

GymBuddy

Final Report of Week 2 (02266)

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1 INTRODUCTION (ZS, ZW)

Exercise form and technique are one of the most important variables when exercising to avoid injuries. Maintaining proper form and technique for exercise is crucial to avoid injuries and achieve fitness goals. However, for beginners, mastering the correct form can be challenging, often leading to frustration and decreased motivation. Personal trainers, who offer valuable guidance and encouragement, are often inaccessible due to high costs.

The **GymBuddy** robot, leveraging **computer vision**, addresses these issues by providing **real-time feedback** on the exercise form, tracking progress, personalized workout plans based on the needs and goals of each user, and encouraging the user throughout their training session. The workout plans tailored specifically to each user and including diverse exercises maintain high motivation [1], whether you want to train at home or in the gym. Your own personal GymBuddy bridges the gap between professional training and independent workouts, transforming traditional gym routines into safer, more effective, and engaging experiences.

2 EXISTING WORK (ZW)

The development of robotic and AI-driven systems in fitness has led to many innovative solutions, such as ddrobotec Robotrainers. This kind of system focuses on personalized strength training and rehabilitation leveraging robotic technology to adjust resistance and motion patterns based on the individual. GymBuddy robot aims to transform the fitness experience by addressing the challenges of exercise form correction, personalized guidance, rehabilitate previous injuries and user motivation. However, the two systems still has it's differences in their goals, functionality, and user engagement.

Robotrainers like ddrobotec, offering advanced, muscle-centric cognitive testing, training, and exergaming (games for exercise). With precision diagnostics designed to enhance performance, health, and longevity, these systems showcase how robotics can revolutionize physical and cognitive abilities, paving the way to a healthier and longer life[2].

GymBuddy builds by making these benefits accessible to a broader audience, transforming the traditional gym experience into an interactive and motivational journey. GymBuddys ability to follow users around the gym ensures that it can assist with various exercises, not just those performed on a stationary device, like ddrobotec. GymBuddy actively encourages users during their workouts, helping maintain motivation, which is crucial for beginners.

3 ITERATION #1 (AA)

What was Validated : By hosting a mini-workshop with focus groups there could be provided actionable feedback on both the design and functionality of the **GymBuddy** robot. The session aimed to identify pain points and opportunities for improvement in the landing page as well as the wireframes and prototype.

How we did it : We hosted a mini-workshop in the form of focus groups with six participants. The session included predefined questions and began with ice-breaking activities (see Appendix E.1).

We made sure the participants were well-introduced to the idea of the product before asking the predefined questions.

Two main pain pages, labeled Opportunities and Challenges, were used. Participants wrote feedback on sticky notes and placed them on the relevant page. This exercise was followed by a group discussion where participants elaborated on their feedback. For the poster, participants were asked to identify both strengths and weaknesses. Specific feedback included issues with design elements, such as the image size being too large and poor contrast between text and background.

Regarding the prototype, participants expressed a need for features like real-time progress tracking and a way to monitor reps and exercises during solo gym workouts.



Figure 1: Participants filled out sticky notes

Outcome of Validation : After hosting the focus group workshop, we gathered feedback and incorporated it into the prototypes redesign. Overall, participants found the concept promising and relevant, with significant areas for improvement highlighted.

For the landing page, feedback indicated that the image was too large and the contrast between text and background needed adjustment. This led us to refine the design for better balance and readability [Figure 4]. Participants also emphasized the need for a more user-friendly layout, which prompted a complete redesign to enhance navigation and accessibility. For the prototype functionality, participants requested real-time progress tracking and assistance with counting reps during solo workouts. In response, we implemented a live loading bar feature on the workout screen, allowing users to track their rep count without interrupting their exercise routine [Figure 3]. These changes improved the usability and relevance of the prototype based on user needs.

4 ITERATION #2 (ÖC, ZS)

What was validated: The hypothesis was that GymBuddy, offering a form analysis, a customized training plan for a specific user, and motivational encouragement, could effectively address injuries and motivation loss. The project aims to improve gym experiences by giving new gym enthusiasts the personal coach they need. We hypothesized that such an approach would increase users motivation and engagement by making updating and tracking your health progress easier, which could be crucial to support long-term user retention of social robots.

How we did: We performed a **think-aloud test** with our prototype developed in Figma. The test was carried out with three students from the Technical University of Denmark, who also represent GymBuddy's target group, as they wanted more personalized training routines based on their needs and the motivation to perform them consistently. By testing our high-fidelity prototype, we can determine the user-friendliness of our social robot and see how the users would interact with the prototype. We started by planning some tasks the participants would perform and give their thoughts on. The participants were first introduced to the concept of a social robot and the purpose of GymBuddy, and then asked to perform the tasks which were the following:

- Create a new user and specify your needs
- Review and complete a workout session
- Update your current body weight

The think-aloud test was conducted in the following manner [3]:

- (1) The participants verbalized their thoughts on the user interface and interaction with the system to give us access to their expectations and preferences (Figure 2).
- (2) One group member worked as the facilitator to guide and encourage the verbalization of the participants thoughts.
- (3) The rest of the group members took notes and observed the participants interactions with GymBuddy and documented the feedback received.
- (4) After the tasks were finished the participants could freely navigate the system, and general feedback was collected through an open dialogue about the user experience, which was noted

and analyzed to identify other patterns and areas for improvement.



Figure 2: A participant performing the think-aloud test

Outcome of validation: After conducting the **think-aloud test**, we collected all the feedback given and considered implementing the feedback in the group. Overall, the participants found the prototype to be very **user-friendly** and **easy to navigate**, with some minor changes to the user interface. The testing revealed that the user interface had a great color palette, but the participants wanted different colors in some of the wireframes to differentiate them from the main color used in the logo. During the setup, participants also found it difficult to see the descriptive text of the different options, as the font size was too small. After finishing their user setup, the participants recommended a shortening of the description of the workout splits. During their workout session, the participants requested some changes in regards to adding the **ability to pause** and **removing the disabled buttons**, as they thought it was already enabled or possible to click. When changing their current body weight, participants had difficulty finding the page to change their weight. They first navigated to the profile page and then to the progress page that shows their health results over the months. Even on the progress page, they had a hard time finding the button, hence we also changed the design to be more intuitive. In our graph showing the tracked health progress, we also added some data representing the user's body fat percentage alongside the weight data, as this was something the participant wanted.

Although we implemented many of the suggestions and feedback, some of the suggested modifications were not implemented after careful consideration in the group. For example, one recommendation was to change the background color to a darker color, but we chose to maintain the same background color. This decision was based on several factors, such as the primary color we used already did not have a good contrast with the darker background. We also wanted the interface to be very clean, so that the user is not distracted by the colors. To conclude the iteration, the think-aloud test confirms our hypothesis and it is also clear that there is potential in the market for our product. Feedback from the test has improved our prototype's user interface and made the navigation more intuitive. In the next iteration, we wanted to ensure that the adjusted prototype of GymBuddy meets the user expectations and that the unique value proposition is enhanced.

5 ITERATION #3 (AA, LR)

What was Validated The feedback from our presentation the 17th of January validated the need to narrow down the scope of our project. Initially, **GymBuddy** targeted a large market segment including beginners, older adults, and fitness enthusiasts. However, feedback suggested that this approach was too wide. We validated that focusing specifically on beginners would allow us to provide more custom solutions. Additionally, feedback confirmed that certain features, such as heart rate monitoring, were unnecessary for our primary user base and could be removed from our prototype [F]. Suggestions to improve the prototype, like adding a loading bar to count workout reps and incorporating eye movements that follow user motion, were also validated as valuable enhancements.

How We Did It We gathered feedback during our presentation, where peers and teaching assistants evaluated our concept and prototype. The feedback highlighted the need for a more focused market segment and less functionalities. Specific critiques addressed the product's usage, especially its usability in gym spaces and who is the owner of **GymBuddy**. We carefully analyzed this feedback and updated our Lean Canvas [B], user story map [C], and wireframes [D] accordingly. Key improvements included narrowing our market to beginners, removing the heart rate tracking feature, and enhancing the prototype with interactive elements like a rep-counting loading bar and animated eyes that track user movements.

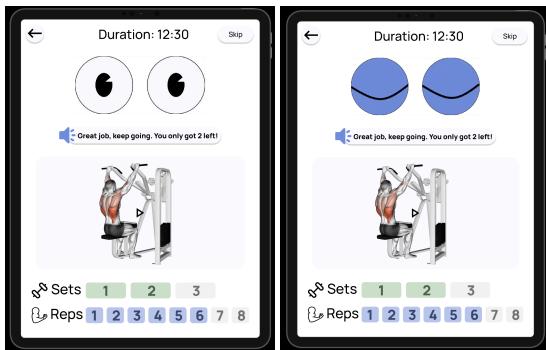


Figure 3: Workout page with the eyes blinking and the process bar

Outcome of Validation As a result of this feedback, GymBuddy now has a more refined target market focusing exclusively on beginners allowing us to deliver a more effective and user-centric product. The removal of heart rate tracking simplified the design and functionality, making GymBuddy more approachable. The addition of interactive prototype features, such as the loading bar for rep counting and animated eyes, improves user engagement and usability. These changes were validated through the presentation feedback and are now reflected in our prototype (see validation [E.3]).

6 DISCUSSION (RA, LR)

The iterative design process of GymBuddy has been a valuable learning experience, allowing our team to explore the intersection

of user experience (UX) principles and shaping development. Through feedback and validation, we were able to refine our initial concept and address significant design challenges for improvements.

The **think-aloud tests** [4] and peer evaluations provided valuable insights into the usability of our prototype. Participants feedback [E.2] highlighted the importance of clear and intuitive navigation, particularly in features central to GymBuddy's value proposition, such as updating progress metrics and following personalized workout plans. By focusing on creating the simplest prototype 5, GymBuddy emphasizes tracking and planning workouts customized to individual needs, ensuring proper form, and preventing **injuries for beginners**.

Design adjustments, including optimizing font sizes, enhancing the color scheme for better differentiation, and simplifying the interface, significantly improved the usability of the prototype. Feedback received during the last iteration also validated the removal of non-essential features like the heart rate 5, aligning the product's scope more closely with the needs of its target audience beginners. Interactive features like animated eyes and a rep-counting loading bar were positively received, emphasizing the potential of engaging elements to foster user motivation. These additions underline GymBuddy's unique value proposition as an accessible tool for beginners.

However, the iterative process also revealed the challenges of balancing functionality with simplicity. While we implemented many suggestions, such as improving navigation and enhancing the visual appeal, certain recommendations, like changing the color contrast and adjusting the prototype picture in a way to write more texts about the prototype function on the Landing page [6], were adopted to preserve the clean and distraction-free aesthetic of the interface.

Looking ahead, our future work is focused on the idea of incorporating a **wristband** accessory. This optional feature could improve GymBuddy's functionality by providing real-time tracking of physical activity, such as steps, calories burned, intensity of workout, and measuring heart rates.

Ethical Considerations:

Ethical considerations must be strictly observed in the development of GymBuddy regarding **user safety, privacy, and well-being**. The product will track user movements and offer some form of real-time feedback; handling this information responsibly demands very intense measures regarding data privacy and security. Users should be ensured that they provide informed consent for any data collected, kept securely, and used only to improve workout performance. Additionally, GymBuddy will only provide the most accurate and safe recommendations so as not to injure the person, without any advice being given that might result in physical or mental harm. Accessibility of users with different capabilities and at different levels of fitness could be assured to avoid inequity and ensure equal opportunities with the product.

7 CONCLUSION (RA, ÖC)

The development of the GymBuddy prototype has been a valuable exercise in user-centered design, allowing us to refine the concept through iterative feedback and validation. By **narrowing the scope** to focus on **beginners**, we successfully created a simplified yet effective prototype that addresses core needs, such as proper exercise form, personalized workout plans, and user motivation. The adjustments made during each iteration have improved the usability, functionality, and engagement of the system. Although the current prototype focuses on essential features, future developments could explore additional enhancements, such as the integration of optional accessories such as wristband wearable and the possibility of data interoperability, to further enrich the user experience and support long-term fitness goals. The use of wearables would provide prospective users with a better understanding of how their exercise affects their pulse. In conclusion, GymBuddy shows how fitness plans can be revolutionized for beginners with the use of social robots to make personalized routines easily accessible and give prospective users a better understanding of the correct form and techniques to avoid injuries.

8 CONTRIBUTIONS

All group members contributed equally to the project, from developing the artefacts and prototype iterations to presentations and report completion. This collaboration ensured a well-balanced effort to include every group member's perspective in the project.

REFERENCES

- [1] Gavan Chapman. 2020. Here are the top 5 reasons why members are leaving your gym. <https://vigr.com/5-reasons-gym-members-are-leaving/> Accessed: 2025-01-15.
- [2] ddrobotec. [n. d.]. Push Your Limits with AI-Powered Robotrainers. <https://ddrobotec.com/> Accessed: 2025-01-16.
- [3] Rex Hartson and Pardha S. Pyla. 2018. *The UX Book: Agile UX Design for a Quality User Experience* (2nd ed.). Morgan Kaufmann, Cambridge, MA. <https://www.amazon.com/UX-Book-Design-Quality-Experience/dp/0128053429>

A LANDING PAGE



Figure 4: Landing Page for GymBuddy

B LEAN CANVAS

PRODUCT		MARKET	
1. Problem The user has a hard time tracking their progress in the gym. The user exercise with poor form, which result in injuries. Creating a workout plan specific for a user is hard.	4. Solutions In real-time form analysis and motivational interaction is added. Generate personalized training plan and workout sessions. Keeps track of your progress and update your training plan, personalizing it.	3. Unique Value Prop. Our solution offers a real-time analysis of a workout performance which can help to correct users to prevent injuries and give motivational feedback under workouts. It is easy for users to get a personalized workout plan based on preferences and needs. The robot can recognize when users feel unmotivated and provide empathetic support	9. Unfair advantage What do you have that gives you an unfair advantage? Something that cannot be copied or bought.
5. Key Metric List the numbers that tell you how your business is doing		6. Channels What free and paid channels to your customer are there?	2. Customer segments The product is designed for gym-beginners in their 20's, that needs motivation and consistency in the gym or at home.
7. Cost structure List out your fixed and variable costs.		8. Revenue streams Identify your revenue model, and calculate back-of-the-envelope numbers for lifetime value, gross margin, breakeven point, etc.	

Figure 5: Lean Canvas for GymBuddy

C USER STORY MAP

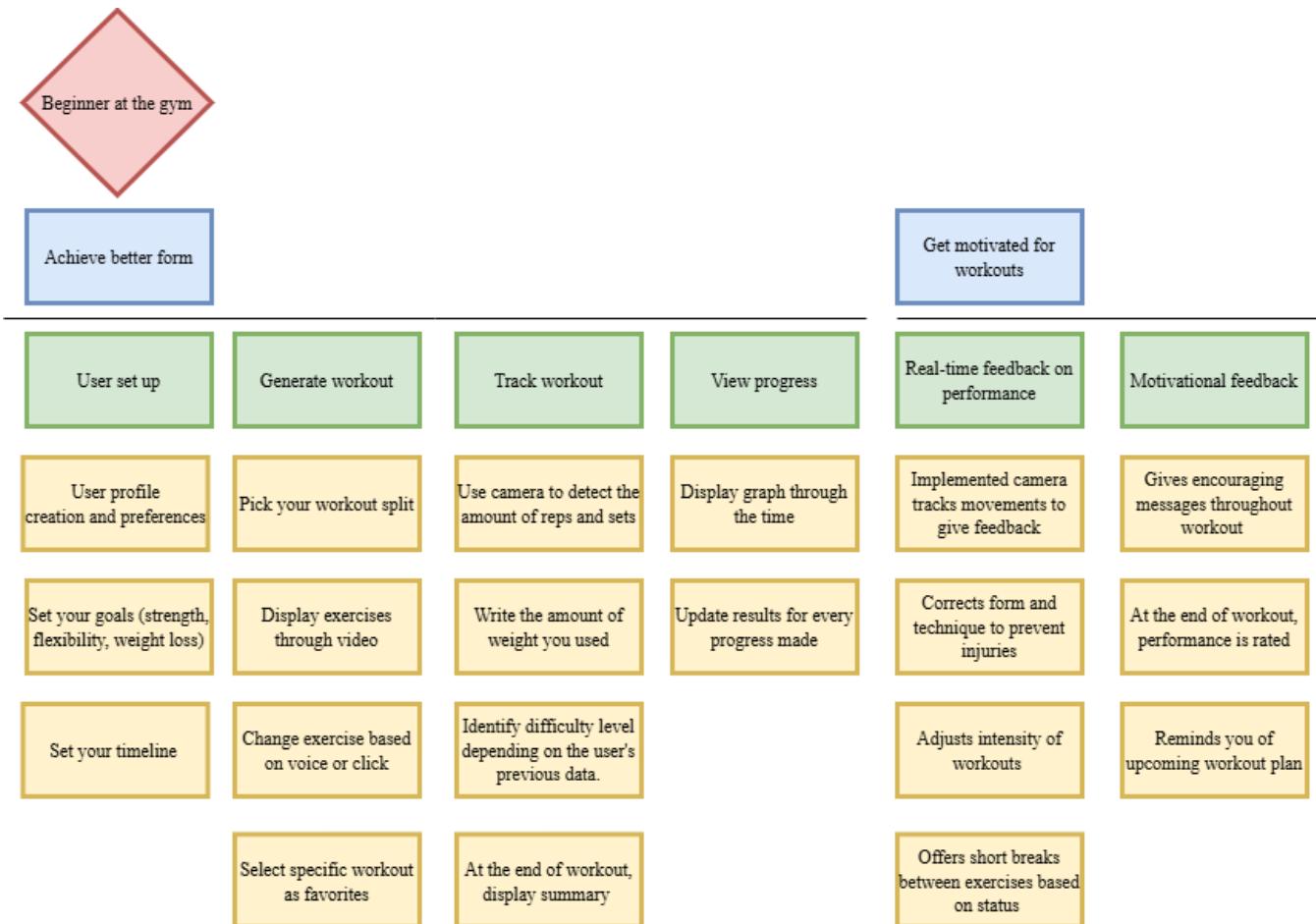


Figure 6: User story map for GymBuddy

D WIREFRAME

Here is the link for Storyboard

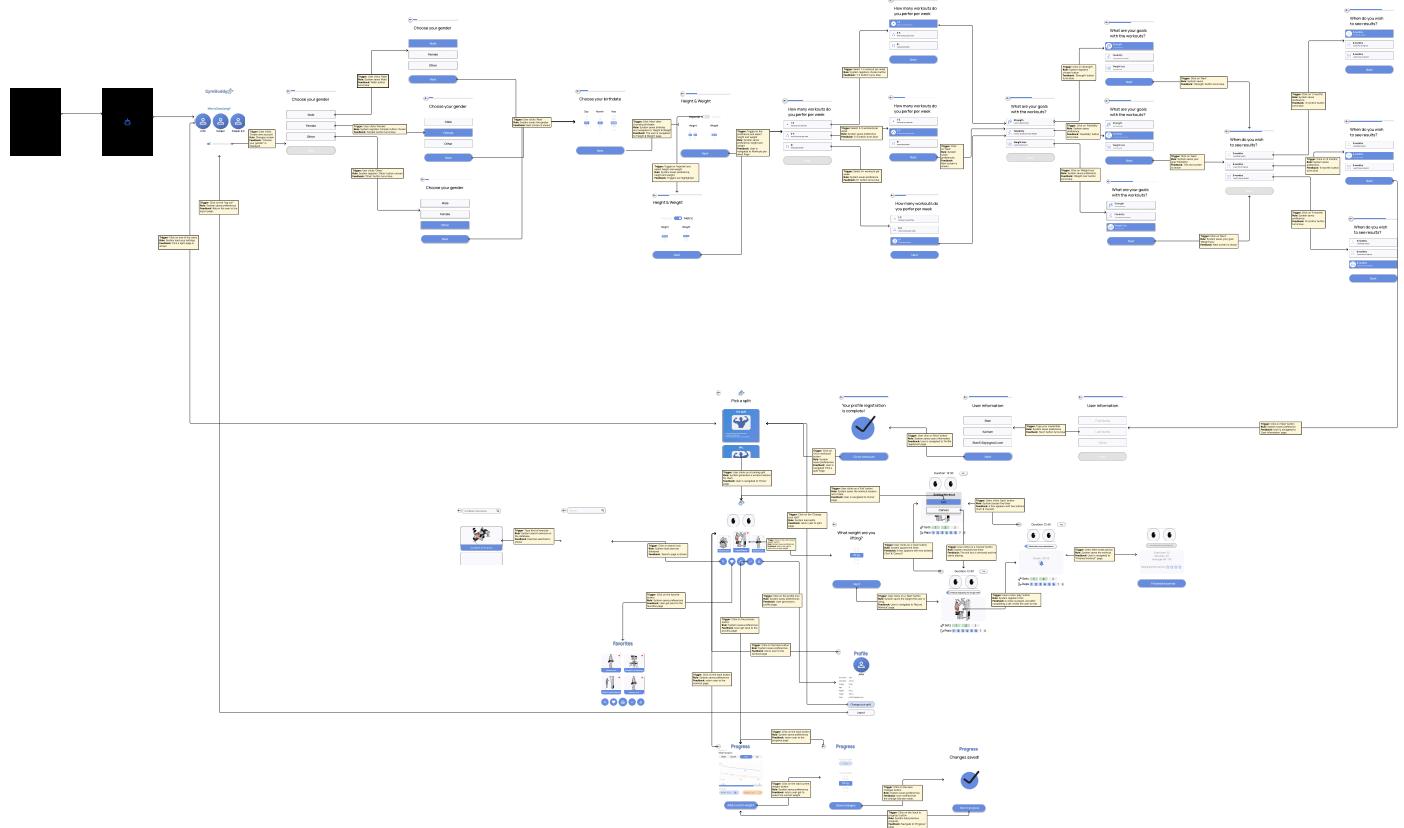


Figure 7: Final Storyboard

E APPENDIX E: VALIDATIONS

E.1 Validation Documentation for Iteration #1

Feedback-notes from the focused group workshop:

Expectations with a Gym Trainer

- Like to get an introduction to machines.
- Prevent injuries by correcting form.
- Motivation and having another person for encouragement.
- Being there for someone.
- Personalized experience based on your needs.

Considerations

- Where do you have to park it?
- What if you run into stairs?
- Tracks everyone around the gym (with an implemented camera) to avoid collisions.
- Collect data from the equipment for better performance tracking.
- Consider speaker volume to avoid interruption (especially at the gym).
- Customizable setup for how much it talks or connects with earbuds.
- Integrate music options into the system.
- Include an app integrated with the robot.
- Find suitable songs and playlists for every exercise (e.g., podcasts for StairMaster).
- Decide if the screen/tablet should be built-in or if users can connect their own phones.
- Be cautious in crowded places (especially if many start using the robot).
- Consider the size of the robot, especially for locker storage.
- Handle multiple users can it differentiate between users or only track based on profiles?
- Track your pulse during workouts.
- Prepare the next workout during warm-up.

Poster Considerations

- Hard to see the small blue text at the top (add a white frame behind it).
- Include a tablet or phone image on the poster if relevant.
- Use smaller images for clarity.
- Bullet points need icons and should be placed strategically.
- Use consistent blue color tones (why is the icon not colored but the dumbbell is?).
- Use dashed lines to indicate phone integration.
- Show the robot in a gym background (consider changing the background).

Opportunities (Sticky Notes)

- Keep track of progress include features like, "What could I lift last time? Can I lift more today?"
- Simplify workout tracking.
- View real-time progress and exercise plans without checking the phone.
- Improve motivation to go to the gym.
- Integrate with FitBit, Apple Watch, or gym apps via QR code scanning.
- Track reps and exercises for solo gym-goers.
- Alert people in case of an accident.
- Safety feature for low blood sugar or fainting (automatic emergency call).
- Recommend available machines as replacements for usual exercises.

Challenges (Sticky Notes)

- How does it move up stairs or elevated surfaces?
- Ensure safe operation around weights and people.
- Connect both to the product and the users phone simultaneously.
- Reconsider the size of the device for better portability.
- Keep the robot out of the way of weights and people.

E.2 Validation Documentation for Iteration #2

Three tasks were prepared for the think-aloud test to evaluate GymBuddys user interface and functionality that reflect the most interaction prospective users will have with the system. The following is a detailed description of each task and their rationale for being used in the test:

- (1) Create a new user and specify your needs
 - This task involved the initial interaction with the system, where the participants were required to create a new profile.
 - The task tests the systems ability to easily and intuitively collect and process user data. It also helps evaluate how user-friendly the creation process is, and whether it provides a good introduction to the systems features.
- (2) Review and complete a workout session
 - In this task, the participant must select and start a workout session from a list of tailored programs.
 - This task evaluates the functionality of the system in training guidance. It is crucial to see how the user interacts with the training programs, and whether the instructions are clear and motivating. This provides information about the user experience and can reveal areas for improvement in the training layout.
- (3) Update your current body weight
 - As part of a regular update, the participant must enter their current weight into the system.
 - This task tests the systems user interface in terms of updating and maintaining user data, which is vital for tracking progress over time. It is important to ensure that this feature is easily accessible and simple to use, as regular weight updates are central to the users ability to monitor and motivate themselves throughout their fitness journey.

From the think-aloud test of GymBuddy, we gained significant insights and the following are the documented observations on each task that the participants performed:

- (1) Create a new user and specify your needs
 - The participants liked how the colors used throughout the different wireframes in the system complemented the main color in the logo. However, a participant suggested that more colors would be a good idea to include in some of the icons or buttons to make differentiation easier.
 - One participant was a little confused about the switch between imperial and metrics initially but made better sense as they were switching it. Adding an icon by its side could potentially minimize confusion.
 - All participants suggested some adjustments to be made to the text sizes in the wireframes for user setup. One participant said: I feel like I had to be very close to the screen when setting up my profile, as some of the text was too small for me to read from a longer distance.
- (2) Review and complete a workout session
 - All participants found it easy to go through the workout sessions and could see themselves using specific exercises in their workout routine.
 - Some of the participants mistakenly clicked on buttons that they thought were clickable. One participant said: This button has been there throughout the entire workout session, but I was only able to click it when it ended. Maybe it should only be included at the end.
 - One user suggested adding some details to the eyes of GymBuddy to make it more realistic, but the rest of the participants gave positive comments about the cartoon eyes.
- (3) Update your current body weight
 - The participants were confused about which page they could change their body weight as they navigated through the different pages. One participant said: I went to the profile page first, but it makes sense that I have to change my body weight on the progress page now that I think about it.
 - One of the participants suggested that there should be some data added for the fat loss as well, since fat loss was highlighted under the graph.

E.3 Validation Documentation for Iteration #3



Gymbuddy: Is the market a personal buddy or something the gym owns and makes available to the users -- or a robot that uses your own phone? Is it perhaps scoped a bit widely, both towards beginners and more experienced users; consider scoping it to something you do really well -- is the focus mainly on doing exercises right or being motivated? The product itself appears a bit like an MVP though, which I like -- but it was hard to understand how the product actually works?

It seems like it could just be an app

Could it not be inconvenient to have a thing driving around the gym?

good

GymBuddy: I like the prototype made with cardboard. The UI is a little 2008 iPhone 3G. I would definitely look at a design system in the future to make it better looking. Perhaps make sure the Prototype works next time. Why do you have to click somewhere on some of these screens just to click next?

Gym-buddy: I think the mvp prototype needs a bit of work it seems to be missing quite a few features/interactions at the moment

Gym-buddy: For me you do not need to go through the login/setup wireframes, but you should focus on the functionalities. We needed to see more of the functionalities of the app. The solution can be more clear.

There are some problems with the prototype, but the idea is good.

Gymbuddy: Nice presentation, is it owned by the user or the gym? Can it be scoped a bit more?

GymBuddy: I like the idea and i would use it myself, i would like to have the possibility to play music while training you could considere including this feature if it doesnt have it yet.

GymBuddy: love the prototype and nice and intuitive presentation

Typically good, a nice design.

GymBuddy: Simple design

GymBuddy: Is this for the Gym or the Home? Do you need to buy it yourself and bring it to the gym or is it something the gym has? How does it measure the heart rate using a camera?

GymBuddy: Maybe set up wireframes are not necessary. Not entirely how the product would actually work when working out, wireframes for this would be nice.

Figure 8: Feedback from presentation

F LINK PROTOTYPE

Here the link of the executable prototype