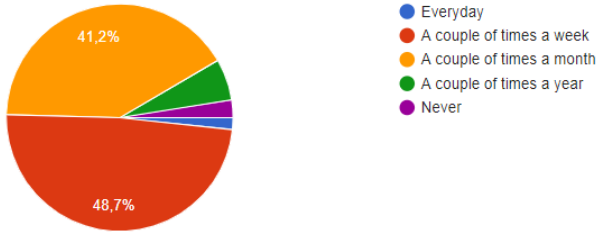
Do you wear a helmet?

119 svar



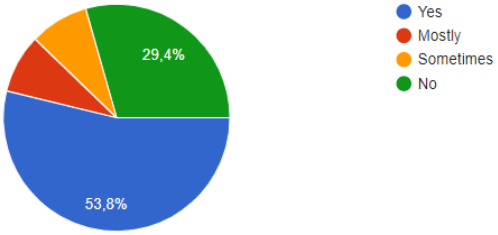
How often do you ride your bike (off-road/mountain biking or alike)?

119 svar



Do you wear any other type of protective gear (other than a helmet) when cycling?

119 svar



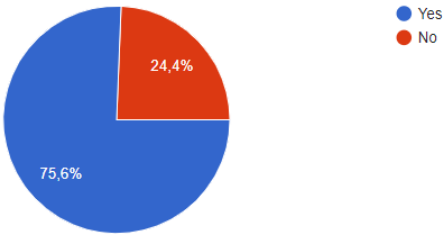
Where do you most often ride your bike (when biking off-road/MTB or alike)?

110 svar

Änggårdsbergen
Änggården
Delsjöområdet
Änggårdsbergen
Mölnlycke
Ängårdsbergen
Gothenburg
Göteborg
Ängårdsbergen

Have you ever gotten into an accident riding a bike?

119 svar



Interview questions

1. How old are you?
2. What gender/non-gender do you identify with? ,
3. Are you ok with sharing data? Record?
4. Would you call yourself an experienced cyclist? How often do you ride?
5. When you ride, do you do it alone or with a friend or more?
6. When biking do you always bring your phone, why or why not?
7. When biking alone, do you keep other people updated on where you are? How do you do that?
8. Where do you bike?
9. Do you often bike to new and different areas you've never been to before?
10. Do you feel safe riding in isolated places? Why or why not?
11. Have you ever had an incident? How did it happen?
12. In which situations did you need help and what have you done in order to ask for help?
13. Do you have any idea of a solution to feeling safer when riding in remote places? What do you think about this idea…?
14. Is there anything you can think of that would be good for us to know
15. Are you satisfied with everything with your bike right now?

10 Appendix B Initial sketching

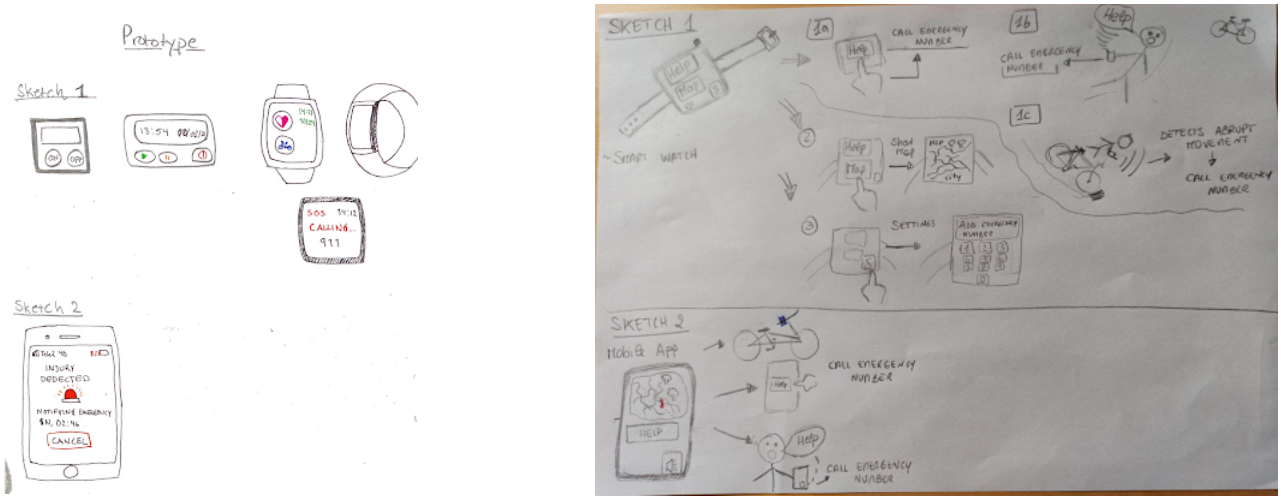


Figure 3: a) To the right, initial sketch of a watch design and an app. b) To the left, initial sketch of a watch design and an app

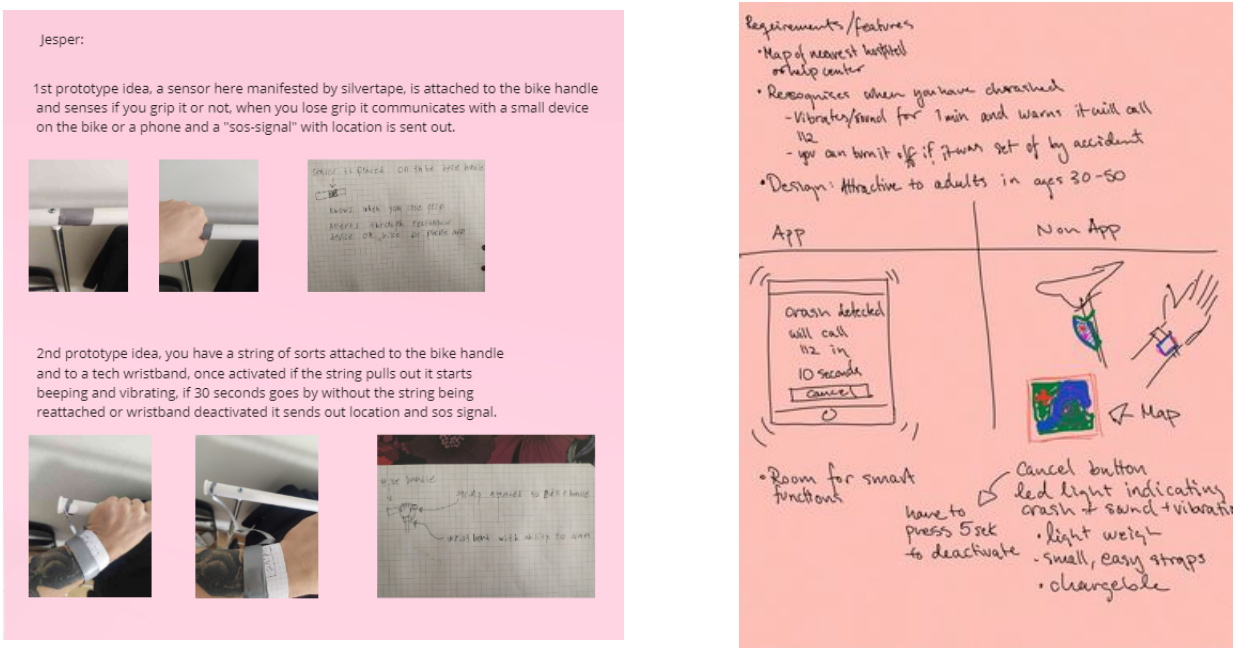


Figure 4: a) To the right, initial sketch of a sensor based prototype. b) To the left, initial sketch of an app and a watch design

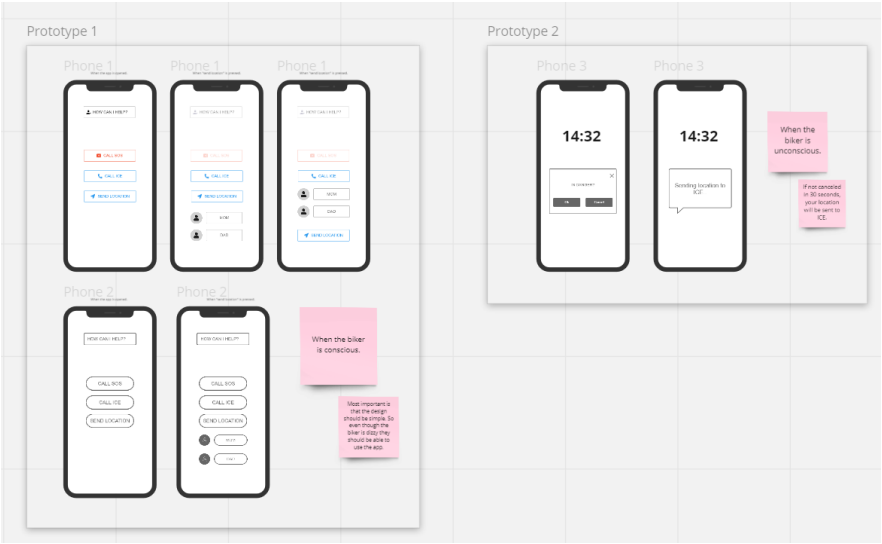


Figure 5: Initial sketch of an app based approach to the problem

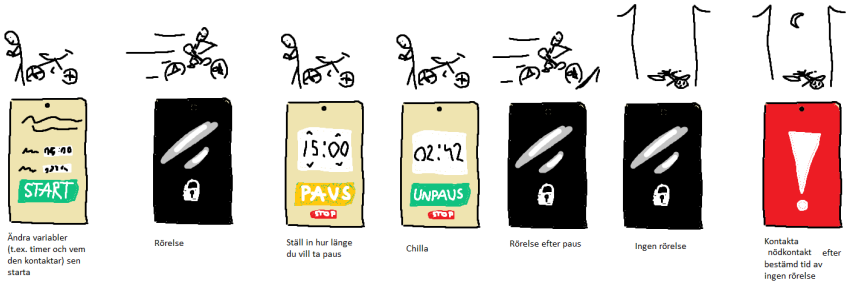


Figure 6: The selected idea. An app that tracks when you've been idle for too long and sends an emergency message.

11 Appendix C Prototypes

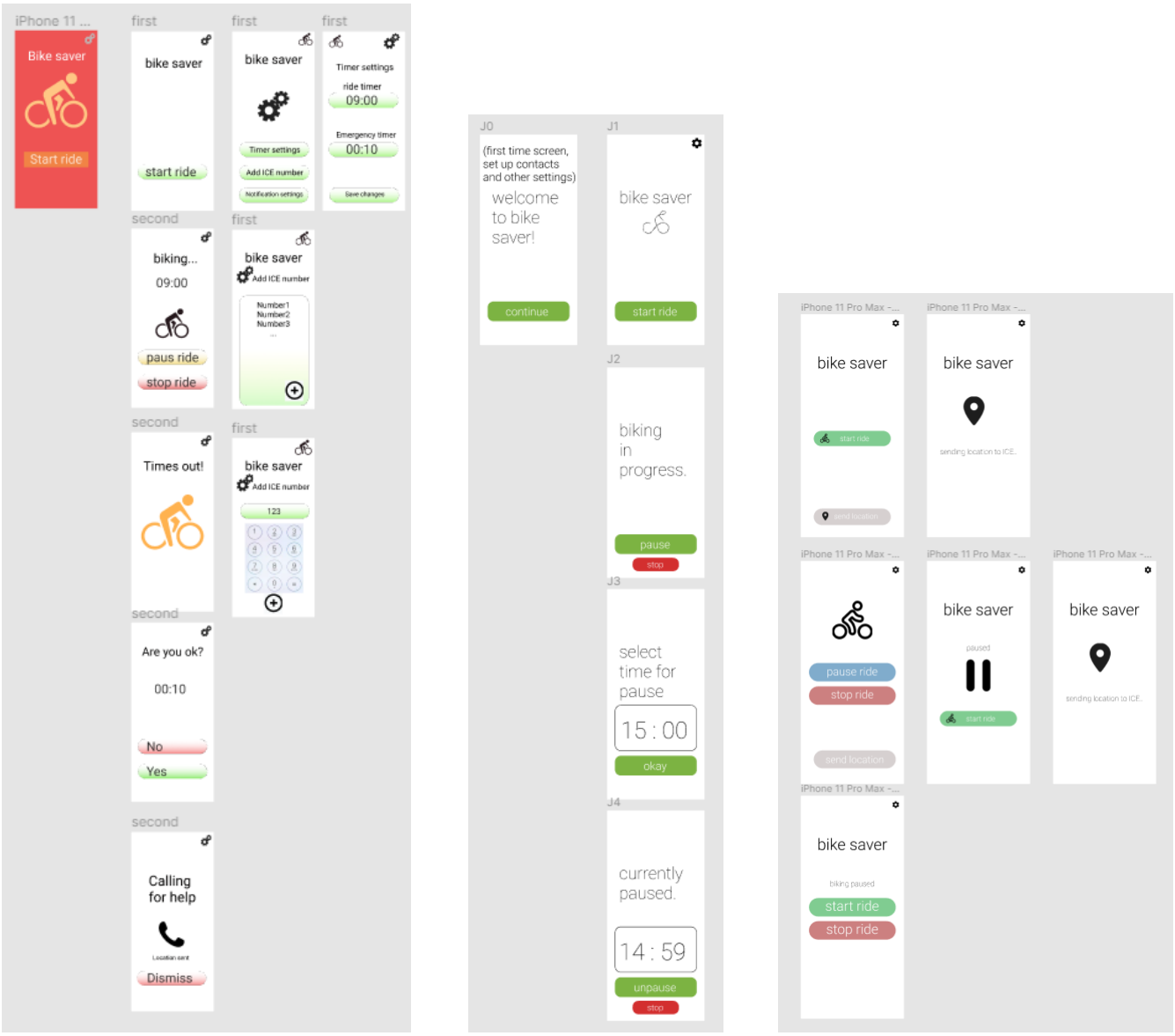


Figure 7: First draft on interactive prototypes using Figma

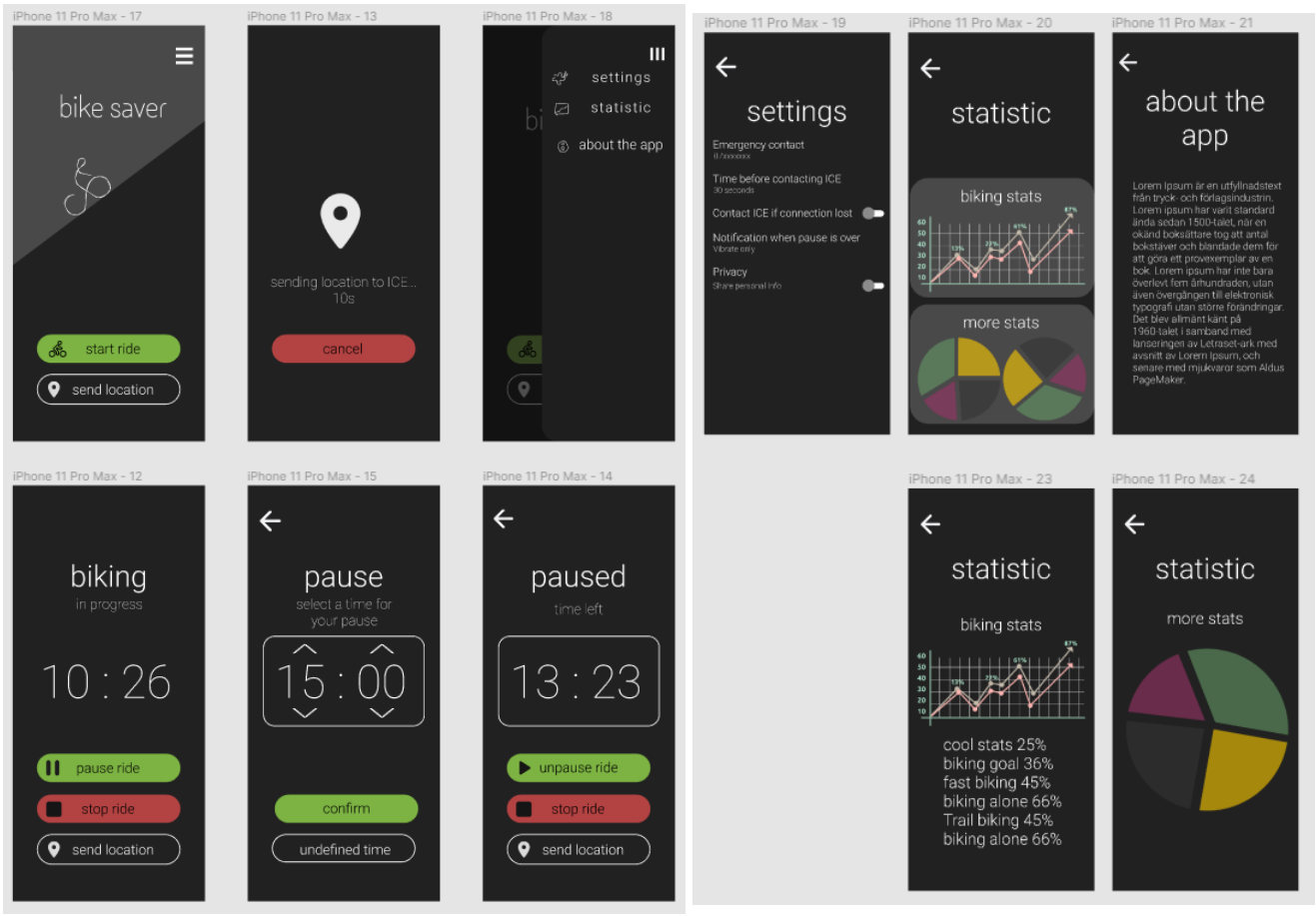


Figure 8: A more elaborated prototype, combining the features from figure 7

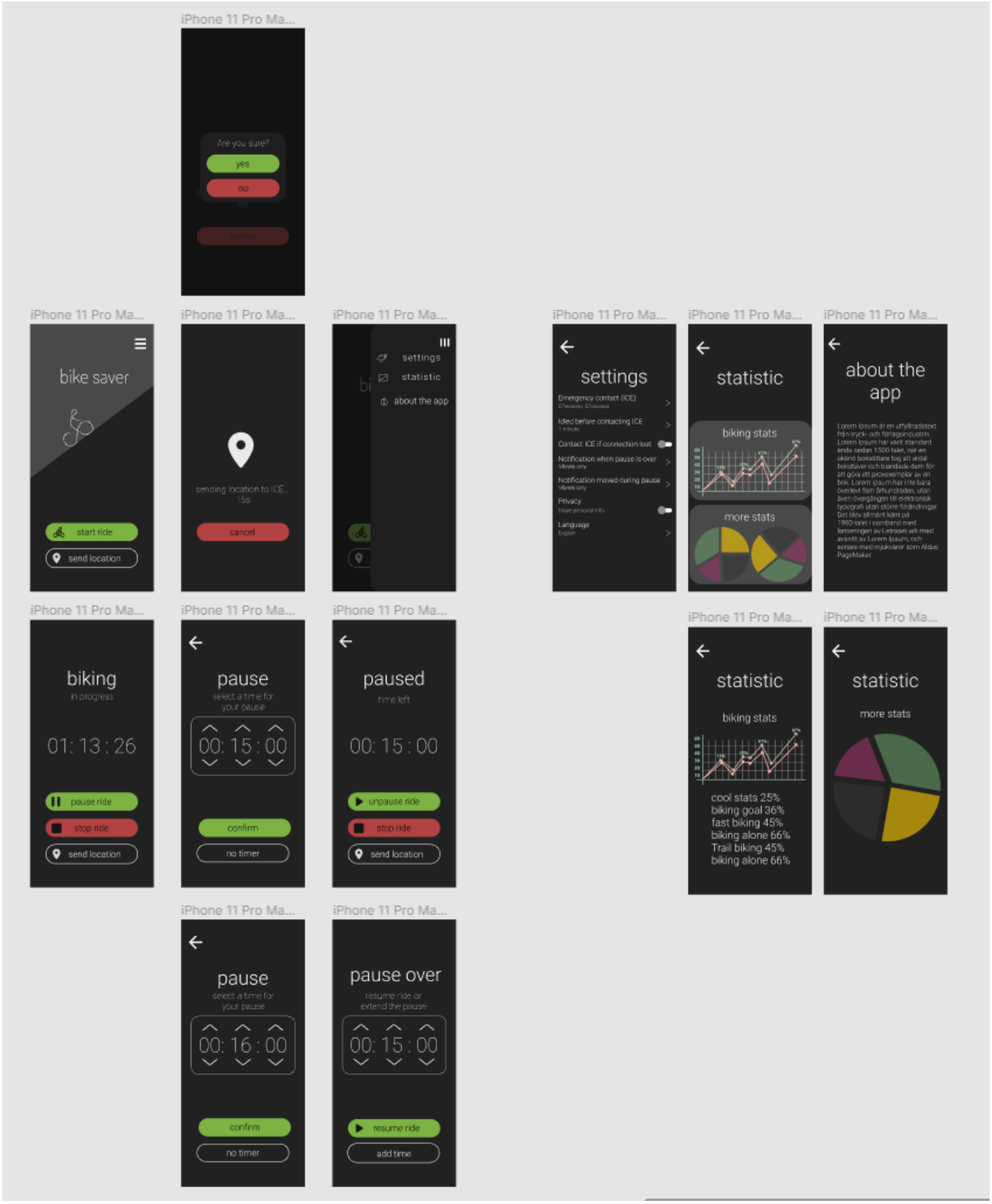


Figure 9: The redefined prototype

12 Appendix D Storyline

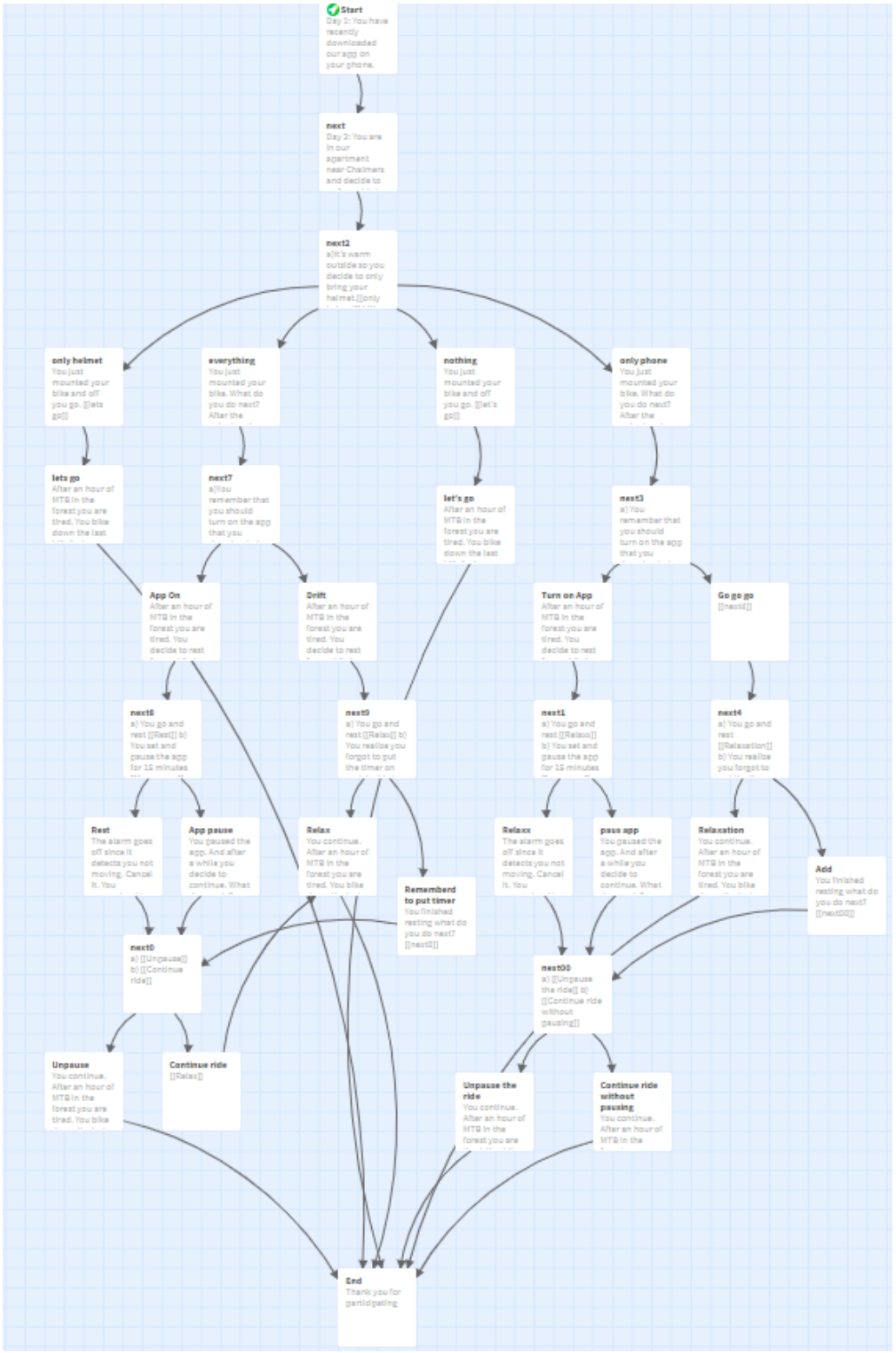


Figure 10: An interactive storyline with scenarios (made using twinery) used together with the prototype in the evaluation process