# LET'S GET PHYSICAL:
# EXPLORING GAMIFICATION IN FITNESS APPS TO SUSTAIN USER ENGAGEMENT

by

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A Major Research Project
presented to Ryerson University

in partial fulfillment of the
requirements for the degree of
Master of Digital Media
in the program of
Digital Media

Toronto, Ontario, Canada, 2020

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## Abstract

Think about the last time you tried to download a fitness app. Odds are, you were met with a lot of options. With over 320,000 digital health apps available (Young, 2018), mobile users can become overwhelmed by choice (Wu, 2017) and about 71% end up dropping out of app based fitness programs within the first 3 months (Osypenko, 2017). While fitness apps can attract new users and generate high overall downloads through the utilization of gamification, novel experiences, and behavior change strategies, the research in this project has identified that these apps struggle to keep users engaged and using the app beyond the first 1-3 months. This project seeks to understand more about how gamification in fitness apps can be improved and how knowledge from game design and player-styles / personality types can be leveraged into creating a fitness program designed to motivate and engage specific users towards completing a fitness goal. This project aims to create a prototype of a mobile fitness-game experience that attempts to serve as a medium that gets users interested in getting active but also playing a game that is fun, motivating, and a way to act as a stepping stone for their future fitness endeavors. This prototype will be tested through iterative user-testing and serves as an artifact, demonstrating the theorized gameplay mechanics and strategies outlined in the paper.

**Keywords:** Fitness | Gaming | Role Playing Games | Cross Platform Mobile Applications | User Experience Design | Product Design

## Acknowledgments

I would like to thank my supervisor Steve Cober and second reader Jason Boyd for agreeing to offer their insight, time, and guidance to help me mold my project into what it is. I would like to thank the Masters of Digital Media program and each of my professors for continuously pushing me harder to think about how technology impacts our daily lives. At the very base of everything, I would like to thank my family and friends for always supporting me and making me a better person.

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## Introduction

Regular physical activity is critical to human health. People who are more active tend to live longer, have lower risk for heart disease, stroke, and are more likely to maintain a healthy weight. Recent studies estimate that physical inactivity contributes to 5.3 million deaths per year globally (Miles 2007).

Modern solutions are being developed daily to help alleviate this problem. In terms of fitness applications, there are currently over 320,000 health and fitness apps in the app stores (Young, 2018). Contemporary technology and smartphone usage has come with a lot of benefits. We have information at our fingertips, easy access to various social networks and content whenever we need it. The increase of smartphone usage does however come at a cost - namely our decreasing attention span when it comes to digital content (Wu, 2017).

Fitness applications in particular suffer from high saturation and low retention rates. When users feel like they are not getting the results they need, it is easy for them to delete their app and find a new one. User churn rates in fitness applications outweigh retention in any kind of app. According to statistics, 71 percent of users will abandon an application within three months (Osypenko, 2017). Researchers believe that this comes as the result of designing weak mechanisms for behaviour change and issues creating a need for long term use (Byambasuren, Sanders, Beller, and Glasziou, 2018). Smartphone apps still however have a huge potential to create positive change on users and make an impact on creating behaviour change for a healthier lifestyle.

This paper begins with a literature review that introduces relevant background information and explains how gamification can be best utilized alongside player styles to create

an effective environment for user engagement. The following section of the paper reviews the methodological approach used throughout the development of the project. This project adheres to the User Centered Design process outlined by the Interaction Design Foundation ("What is User Centered Design," n.d.). The paper will then proceed to discuss findings from prototype testing and evaluate how the design met the user requirements. Concluding remarks and limitations will follow after that, along with suggestions for further explorations.

## Literature Review

### Instant Information and Attention

According to a 2016 survey by Deloitte, more than 40 percent of consumers said they look at the devices within five minutes of waking up. Fifty percent said they check them in the middle of the night (Deloitte, 2016). As of January 2020, there are 1.8 million apps on the iOS app store (Costello, 2020). This has come a long way from the original 500 apps in the first iteration of the iOS app store in 2008. New apps are created everyday to solve problems, facilitate, leisure, and add utility to user's lives but each of these apps have to compete with each other for their user's attention.

In their review of the 2019 app market, *Business of Apps* indicated that 25% of apps downloaded around the world are only used once. Furthermore, they found that over a 90 day period, app retention rates vary at 29%, although they iterate that this is a generous estimation. Over 50% of user churn occurs within the first month, and then drops off to lower rates after that mark (Iqbal, 2019).

Social media apps are currently the most popular apps in terms of usage, with Facebook dominating since they own 3 out of the top 4 apps. Facebook's popularity comes with its ability to tackle users in virtually every end of the globe (except for places like China, where Facebook is banned). In 2018 however, games were the most downloaded category - with health and fitness not even being in the top 10 on either Google Play or iOS. (Iqbal, 2019). The only fitness related item that ranked highly in terms of usage was seen in the global phenomenon of Pokemon GO - which was the 8th most played game globally.

**The Driving Force Behind Popular Applications**

What makes some experiences more worth our attention over a long term period than others? Both social media apps and games incorporate the framework of sociability and gamification within their designs. It is important to note that these frameworks are not exclusive to the category that the app is found in. Many of these apps, if not all, incorporate both elements into their design to create an engaging and also addictive experience.

**Sociability**

It goes without saying that we are living in a social media era. Instagram, Whatsapp, WeChat, and Facebook are apps that touch users all around the world. A particularly important aspect of social media websites is social validation. The likes, comments, and instant interaction we get when we post/share content online has considerable effects on our motivation to continue using these apps. Furthermore, "fear of missing out" is another driving force. Our brains are wired for collaboration, comprehending, and managing our place in shifting alliances. Social media applications give us the opportunity to form and solidify these alliances as well as explore new ones (Keep It Usable, 2017).

The primal instinct social media applications let us tap into have been so effective, that psychologists estimate that as many as 5% to 10% of Americans meet the criteria for social media addiction today (Hillard, 2019). This can be attributed to the dopamine inducing social environments that are baked into all of the popular social media applications. Facebook, Snapchat, and Instagram produce the same neural circuitry that is caused by gambling and recreational drugs to keep consumers using their products as much as possible.

**Gamification**

Games motivate millions of users globally to spend time and money towards completing menial tasks. In the contemporary digital age, "gamification" is the current buzzword used to describe the ability to capture the tactics used in games and apply them to non-game contexts. Gamification elements include badges, leaderboards, and points. Designers argue however that apps cannot be successful with just the integration of game components but need to include game design as a whole. Games are not a replacement for thoughtful experience and interaction design; they are an alternate lens for framing that process (Deterding, 2012).

The notion of gamification can be broken down into several components, as described in Burke's 2016 book, "Gamify: How gamification motivates people to do extraordinary things." Game mechanics refer to the individual components seen in games such as points or leaderboards. Experience design describes the journey the players take with the elements. This includes the game's storyline, play space, and gameplay itself. Gamification seeks to engage with the user digitally rather than personally. This means the player will interact with smartphones, wearables and other digital devices. The goal of gamification is to motivate people to change behaviors or develop skills, or to drive innovation. Gamification focuses on enabling

players to achieve their goals—and as a consequence the organization achieves its goals (Burke, 2016).

**Contemporary Digital Fitness**

Fitness, lifestyle, and overall health apps are nowhere near as popular in terms of usage as the social media apps and games mentioned above. Fitness apps and experiences revolve around trying to promote behaviour changes in users. These apps seek to either serve as a gateway to a "healthier" lifestyle or a tool to maintain this change. In 2017, Sullivan and Lachman conducted a meta-analysis examining both the promotion and measurement of physical activity through the use of behaviour change strategies and fitness technology. A key aspect of this review was to pinpoint the most common behaviour change strategies used in these apps. The strategies include:

- Self monitoring
- Feedback (linked with gamification)
- Rewards (linked with gamification)
- Social support (linked with sociability)
- Virtual Coaching

The most common metric tracked by these apps are steps. It is unclear, however, whether steps are the best activity indicator or motivator, and whether this metric is meaningful to those without a fitness tracker or app that measures steps. A separate study by Erin Lee and Jaehee Cho (2016) argues that the act of recording steps (or other things like food logs) is actually

important because it contributes to the routinization/habitualization of activities like walking (or dieting, in the example of recording food logs).

Despite integrating all of these factors, what is holding fitness apps back from being as popular and effective as other social media apps or game apps? The main issue is the over-reliance on gamification elements. Apps tend to use game mechanics without focus on the experience design itself. Games ultimately end and when the novelty of prizes like points, leaderboards, and step counts wear off, the experience becomes monotonous and users quit (Eyal, 2017). Although system rewards support reflection and offer early-stage motivation, researchers also suggest that it may be worthwhile to consider broader reward types such as "real-world" rewards. (Huang, Murphy, & Zimmerman , 2014). Developers often make the mistake of thinking users will indefinitely care about the 'digital' rewards the app may provide them and the researchers suggest trying to branch out and bring in more ties to the real world (Huang, Murphy, & Zimmerman , 2014).

In a study run by Lister, West, Cannon, Sax, and Bordegard (2014) researchers reviewed 132 health and fitness apps in the iOS app store and analyzed their use of gamification components. The objective of the study was to analyze the gamification of health and fitness apps as a potential component of influence on a consumer's health behavior. What the researchers found were the most popular apps showed widespread use of gamification principles, but low adherence to any professional guidelines or industry standard.

Common gamification systems included:

- Leaderboards
- Levels of achievement

- Digital rewards
- Real world prizes
- competition/challenges
- social/peer pressure

It is clear that the use of gamification is heavily influenced by the video game industry. The use of game elements were correlated with app popularity. It can be easier to explain a concept to a user as a game than a set of principles and patterns out of the context of a game.

Relying only on gamification doesn't just fail to engage players; it can actually damage existing interest or engagement with the service or product itself (Deterding, 2012). Adding on gamification elements to tasks without taking into consideration the overall design of the "game" can lead to making the user feel annoyed or that they are being forced into doing something (Eyal , 2017). "Reactance" is a physiological phenomenon which states that humans will resist things they feel coerced into doing. This is counterproductive when the goal of the app is to help form behaviour changes. To sustain motivation over a long period of time, users have to want to do the activity that they are doing (Eyal, 2017). Researchers are also concerned with the promises that fitness apps make. In a study done in 2018, researchers were only able to find six systematic reviews, which included only 23 randomized control trials — the gold standard for medical research — since 2008. If the fitness aspect of the app does not cause the user to lose weight or improve their physicality, this will lead to users persistently deleting apps and trying others.

These factors all come together to highlight an important point. When designing a fitness application, if all the focus is on combining behaviour change strategies to maximize arbitrary

sociability and gamification, then the app will most likely not help users over the long term. The sociability and gamification mechanics have to mean something for the user in order for them to continue using their app.

**Motivation, Game Loops and Player Styles**

To keep a user engaged in a particular game, and give them their "why" to complete their experience requires the innate design of the game to generate motivation for completion. According to David Ghozland (2007) : "The gameplay and the game systems will play the role of immersive catalyst, in order to monopolize the whole attention of the player. The persuasion capacity of a game designer is measured by the strength of his game systems." Users retain their engagement through a combination of the game's story, world design, and most importantly, gameplay.

The PNRC system (see Appendix A) is designed to manage internal motivations from both the game and the game context (Ghozland, 2007). Rewards offered in the game must scale to the context of the gameplay experience that the game seeks to deliver. Ghozland argues that the player's motivation is an outcome of the following 4 functions:

**Player State (P).** The "Player State" is the stage the player is at at various points of the game. For example, the level of their equipment, their power, and their knowledge of the game world / game mechanics.

**Needs (N).** "Needs" are what the player requires as the game's challenges arise. Needs are determined by the player's state and where the player is in the game.

**Reward (R)** . This refers to the player's expectation of their reward. The value of the reward is based on estimated difficulty and is a function of the player's Needs.

**Challenge (C) .** "Challenge" refers to the player's expectations regarding their challenge. The value rises the more the player believes in their own abilities.

With regards to the various variables, motivation (M) can be equated as

$$M(P) = N(P) * R(P) * C(P)$$

As soon as one of the functions (N,R, or P) is null, the motivation of the player state is null. For example, for a given player state, if good performance is not recognized by the system, motivation decreases. Similarly, if the player is given a poor reward, despite having significant needs and also having a high belief in their ability, motivation will decrease.

Depending on the style of the game, games can have a variety of models revolving around any one of these player states. For example, a game that seeks to reward the player with every action they complete, would follow a "motivation on the reward" model. This would result in a closed loop and as the player progresses, their needs N are big and expectations on reward R would scale with that. The C value would be proportional to the player's strength. As P grows, N, R, and C follows the same evolution. Games can also be designed around the "motivation on the needs", "motivation on the challenge" , and "motivation on the player state." Of course, games could feature a mixed variety of these motivation models, but this is largely based on who the game is designed for and what objectives the player is expected to complete.

In the case of fitness apps, again, applying gamification elements without thinking of the larger picture of the game model could contribute to why users fail to remain engaged by the challenges the apps may offer. Game models are important, but researchers are understanding

that the effectiveness of games (or any task) for motivation can also be influenced by both player styles and player personalities. Motivation science is an emerging field and offers a multidisciplinary, multimethod approach to finding out the ways in which users can be encouraged to complete a task (Murayama , 2018).

Does the allure of rewards truly enhance outcomes? According to recent findings in cognitive neuroscience, the answer seems to be 'yes' (Murayama, 2018). But research in social psychology has also found that extrinsic rewards can sometimes undermine intrinsic motivation when people are engaged in an interesting task. This is known as the *undermine effect* (Deci, Koestner & Ryan, 1999). This effect suggests that sometimes, rewards may not always benefit performance on tasks that could be performed without extrinsic incentives (for example - an interesting task).

The balance of rewards offered has to be something that speaks to the user engaging in the game. In 2018, Orji, Tondello, and Nacke conducted a large-scale study of 543 participants to investigate how different gamification user types responded to ten persuasive strategies depicted in storyboards representing persuasive gameful health systems.The strategies tested were competition, simulation, self monitoring, goal setting, customization, reward, social comparison, cooperation, personalization, and punishment. This was plotted against the Hexad model for different player styles.

The Hexad model (Appendix-B) describes 6 player types (achiever, socialiser, philanthropist, free spirit, disruptor, and player). The Hexad gamification user types is the first user typology that is specifically developed for studying user preferences in gameful systems.

Orji, Tondello, and Nacke argue that most, if not all, persuasive games offer a one-size-fits-all strategy for behaviour change; however, research shows that this may lead to ineffective results.

Researchers found that people's gamification user types play significant roles in the perceived persuasiveness of different strategies. What the researchers found was that people scoring high in the ‘Player’ category tend to be motivated by competition, comparison, cooperation, and reward. Players are motivated by external rewards or incentives. They will do whatever to earn a reward within a system, independent of the type of the activity (Orji, Tondello, and Nacke, 2018). Interestingly, 'Socialisers' could be motivated using any of the strategies listed in the study and they are the most responsive to persuasion overall. The Hexad model defines ‘Socialisers’ are defined as being motivated by relatedness. They want to interact with others and create social connections. In summary, ‘Socialiser’ and ‘Player’ emerged as the user types that are most motivated by the persuasive strategies overall. ‘Achiever’ and ‘Sisruptor’ emerged as the least responsive user types. ‘Disruptor’ is negatively associated with most of the strategies, while ‘Achiever’ shows no significant relation with any of the strategies (Orji, Tondello, and Nacke, 2018). The ‘Achiever’ is defined as seeking to progress within a system by completing tasks, or prove themselves by tackling difficult challenges. ‘Disrupters’ on the other hand test the system’s boundaries and disrupt the system either directly or through others to force negative or positive changes (Orji, Tondello, and Nacke, 2018).

## Methodology

The following section of the paper will outline the methodology used to create a prototype of a fitness app demonstrating gamification mechanics designed for specific player

archetypes identified from the Hexad model. Prototype design would adhere to the User Centered Design process, outlined by the Interaction Design Foundation ("What is User Centered Design," n.d.). A table referencing this process can be found in Appendix C. User-centered design is an iterative process where you take an understanding of the users and their context as a starting point for all design and development.

The process describes four areas of action: (1) Understanding context of use; (2) Specifying user requirements; (3) Creating design solutions; and (4) Evaluating against requirements. It is important to note that the process has opportunities to go back and reevaluate any of the areas of action at the time of evaluation. This allows us to iterate on ideas, goals, and solutions and to test again. I believe this process applied towards a working prototype will help build on existing research and will seek to provide insight on how the identified gamification strategies, behaviour change processes, and identified user-types play together and create further areas for focus and improvement.

**Context of Use**

Context of use is defined as the conditions under which a given artifact or product is used and also how it will be used in day to day conditions ("What is User Centered Design," n.d.). For the context of this app, we know that this will be developed to be a game played on a mobile device. The game is accessed via the Google Play store or Apple store. The fitness game is one that can be played casually while seated and also on the go, since the app will aim to integrate with fitness mechanics such as steps. The player has an expectation that the game will somehow interact with their activity and visualize it to facilitate their fitness journey. To do this, the game will talk to the smartphone and integrate collected data into its UX.

## User Requirements

To identify user needs, a survey was created to supplement the findings from the literature review. It was deemed beneficial to conduct the survey because of the ever evolving nature of the app store dynamic. User moods, preferences, and experiences are always evolving, so having an up-to-date understanding of how users feel about fitness apps can reaffirm previous findings and highlight new ones.

### User survey

A survey was conducted via SurveyMonkey's recruit platform that garnered 147respondants. Ages ranged from 18 - 60; 69 respondents were male and 78 female (see Appendix D for survey questionnaire). The purpose of the survey was to gauge user sentiments towards fitness apps and what they may find missing from their experiences with them. Results from the survey would be used in combination with the research to cultivate a framework for the designed prototype.

A majority of the respondents admitted to being willing to try a fitness game. The highest cited reasons for downloading fitness apps in the past were: (1) inspiration; (2) curiosity; (3) keep workouts fun. Interestingly enough, the highest cited reasons for what users felt would benefit them most in a fitness app were: (1) keeping workouts fun; (2) home workout inspiration; (3) set clear goals. When users were asked to openly comment on things they would like to see in fitness apps, users frequently mentioned requiring easy ways to track their activity, to be more dynamic for different types of fitness levels, and ultimately to keep them motivated to keep using the product.

It can be assumed that the requirements of having a more fluid, fun, and easy to use experience will be a constant goal for designers and developers to work towards. Nonetheless, it is something that must continuously be iterated on as we move closer and closer to this requirement.

Based on survey results, we could say that the primary thing users care about is finding something that makes getting fit fun and easy. This is important to the user because with current experiences with fitness apps, users feel like they struggle to stick with one app and get bored easily. The emotions driving the user's behaviour are largely frustration and confusion from feeling like they cannot stick with their fitness goal, yet they still have curiosity and hope that something will be able to help them. Through finding the right app for them, the user stands to gain comfort that they are taking action towards a lifestyle change that they want.

**Defining features**

Part of what this project is aiming to do is put user requirements in the context of specific player styles. This will hopefully move away from "one-size-fits-all" approaches and better keep specific users engaged throughout various parts of the fitness experience. As Orji, Tondello, and Nacke highlighted in their study (earlier referenced above), the archetype of the "Player" and the "Socializer" from the Hexad model were most receptive to the different persuasive strategies. For this project,  the game will primarily be designed for the "Player" archetype and have a secondary focus on the "Socializer" archetype.

Like other apps in the fitness category, gamification will be used to keep the experience fun. However, as identified in the literature review, this prototype will move away from only

focusing on game mechanics (points, leaderboards, badges, etc.) and will focus on these in relation to the greater experience design being created for the identified archetypes.

**Rewards.** We know that the Player archetype is motivated by Rewards. They will do what is needed to collect rewards from a system. An emphasis on rewards is what will make up the backbone of the game loop. This is so an explicit system is created that will ensure that, as the player is going through the game, they are more likely to be motivated to achieve the next reward - thus keeping them engaged for longer. Per Ghozland (2007), the *Motivation of the Reward* loop is focused on rewarding each effort made by the player. Games following this type of design typically fall into the realm of role playing games (RPG) or adventure games. In these situations, the primary goal of the player is to progress through levels and defeat enemies. Defeating enemies nets the player experience and rewards and the more the player progresses in the game, the stronger they will get. The game's difficulty level will grow as the player progresses, but the game will offer the player the ability to get stronger with each interval. This is a very common gameplay scenario and a concrete loop that can fit behind many narratives. The overall loop is closed as the player moves from encounter to encounter. Their needs **N** are big (equipment and levels) and expectation of rewards **R** are big (experience and treasures). Expectations on challenge **C** are proportional to the strength **P** of the player. Since **P** continues to grow, **N**, **R**, and **C** follow the same evolution during the game.

Thus, the basis of keeping the game fun will be through constantly providing the player with rewards as they progress through the RPG style game world. This RPG game world will be layered, however. At the foundational level will be what the user will expect in a traditional RPG video game. This includes a unique world, quests, a level system as well as items, upgrades, and

characters to talk to as they explore. At this level, the game offers a base type of extrinsic reward. Completing quests, leveling up the character, exploring areas of the game world all merit in-game rewards, per the PNRC model. These rewards scale over time as well and balance out at each level of the player state.

At the next level will be the reward for fitness activity. While the prototype is meant to be played as a game, the fitness element is what stabilizes the experience as a digital fitness program. The next section of the paper will go more in depth in terms of how fitness data will be used, but for context of rewards, the user will expect to receive rewards that map to the amount of effort they exerted in the real world, outside of the game. This means the game must recognize the user's efforts and continuously provide them with rewards for their activity. This will serve as a source of motivation for the player.

Finally, the last layer of rewards are intrinsic in nature. This involves the satisfaction of helping others accomplish their fitness goals. These rewards speak most to the Socializer archetype. To achieve this, the game will leverage common game mechanics found in online RPG games. For example, having a friends list of users that the player can interact with. Being able to defeat enemies together in a cooperative mode, and also being able to send in-game gifts that could help others. This can be extended to creating game factions and teams that players can be a part of and complete challenges, fostering a level of social competition.

**Tracking activity.** To make fitness data easy to track and use, there are two core requirements. The first is that there needs to be seamless integration between the real world and the digital game world. This means that the mapping between fitness activity and game mechanics need to make sense for the user. The second requirement is that the actual quantitative

data must be simple to track. This is where the benefits of smartphones can be leveraged. With the smartphone, it is simple to track common fitness metrics such as steps and also sleep. Furthermore, it is possible to track nutrition as well, through widely available API's that provide nutritional databases. A benefit to keeping it simple when it comes to the level of tracking is that it reduces the amount of complexity for the user. If the user feels overwhelmed, there is a possibility that their engagement may be lost. Additionally, contrary to many fitness apps and programs, a dedicated workout routine and strict diet regimen is not the only method to adopting a healthier lifestyle. Too often, these are hard to maintain and require much trial and error for the user before finding a program that fits with their lifestyle and preferences (Baechle & Earle, 2008). The approach that will be taken with this app is to descope the breadth of fitness goal-setting provided to the user and instead focus on bringing awareness to the user's existing habits and provide them with the knowledge to act on this. When working with beginners, it is less critical to have a 100% perfect fitness program because most beginners will make progress with anything given to them (within reason) (Baechle & Earle , 2008).

To make tracking feel simple, and thus meet requirements for the user being able to easily track their activity, it is hypothesized that if tracking activity is made part of the game mechanics and integrated into the game loop, it will be more fun to do so, and thus the user may have more motivation to do this activity as well. If the user does not feel forced to track their activity within the app or check on their performance, it could remove mental barriers and thus feel easier, as they are not thinking too much about it.

As mentioned in the section on rewards above, each tracked metric has to map to a mechanic within the RPG design and also fit within the base reward model. To do this, it has to

be decided where each metric can be placed such that it makes sense to the player and the overall game mechanic.

**Goal setting and guidance.** Another finding from the survey was that users were looking for help setting clear goals. To the extent that the app offers fitness tracking capabilities (steps, nutrition, and sleep), it can help the user set goals for each of these as well. This ties into the reward model mentioned above as well, as the game can provide in-game rewards for the player to further facilitate motivation towards accomplishing their goals. It is important to include goal setting as it helps tailor the journey for the user, ensures the experience is dynamic per different fitness requirements, and provides an additional prompt to merge the digital game world with the player's physical world.

## Design Solution

The design phase of the project involves taking the user requirements and intended functionality and uniting it with a proposed design solution. It is important to understand that this design solution is simply the first iteration of the experience and is subject to change based on findings from the evaluation phase. Prototype design and development was completed using Figma, a collaborative design tool (See Appendix E). This tool was chosen because it allows for rapid design, integration of assets, and an effective prototype builder that can be played in the browser. This aspect was important for the user testing purposes as it would allow for easy access to the prototype.

The first version of the prototype is by no means a complete reflection of the outlined requirements and functionality in the previous section. It does however include enough to give

the player a gist of what features to expect. This was intentionally done to ensure testing could run smoothly. If the Figma prototype was too exhaustive, it risks confusing the user with too many scenarios. The prototype sought to display the intro sequence, onboarding process, goal setting, and introduce basic gameplay. Each of these things could be chained together so it flowed naturally for the user. The goal of the prototype's design was to include enough context and information to see if players could make the connections between game mechanics and fitness elements and furthermore to gauge their level of interest in the experience.

With that being said, the prototype introduces the player to the world of "Kalory Island." The first thing the player does is choose their character class, a similar mechanic found in other RPG games:

- *Knight* (warrior)
- *Druid* (mage)
- *Scout* (survivalist)
- *Bard* (charismatic)

Each class has different strengths and weaknesses (See Appendix F for full description of character classes). After this, the player details their initial height, weight, and gender, which is collected for updating their profile and can be used for fitness goal setting. Upon arriving to this exotic world, the player is introduced to the primary mechanic of their camp and the game world and will also start with a base level of resources needed to explore the world and unlock the first series of upgrades. The player receives an in-game device that is their way of tracking their activity and seeing the reward they receive for their activity. Each fitness element is stylized in

the game and documented as part of the gameplay experience for immersion. At this point, the player is introduced to the first fitness mechanic tracked in the game: steps.

Players will receive an in-game currency for their activity level (steps). In the game, this currency will be known as “Pebbles” (arbitrary name, chosen as a lighthearted joke that something so common could fuel the game’s world economy). Pebbles can be consumed for a variety of things such as unlocking levels, opening chests, upgrading equipment or trading for items. Upon death, the player risks losing their pebbles for good.

After this explanation, the player is offered the ability to explore a limited amount of the game’s world. Here they are introduced to the games humor, combat system and the concept of losing their Pebbles upon falling in combat. Combat is implemented as a classic turn based system with leveled enemies that scale to a level range relative to the player. Completion of each combat sequence provides in-game rewards and Pebbles. The player is also introduced to the concept of making purchases with their Pebbles to receive unique opportunities/experiences/items.

Upon deeper exploration, the player is met with a significantly harder enemy. Through a snackbar notification, the player is encouraged to log a meal they may have eaten, which could potentially help them in combat. This is the second fitness mechanism introduced to the user: nutrition. As the player logs their meal, the app exhibits the ability to search and log food from a database, although an API has not been identified. This was done to give the player a gist of what the experience could look like. Prior to logging their meal, since this is the player’s first time tracking their nutrition, they are asked to enter their goals (lose weight, maintain weight, gain weight). This would determine the target caloric intake the app would provide. As of right now,

the app did not implement a unique equation for caloric goals, but it was included to give the user the gist of what they could expect from the app (see Appendix G).

Successful logging of food allows the player to use an item that would benefit them in combat. Because in this example, the player logs a meal with a high carbohydrate macronutrient ratio, they have more energy in combat and can attack twice per turn for a limited period of time.

The prototype features a humorous tone, with 2D, hand-drawn art style. This is meant to provide a relaxed environment and not take itself too seriously, allowing the player to not be intimidated by the prospect of getting active to play the game.

Not included in the prototype is the various social elements and interactions as well as the mechanic of tracking sleep. These were omitted from the design because it felt that it would add more complexity for the user going through basic onboarding and level design. This is an opportunity for improvement and something that should be included in the next iteration of the prototype to test.

**Evaluation**

Conducting usability testing was done via the usertesting.com platform. This allows for unmoderated user testing where the user can interact with the prototype with both their screen and audio recording. Three participants were randomly selected via the usertesting.com recruitment platform. As explained by Jakob Neilson, when conducting usability testing, it is best to stick with a maximum of 5 users. Testing with 5 participants typically uncovers the majority of the usability issues found in a design, and going past that number typically begins to yield less significant insights (Neilson, 2000). It is recommended to run multiple tests with fewer people than a single test with a larger user pool. For the purposes of budget, three users were

selected in this project, with the intention that more user testing sessions would occur with future versions of the prototype. Of the participants, 2 were male and 1 was female. A list of questions asked to the participants can be seen in Appendix H. The outcomes of the evaluation stage will be discussed in the following section.

## Discussion

Of the participants who interacted with the prototype, all of them were able to make connections between game mechanics and fitness tracking. Two of the three participants identified as users who have tried fitness apps in the past, have struggled with their own fitness journey, and were willing to try new apps that would introduce novel ways to help them reach their fitness goals. Both of these participants admitted to being familiar with the RPG elements of the prototype and could make connections and assumptions about gameplay and how it could help their motivation for working out. Both participants were specifically interested in exactly how data would be tracked and how tracking could be made easier for them. One of the participants was actively looking for opportunities to use their camera to scan barcodes on food items to automatically get nutritional information, which is an experience found in other competitor apps such as Myfitnesspal.

It was interesting to see participants interact with the game mechanics and make assumptions about what they could expect in the game. Two of the three participants felt that by playing the game, it would give them motivation to continue their habit of tracking their fitness activity, especially on days they did not feel like doing it, just because of how much it impacted gameplay. Majority of the participants also felt that this would be an experience they would like to try out and play more, and expressed interest in testing future versions as well.

The first round of prototype testing validated the user requirements of users wanting fun and easy methods of tracking their data. This area is where participants expressed strongest interests and it is where they asked the most questions about how things would work. Participants also were able to recognize prompts in the prototype for goal setting, however participants also felt that the onboarding process of introducing both gameplay elements and fitness mechanics felt a little long. It was notable in their tone that participants felt less interested when going through tutorials and text; however, when they were able to freely explore and make their own connections in the game, their interest increased and their tone felt more lively. Because the context of use in this case is a mobile game, participants expect to be able to quickly get started playing, which should be scoped out clearly as a user requirement and thus reflected in the design.

Only one prototype was designed and tested in this project; however, enough feedback was received to provide prompts for a future build of the prototype. This includes reevaluating the onboarding process to make the experience more interactive for the user to begin playing, rather than reading text from the app. This interaction could better fit with goal setting strategies and give the user more comfort in how the experience would be tailored to their needs. Each fitness element tracked in the game could also be more explicit in terms of how simple it is for the user to use. This includes explicit implementation of things like barcode scanners for entering nutritional data, and also possible opportunities to sync data with other fitness apps participants may be using. What this first round of testing has affirmed is that while users may be excited to try a novel game experience and could be interested in the possibilities of gameplay, their primary concern is the degree in which they feel comfortable with what fitness data is being

tracked and how easy it is for them to track this. It comes back to the original user requirement of users wanting something fun and easy to use.

**Limitations**

The first limitation of this project was that the prototype was tested in the browser, and this could not test the contexts of use mentioned above. While testing in the browser makes the process of user testing easier, it still results in changing the dynamic of how the user is playing the fitness game and moves away from the experience of playing the game on a mobile device. For future usability testing, it would be best if the prototype could be played on a mobile device.

The second limitation was that the prototype did not include the full breadth of features and functionality that were listed in the user requirements section. For future tests, these would need to be included to get a better understanding of how users feel about these features and also how everything is tied together for the final experience.

An additional limitation is that the first round of testing did not test for the Hexad player type of the participant prior to testing so that it could be certain that the correct archetypes were being used. This was not included due to budget limitations for usertesting.com; however, for future testing, knowing the archetype the tester identified with would help in understanding if the designed features actually interested them or not.

**Summary**

In conclusion, this project sought to understand why fitness apps struggle to keep users engaged for long periods of time. It has been identified that health and fitness apps typically see a 70% user churn rate within the first 1-3 months. This project investigated the use of gamification in fitness apps and identified that many instances of gamification rely solely on

introducing game mechanics, but do not incorporate it as part of a larger experience design, with the purpose to sustain motivation through the game loop. Furthermore, the project built off new research on targeting gamification to specific player styles from the Hexad model that would be more receptive to different tactics. This information was used in combination with the User Centered Design Process from the Interaction Design Foundation to create a prototype of a mobile fitness game that specifically designed its game loop and motivation model primarily for the archetype of the "Player" and secondarily for the archetype of the "Socializer." This prototype was tested with unmoderated user testing and has provided useful insight on how to improve the designed user experience. The project seeks to help aid the growing research in human computer interaction and understand how findings on gamification can fit within a contextualized game experience users can test.

## Appendix A - PNRC Model

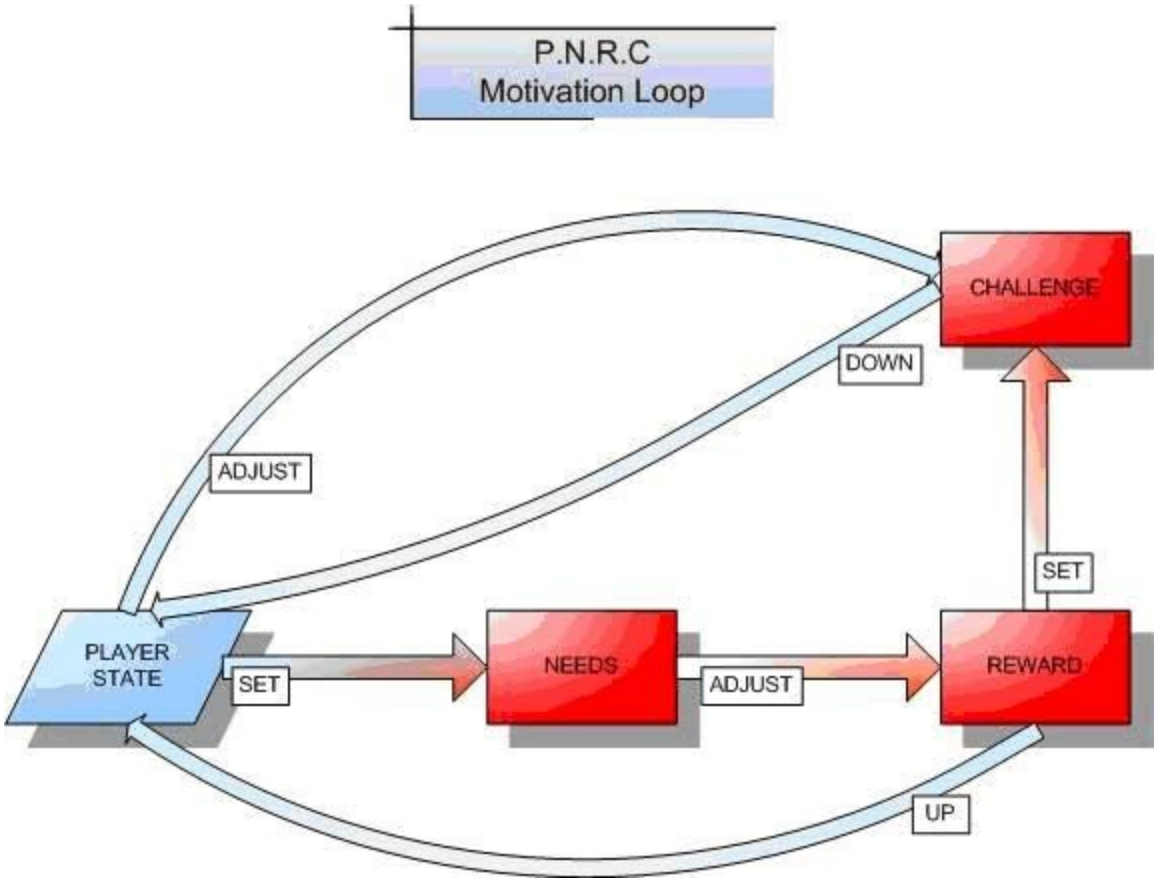


Figure A-1 - The P.N.R.C model by David Ghozland (2007). As the player state changes, they will have different needs. These needs adjust the type of rewards they expect to receive, which determines the challenges the player will face. Finishing challenges increases the player state, which facilitates the rest of the loop.

## Appendix B - Hexad Model


Figure B-1. Illustration of the Hexad model illustrating the 6 player styles and the 6 gameplay mechanics that they are driven by

## Appendix C - User Centered Design Process

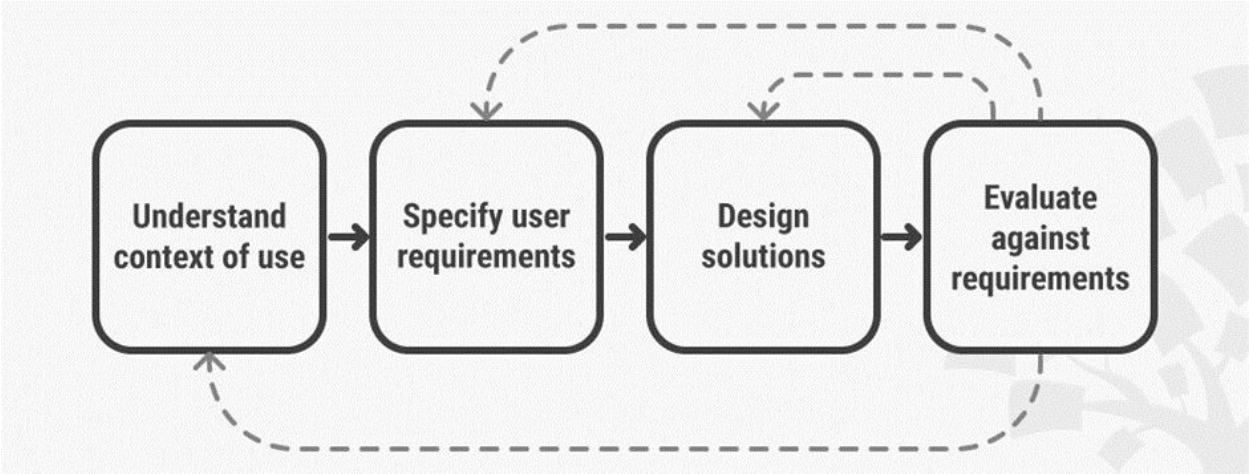


Figure C-1 - The User Centered Design Process. This is from the Interaction Design Foundation. This iterative process begins with defining the context of use, and further defining user requirements. These are used to formulate a design solution. The solution is to be tested, which helps researchers go back and redefine values in the previous steps.

## Appendix D - Survey Questionnaire

1. Would you consider playing a mobile game to increase your fitness?
    a. Yes
    b. No
2. Do you struggle or have you struggled in the past with reaching your fitness goals?
    a. Yes
    b. No
3. In your experience, were mobile fitness apps helpful in getting you to stick fitness goals you have made?
    a. No
    b. Yes (please specify)
4. When was the last time you used a fitness app?
    a. Today
    b. This week
    c. This month
    d. In the last 3 months
    e. In the last 3 to 6 months
    f. Other (please specify)
5. What motivated you to download the apps you did
    a. Workout inspiration
    b. Add structure
    c. Find new people to workout with

d. Curiosity

e. Make my workouts fun

f. Other (please specify)

6. Which of the following features do you feel would benefit you most in a fitness app

    a. Online coaching

    b. Social networking

    c. Making fitness fun

    d. Home workout inspiration

    e. Gym workout routines

    f. Helping you set clear goals

    g. Other (please specify)

7. If you had a magic wand, how would you improve fitness apps or fitness games?

# Appendix E - Prototyping in Figma

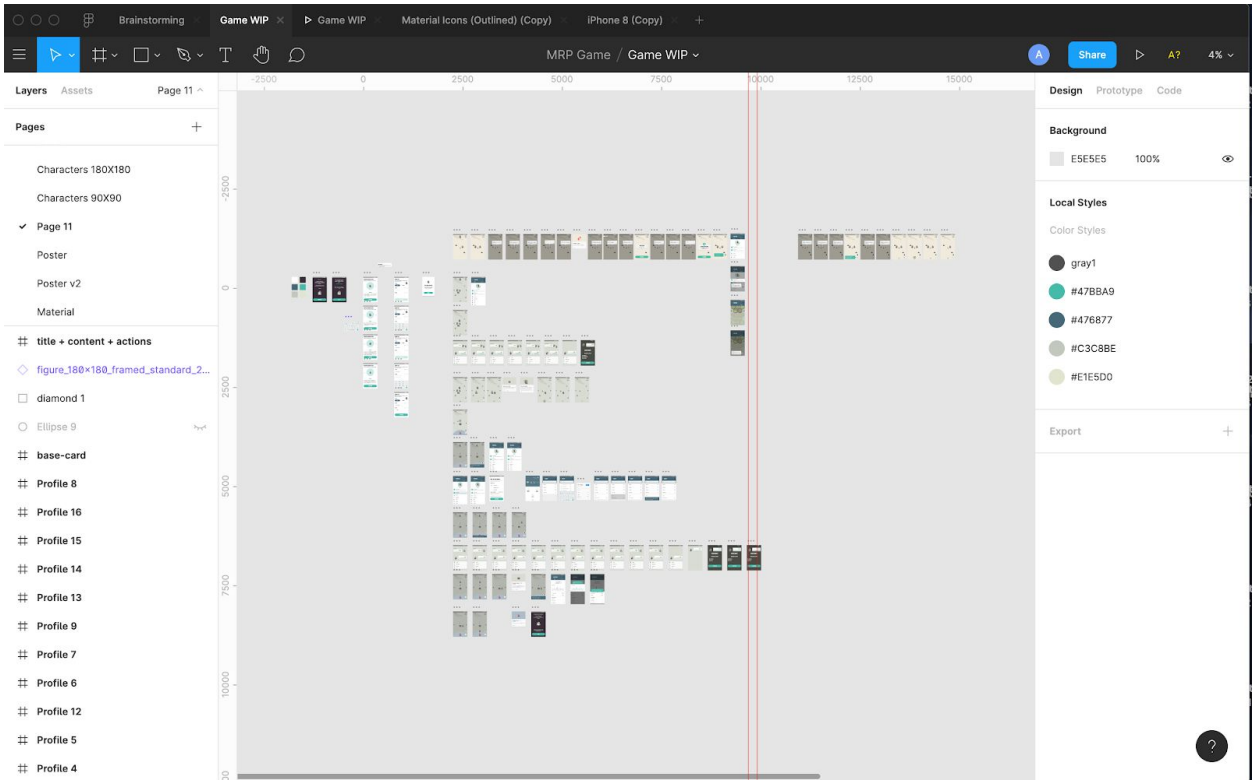


Figure E-1- Prototype design in Figma. A Link to the prototype can be found here:

https://www.figma.com/proto/oP0l3flUKIfjG6KT5PflsF/Game-WIP?node-id=68%3A566&viewport=-294%2C-1604%2C0.2433300018310547&scaling=scale-down&hide-ui=1

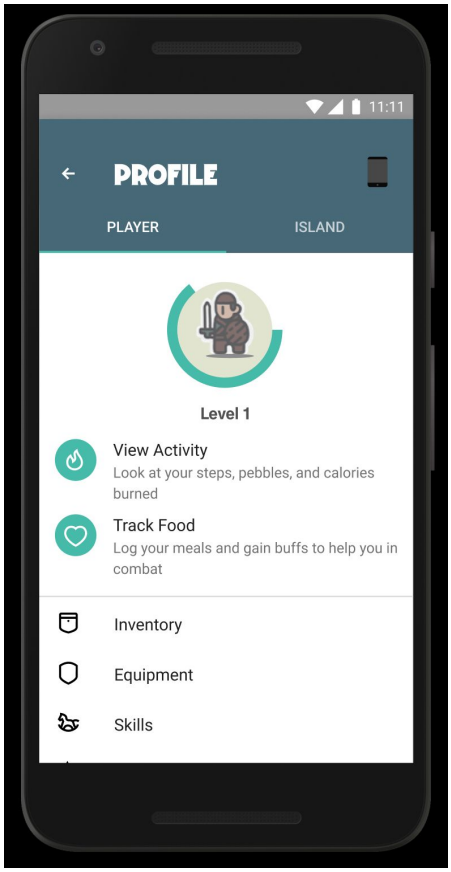


Figure E-2- Designs in Figma were exported as a prototype that could be played in the browser. This prototype would be displayed within a mobile phone to provide context to the user.

## Appendix F - Class Descriptions

*Knight*: *This is the classic warrior. They wield weapons and axes and do bonus damage with them. They benefit the most from wearing armor and have a natural weakness towards magic.*

*Bard*: *This class predominantly features charisma and defensive fighting. They are weak at crafting skills, healing, nature skills and wisdom. Bard's get discounts at all merchants and do better talking than fighting. Members of the class are mostly found in the cities or out strolling the countryside. Their music can soothe enemies and companions alike. This is the hardest class to use.*

*Scout*: *This class predominantly features speedy movement and endurance and is moderately good at magical area effects. They are not very capable with rituals, or magic, but are celebrated survivalists. The scout is recommended for beginners or those wanting a smoother experience in the wild.*

*Druid*: *This class predominantly focuses on the power of magic and healing. They are not known to be trusted by humans because of a few bad eggs. The Druid is flexible and can use their magic for many things outside of combat.*

## Appendix G - Tracking Nutrition in the Prototype

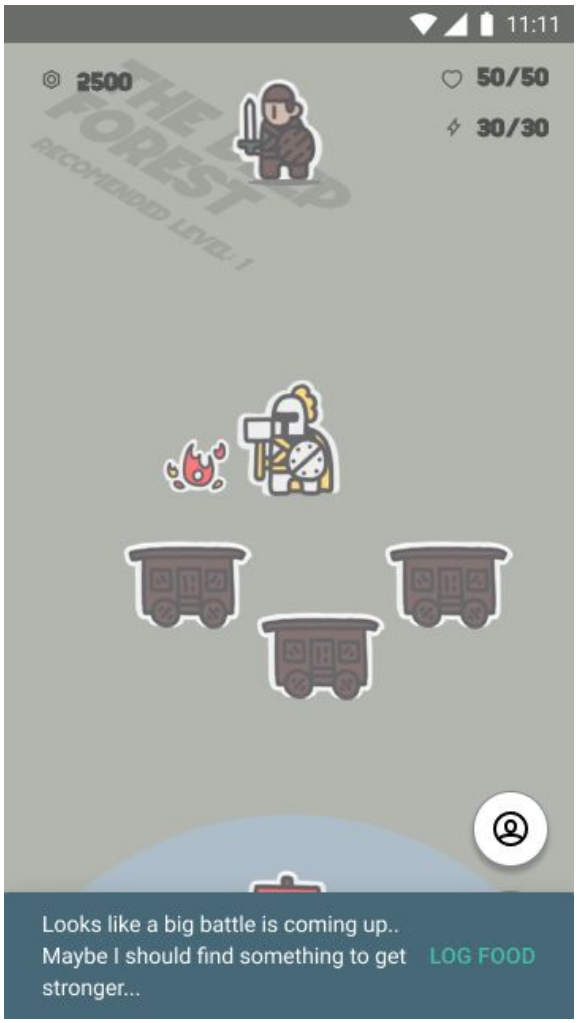


Figure G-1 - A prompt within the prototype reminds the user to log a meal, as it may help deal with a hard challenge in the game.

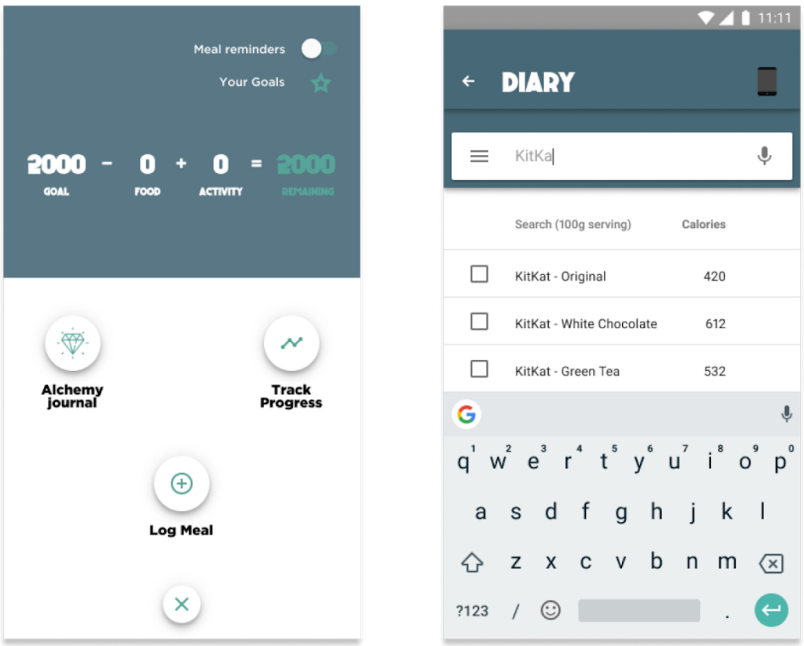


Figure G-2: Tracking nutrition utilized a database for users to search common foods for their nutritional information.

Appendix H - Usertesting questions

1. Please take a moment and talk about your experiences with fitness apps, and how they have or have not helped you reach your goals. [Verbal Response]
2. Launch URL: https://www.figma.com/proto/oP0l3flUKIfjG6KT5PflsF/Game-WIP?node-id=68%3A566&viewport=-294%2C-1604%2C0.2433300018310547&scaling=scale-down&hide-ui=1
3. You have been taken to a new page. When you see the page, move on to the next step. For the best experience, copy the link and view it in incognito or private mode (depending on your browser)
4. Take some time to freely explore the prototype and play through it. Remember to talk out loud as you Tap 'next' when you are done. Remember, if something looks weird or images do not seem to load, copy the link and view it in an incognito or private mode in your browser.
5. In your own words, describe how you might benefit from using this app
6. How unlikely or likely are you to use this app in the future? Explain your answer.
7. Is there anything missing in the app that you expected to see? [Verbal Response]
8. Do you have any final comments, feedback, or questions? [Verbal Response]

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