

# Re:Food Final Report

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# Introduction

Our project, “re:Food,” is an application designed to assist people in breaking unwanted habits and maintaining long-term food & weight related goals. Obesity is an ongoing issue that is associated with preventable negative health consequences such as type 2 diabetes and heart disease; from 2017-2018, roughly 42% of the US’s adult population was considered obese, and that number continues to rise (CDC, 2020). This highlights the importance of helping people to curb their caloric intake. However, straightforward solutions such as “dieting” have proven to be ineffective; many individuals report the desire to lose weight, but few accomplish long-lasting weight loss (Kraschnewski et al., 2010; Santos et al., 2017). This may be because unhealthy eating is rooted in difficult-to-modify habits that are evoked by food-related stimuli. Our application aims to help people curb unwanted eating by using food “go/no-go” training. This training involves exposing individuals to unhealthy food cues and allowing them to “practice” inhibiting their responses towards them. Indeed, another similar application has shown hopeful results using this task (Aulbach et al., preprint). re:Food users will be given the opportunity to do the training daily for an extended period of time (ideally 4 wks+). To keep people practicing, our app is designed to be engaging and fun, with level progression in the task itself and a token economy game that involves cashing in points earned during the task for in-app rewards.

# Statement of functionality with screenshots

Re:Food users will undergo a standard sign-up procedure (email, password, username); returning users can login with their email and password [fig.1 & 2]. Upon signing up, users are asked for optional biometric information [fig.3] and to fill out a mandatory survey [fig.4]. The survey functions as a litmus test for the developers to ensure that the app is helping people by reducing habitual eating. Furthermore, the survey functionality could be utilized by researchers to investigate a broader array of relevant questions. From the homescreen [fig.5], users can access the central features of the application:

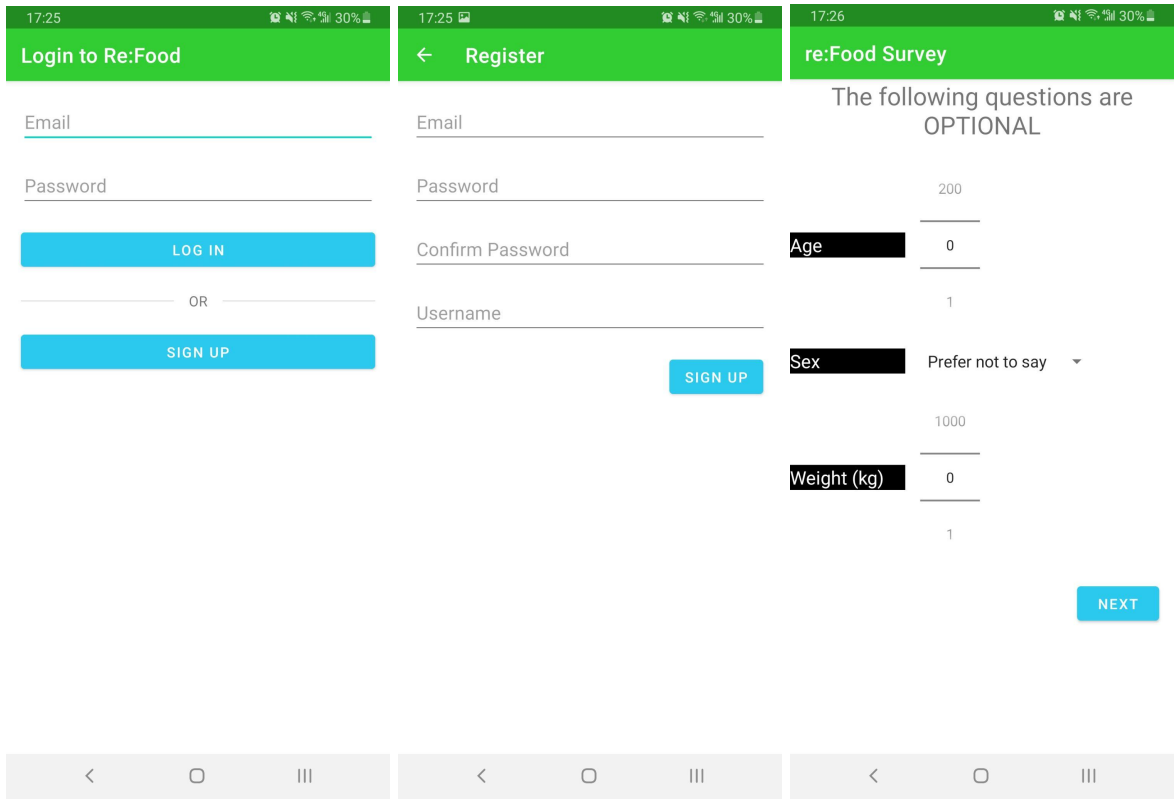


Figure 1: Login Page

Figure 2: Register Page

Figure 3: Biometrics Survey

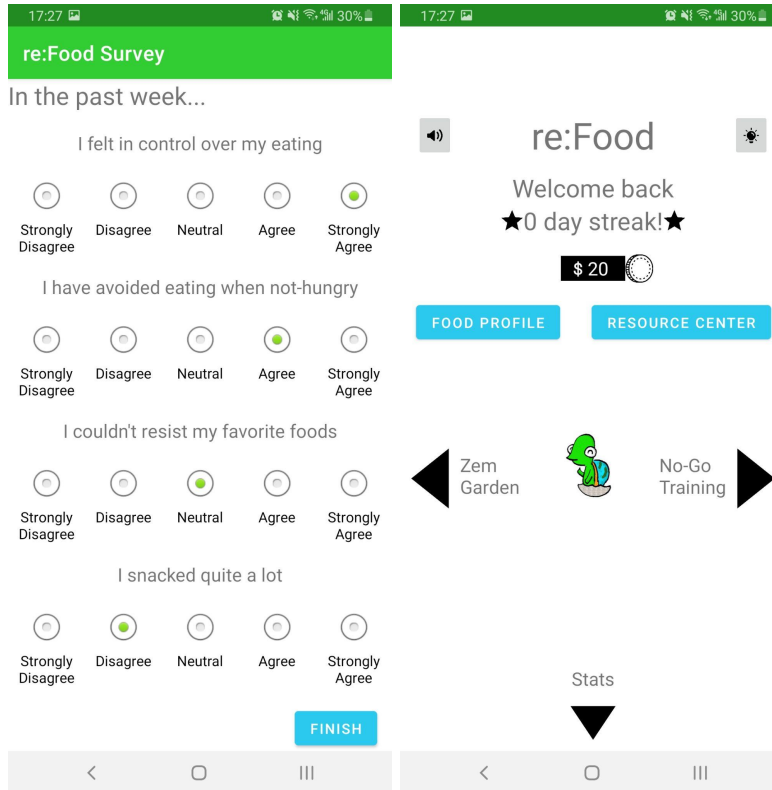


Figure 4: Food Profile Survey    Figure 5: Home Page

### Go/No-Go Training Game Functionalities [Fig. 6-14]

The go/no-go training game is straightforward: users should tap on healthy food images and avoid tapping on unhealthy ones [fig. 6]. The image cues that are green bordered (“go”) always have healthy foods inside [fig. 7], while red bordered cues (“no-go”) contain unhealthy foods [fig. 8].

Correct responses (healthy press, unhealthy avoid) result in +1 coin. Incorrect responses (healthy miss, unhealthy press) result in -1 coin [fig. 9-10].

Each play of the exercise has two rounds, each with 40 image cues. Special distractor cues (coins, bombs, and bell cues [fig. 11-13]) are not bordered and are black/white. Pressing on coin cues and shaking the phone when a bell appears both result in +5 coins. Pressing bombs results in -5 coins. Avoiding special cues will produce no loss or gain of coins as they are only distractions.

There are two rounds per play. In round 1, the cues pop up at random positions. In round 2, the cues move in falling style as shown in the instructions in Figure 14.

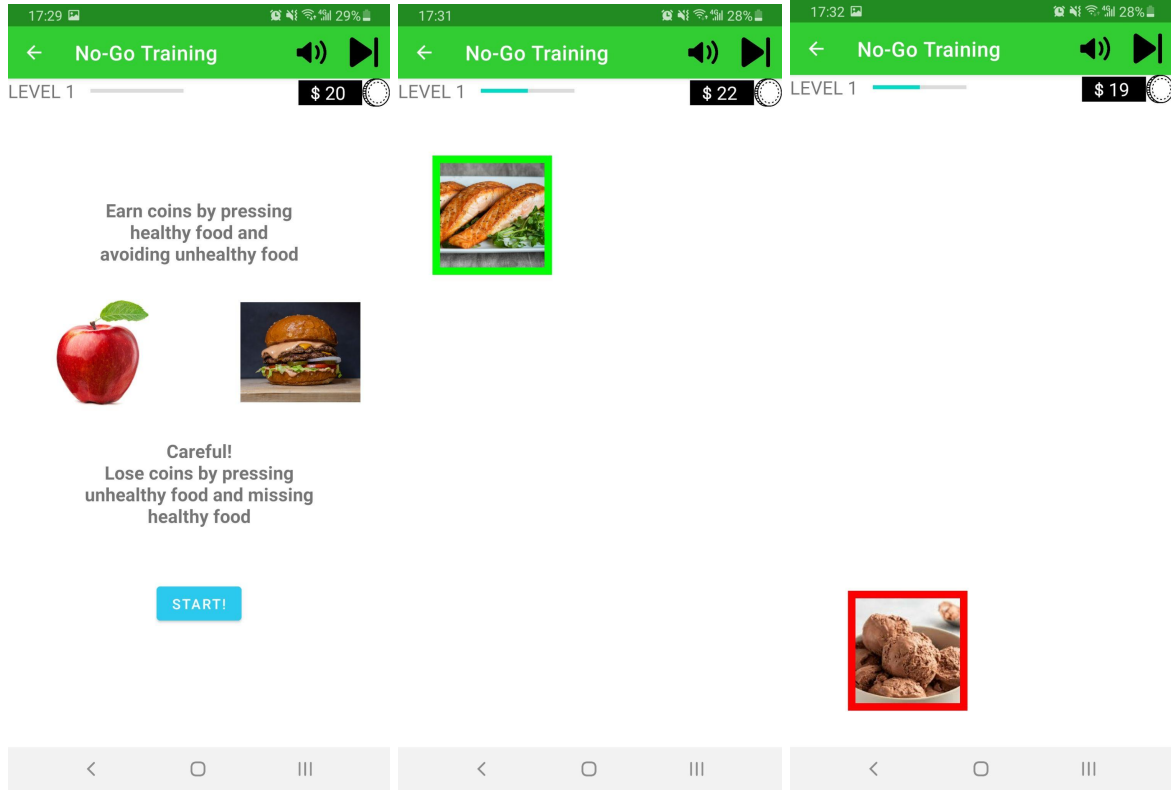


Figure 6: Exercise instructions Figure 7: Healthy Food Cue Figure 8: Unhealthy Food Cue

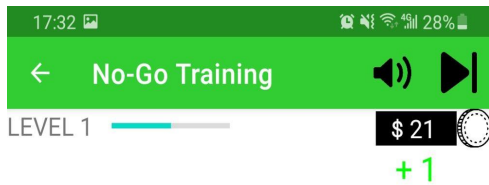


Figure 9: +1 coin

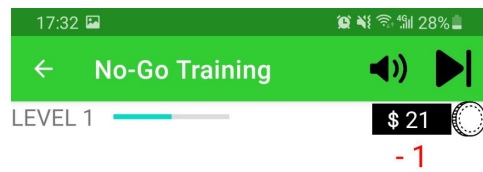


Figure 10: -1 coin

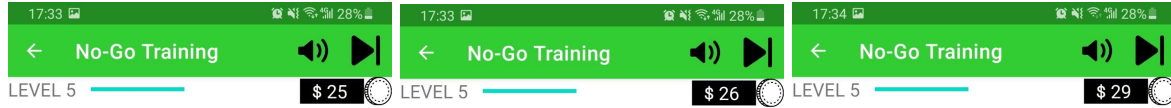


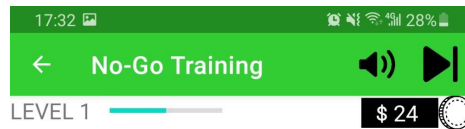
Figure 11: Coin Cue



Figure 12: Bomb Cue



Figure 13: Bell Cue



Beware that images are going to fall down



Click on them before they reach the bottom

NEXT ROUND!

Figure 14: Round 2 Instruction

There is also a leveling system of increasing difficulty as users play the game. Every game play will result in 1 XP added for the user, and the XP bar will be updated accordingly. After enough XP is collected, the game levels up and variations are added to increase the difficulty. The details are as follows:

Level 1:

- Standard game as described above (sans distractor cues).
- 20 healthy food cues, and 20 unhealthy food cues
- Cues appear (static) in round 1; fall in a linear style in round 2
- Fixed inter-stimulus interval (ISI) of 500ms

Level 2:

- Same distribution of cues as level 1
- Cues start to fall in an accelerated fashion in round 2, with a factor of 1.0
- Randomized ISI between 300ms-800ms

Level 3:

- 2 coinCue, 2 bombCue, 18 healthy food cues, and 18 unhealthy food cues
- Falling cues accelerate slightly faster than level 2, with a factor of 1.3
- Randomized ISI between 300ms-1000ms

Level 4:

- Same distribution of cues as level 3
- Special Cues (coin, bomb) move horizontally instead of falling in round 2
- Acceleration factor of 1.6
- Randomized ISI between 300ms-1200ms

Level 5:

- 2 coinCue, 2 bombCue, 2 bellCue, 17 healthy cues, and 17 unhealthy food cues
- Special Cues (coin, bomb, bell) move horizontally instead of falling in round 2
- Acceleration factor of 1.9
- Randomized ISI between 300ms-1200ms



## Food Profile Page [Fig. 15-16]

The food profile module is for users to see and modify their account info, notification settings, and complete their weekly surveys.

### Notification

If notification is enabled by the user from Food Profile, we send daily notification to the user to encourage continuous use of the app.

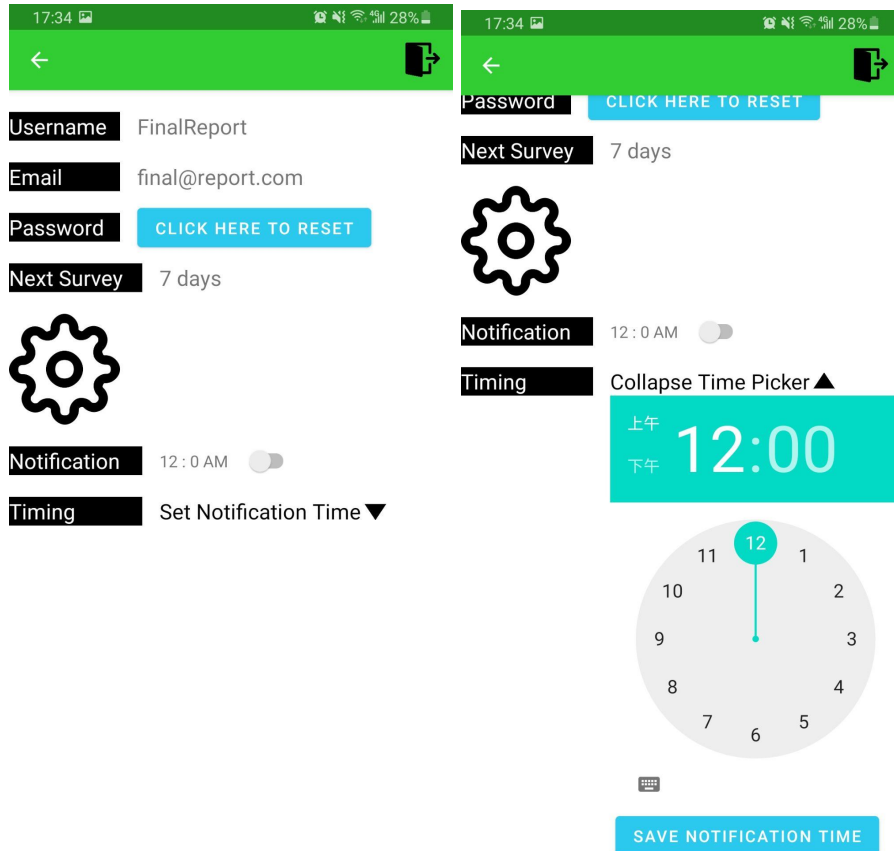


Figure 15: Food Profile      Figure 16: Food Profile with Timepicker

## Zem Garden Page Functionalities [Fig. 17]

The “Zem Garden” is where users can cash in their coins (earned in the go/no-go game). Players can purchase “Zems”, and can choose to display a Zem on the homepage.

**A note:** The “Zem Garden” is an example of something that did not work the way we had intended it to. This was due to time constraints. We initially planned to have the Zems “hatch” from eggs over the course of a few days, and to have a separate screen to display all the Zems. We also thought having user-to-user capabilities to share progress/Zems would be nice but--again--that would have been too time consuming.



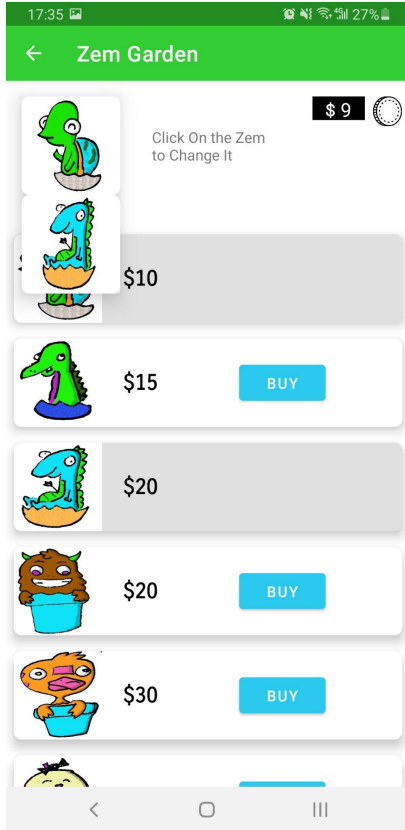


Figure 17: Zem Garden

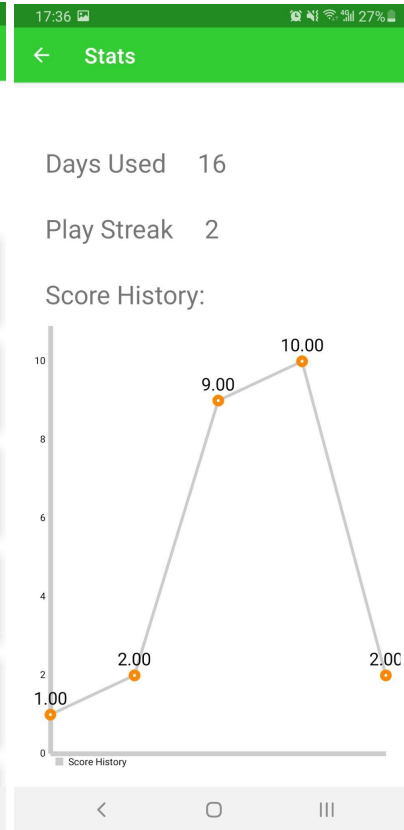


Figure 18: Stats center

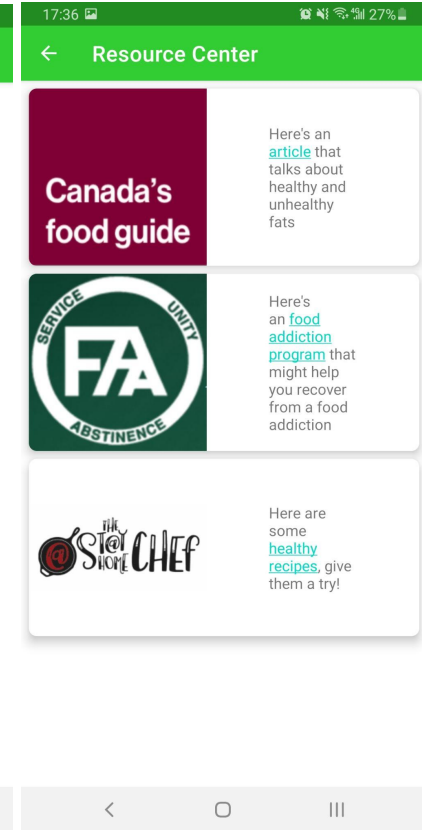


Figure 19: Resource Center

### Stats center Page Functionalities [Fig. 18]

The number of days used since registration, the play streak, and a graph of the score of the 5 recent plays are demonstrated in this page.

### Resource center Page Functionalities [Fig. 19]

The resource center provides users with external links to some other resources related to food curbing and dieting.

# Overall design

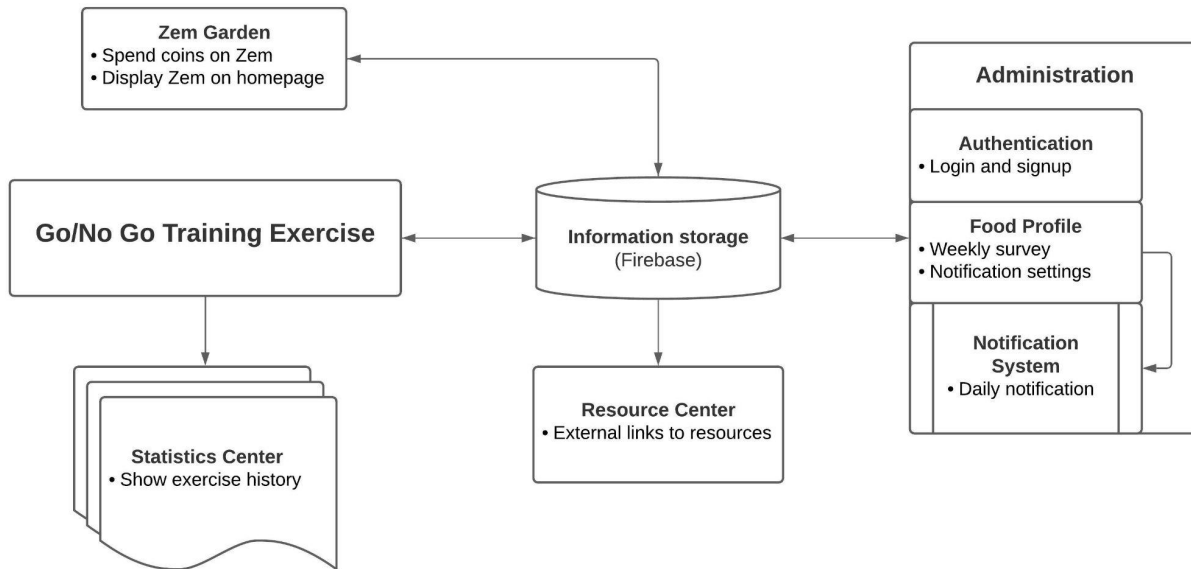


Figure 20: Block diagram of software structure

## Information storage

The information storage module interconnects the multiple modules. All the persistent data is stored in Firebase Firestore, including exercise history, number of coins earned, the bought zems, survey results, and also administration info. User information is maintained after uninstallation of the application.

## Authentication

The login and signup functionalities are implemented with the use of Firebase Authentication. After entering the sign up information, a one-time biometric survey and the first food profile survey will be presented.

## Food Profile

The food profile module manages and displays users' account details, notification settings in Firebase Firestore. And it guides the user to their next weekly survey.

## Notification System

The daily notification functionality is implemented via alarm manager, notification manager, and broadcast receiver. The alarm manager can broadcast an alarm everyday at the set time. The broadcast receiver then notifies the users using the notification manager.

### **Go/No-Go Training Exercise**

The exercise is the core of the app. It is implemented following the psychological exercise with rounds and a leveling system of difficulty as described in the Statement of Functionalities section.

### **Statistics Center**

The stats center includes days used and play streak, both calculated from the exercise time history. There is also a chart displaying the 5 most recent exercise scores from the exercise history field. The chart is implemented using the `com.github.mikephil.charting.charts.LineChart` package.

### **Zem Garden**

The number of coins earned during the exercise is stored in Firebase Firestore. In Zem Garden, the user is able to spend the coins and buy Zems to their collection. They can display a Zem on the homepage after choosing from the bought Zems.

Zems are displayed in a recycler view. Each item of the recycler view includes the price and purchase button. When the purchase button for a zem is pressed, if the transaction is approved, the button disappears and the zem is added to the owned list. The owned list is displayed by a spinner to allow users to choose which zem they want to use in the home.

### **Resource Center**

The resource center page consists of three cardviews displaying the three resources that our specialist has identified with an image and a short text describing what the resource is. Within the description text, some hyperlinks are attached to enable users to go to the corresponding websites.

# Reflection

## **What did we learn?**

We learned about agile project management where we had to communicate with each other as a team and collectively create deadlines and goals for ourselves. Working on a project without a clear “leader” was an important experience. The spiral model was also new for every one of us.

The programmers learned about Go/No-Go Exercise in the field of psychology.

We all learned about how to communicate outside of our own fields, such as introducing and effectively communicating specific concepts like the different parameters and data in the Go/No-Go Exercise, or coding/programming terminology.

## **What would we do differently?**

It took us a long time to realize that turning the go/no-go exercise into a fun game (as opposed to an “exercise”) was going to be the core feature of our app. That is, we put too much energy into the structure of the Zem garden and the token economy at the beginning. Thus, if we were to restart from the beginning we should have spent more time figuring out the levels, progress, and ways to make it fun from the very start (see our future work section for details). If we had, we may have been able to make the game more dynamic by adding different backgrounds and different "rounds" beyond the static and falling ones we currently have.

# Contribution of each group member

## **Erkang Liu (Programmer)**

Implemented:

- Instructions for home page and exercise
- Zem garden display, purchasing and zem changing functionalities
- Stats center
- Resource center
- Daily notification alarm in food profile

## **Yunyi Zhu (Programmer)**

Implemented:

- Login process, and register process with biometrics and survey
- Go/No-go training exercise and leveling system
- Background music across screens, and sound effect in exercise
- Food profile (reset password, next survey, notification settings)
- Unified the theme of the application

## **Zachary Pierce-Messick (Specialist)**

- Provided background on go/no-go exercise by reviewing published research
- Set parameters for go/no-go exercise (cue number, inter-stimulus interval, stimulus display time)
- Helped make big-picture decisions such as what the Zem garden would function as and how the go/no-go exercise would translate to an enjoyable game
- Designed layout of application including homescreen buttons and UI
- Wrote and recorded the music (homescreen & game)
- Created, edited, digitized, and colored the Zem images, including the app icon

## Specialist context

Sometimes it is easy for researchers to be too focused on publications, funding, and establishing one's name without enough regard to what their contributions may mean to real-life people. re:FOOD is an example of how a scientific task (i.e., the go/no-go exercise) used by cognitive psychologists can be utilized outside of the laboratory setting to help people better their lives. re:FOOD is built with data collection in mind, and applications that are structured in this way are a convenient way to gather real-world data from people's day-to-day lives. reFOOD can influence the research field by demonstrating how accessible this means of data collection can be; in the past, very few studies use "Experience Sampling" data collection, and this is a customization of that model. re:FOOD also took some "risks" at higher levels by diverting from established go/no-go research; for example, we added cues that are not colored in order to provide distractions. However, because of the data that can be collected, these additional features in re:FOOD can be assessed for 1) usefulness to app users and 2) possible implementation in psychological experiments. When establishing an experiment, prior data is key to work from in order to be taken seriously in the field. re:FOOD could be a source of prior work that can establish new methodologies to be implemented in-lab. Thus, re:FOOD could actually lead to progress in the field of behavioral inhibition, action control, impulsivity, and the role of distraction/attention in each of these topics.

# Future work

If we have more time to develop re:Food, here are some things we would add in the future:

- Diversify the Zem garden:
  - Rather than buying Zems that appear on the homescreen, users could buy Zem eggs, hatch the eggs, and care for their Zems (a la Tomagotchi) by feeding them daily. This would engage users to continue to use the application, and would provide a resource that would ensure that the coins earned in the go/no-go game are continuously relevant.
- Additional go/no-go difficult levels:
  - At higher levels, the green/red borders could disappear forcing users to focus more on the foods themselves, rather than on colors.
  - More distractor cues could be implemented. For example, a bug that crawls from the side of the screen and needs to be “swiped” away, or a frying pan that needs to be “pinched” to make shrink/disappear.
- Music:
  - A greater variety of music could enhance the UX. For example, separate songs (or the same song with modified instrumentation) could play in the Zem garden, the stats center, and the resource center.
- Inter-user connection:
  - Users may be more engaged if they could “show off” their progress in re:FOOD. Having a “share” button that could post progress & Zems to social media or to other users could accomplish this.
- Research portal:
  - This app could be used to do research on habitual food seeking and impulsivity. It would be handy to have a research portal where scientists could apply to collect data through our survey system.

## Posting contents on the course website

	Video of final presentation	Final report	Source code
Erkang Liu	√	√	√
Yunyi Zhu	√	√	√
Zachary Pierce-Messick	√	√	√



## References

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