Wellness-At-Hand: Exploring novel interactions to support smokers in managing their cravings for cigarette

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EXECUTIVE SUMMARY

This report provides an understanding of the design and implementation of our proposed system, ‘Wellness at hand”, as a digital prototype. The aim of ‘Wellness at hand’ is to help smokers who struggle to manage their craving episodes during their attempts to quit smoking. The system provides four-fold experience of commitment, fun, empowerment and motivation to support smokers to quit smoking. We created a low fidelity digital prototype with Microsoft PowerPoint presentation and tested the system in the usability lab with three participants. The absence of matured technology to support hand-based interaction required for our system, motivated us to opt for the ‘Wizard of oz’ as an evaluation method. During the user testing, we projected the presentation slides on left hand palm of the participant. One of the team members acted as a pseudo system where he responded to every user action as if the system itself is doing it. All the user interactions were manipulated at run time. Every participant performed six tasks. We observed our participants when they were performing the given tasks and later interviewed them to understand their overall experience with the system. Participants had mixed feelings about our system. They found the system very innovative and appreciated it for its purpose; on the other hand, they could not understand the relevance of different functions of the system. We also found several issues related to the system usability such as unclear navigation, and lack of games’ rules. We report our findings from the participant evaluation along with the issues faced during the testing. At the end, we propose some recommendations to help designers interested in exploring interactive technology to help smokers quitting smoking.

RE-STATEMENT OF THE PROBLEM

The purpose of this report is to highlight the findings of our previous assignment by developing a digital prototype of our proposed system, *Wellness at hand*. Wellness at hand is designed to support the users in managing their cravings for cigarette during a quit attempt. To achieve so, our proposed system has the following features that we believe would serve our research purpose of helping smokers:

1. Engage hands to hinder smoking
2. Organize (Set and follow up) the quit plan
3. Explore games to divert attention
4. Provide emotional understanding of craving episodes

Through the above-mentioned features, we intend to evoke the four-fold experience of *commitment, fun, empowerment and motivation* to support smokers in quitting smoking. Firstly, we wanted to provide a hand prototype to divert participant's attention from reaching a cigarette. Secondly, with setting up a quitting plan as the main activity of the prototype, we wanted to provide participants a sense of commitment to their quitting plan. Thirdly, we also wanted to provide participants with elements of fun so that they can enjoy the process of managing craving episodes. For example, the users can play the games with others to have fun as well as to divert their attention from smoking. Fourthly, we wanted to challenge participants by providing them with their own unconscious thoughts as a way to acknowledge their thinking that could be triggering their cravings, therefore, empowering them to stop their craving episodes. Lastly, by providing their progress we wanted to cognitively motivate users to stop smoking.

USERS

The target users for our prototype ‘Wellness at Hand’ are smokers who struggle to manage their craving episodes during their attempts to quit smoking. Despite their efforts to quit smoking their attempts often get hindered by various triggers such as anxiety, and frustration; making them re-enter the cycle of smoking and postponing their efforts to quit. With this project, our aim is to help such individuals at those specific moments when craving for cigarettes become unmanageable for them.

Additionally, since cravings for smoking is not time and space dependent, the user may need help in any context. For example, if a user feels a craving to smoke in a crowded public tram, there is a need to support the user without making him/her stop their current activities. These are the events where the user would want to engage in some short interactions that could divert his thoughts to some other activities. Additionally, the mobile or desktop-based interventions may not be convenient or awkward to be used.

NEW TASK DESCRIPTION

In our first assignment, we defined the following four user tasks: Setting up a quit plan, understanding unconscious thoughts, prevent user from a smoking attempt, and getting feedback on progress. However, after the cognitive walkthrough and while trialing our digital prototype, we found that these user tasks are very broad and unclear for a user to perform. For the user evaluation we, therefore, redefined our tasks along with the addition of two new tasks. Below we define the user tasks:

Task 1: Making a strong quit plan (Same as previous)	
Significance: extremely important	**Frequency:** once
User actions	*Interface Feedback*
User wears the bracelet on either arm and then opens his palm	User sees a welcome screen followed by a message that their body is getting scanned to collect physiological data such as Body Mass Index (BMI), BP,HR, and nicotine level in the blood. System then prompts the user to set up a quit plan.
User defines quit plan by entering #days, #cigarettes allowed in that period, amount of money he wants to donate to charity along with his credit card details.	User will see his plan board.

Task 2: Go to the 'Help' menu (new task)	
Significance: important	**Frequency**: whenever user needs
User Actions	*Interface Feedback*
User pulls their little finger where the 'Help' menu is projected	System then shows the help menu on user's palm

Task 3: Play games (redefined)	
Significance: extremely important	**Frequency**: whenever the user has a

	craving episode
User Actions	*Interface Feedback*
User goes to the menu list and select games menu	The system shows the menu list
User chooses one game from the list and starts the game	The system shows the interface for game along with the rules
User makes different movement as required to play the game on his palm	The game moves to another level of game according to user's actions along with the scores

Task 4: Read the unconscious thoughts (redefined)	
Significance: important	**Frequency**: varies for every user
User Actions	*Interface Feedback*
1. User senses the device warmth on his wrist.	The bracelet makes a beeping sound
2. User checks the message.	The user gets a reflection on their unconscious thoughts.

Task 5: Analyze the progress (redefined)	
Significance: important	**Frequency**: multiple times (whenever the user feels discouraged or whenever is successful in overcoming a craving episode)
User Actions	*Interface Feedback*
User pulls his thumb, where the 'plan' is projected, to check the progress.	The system gives a summary of his quit plan in terms of #days left, #cigarettes left and the donation amount.
User taps the screen to see further	The system shows his progress on bar charts.

Task 6: Delete a menu (new task)	
Significance: important	**Frequency**: depends on the user
User Actions	*Interface Feedback*
User goes to the specific menu he wants to delete and claps	The system shows the message that the menu is deleted

DIGITAL PROTOTYPE

To develop a digital prototype, we started with the idea of developing interface using software like Pop-up and Axure. At the same time, we also wanted to develop something that utilizes hand-based interactions. We thought to use Pocket Projector as a way to project our prototype on the user's hand. However, a traditional interface developed with drawing software was not giving proper look on the hand mainly because a traditional web page occupies a lot of space, which we did not have (given the limitation of hand surface). Therefore, we chose to use Microsoft PowerPoint slideshow as our digital prototype, which not only offered us the flexibility to control the interface size but also allowed us real time editing of the slides according to the user's actions.

Technology used:

We have used two main technology gadgets to build our digital prototype: Microsoft PowerPoint slideshow as different screens of the prototype, and a pocket projector (Figure 1) that projected PowerPoint slides from a laptop computer. The PowerPoint slides were edited and manipulated based on the user interaction.

Figure 1: A snapshot of Pocket Projector

Physically our digital prototype consists of a rubber bracelet to simulate a 'final version' and PowerPoint slides running on a computer connected to a pocket project. However, the important facts of the digital prototype are the design implications it is based on. As a result the digital prototype tries to mimic the characteristics of a 'final version'.

The design of our digital prototype ‘Wellness at hand’ is based on the following characteristics, which we considered a ‘must have’: Minimalistic, Ecological, Futuristic, Simplicity, and Concise.

Minimalistic design: As a result of being projected on the participant’s palm, we did not feel the need to provide ‘extra’ features such as background for the text messages. It was also important to embed the prototype in a bracelet to ‘camouflage’ itself. This would not only provide a sense of privacy to the user but as a mean to diminish any stigma or self-stigma the participant may experience as a smoker.

Ecological design: By using a ‘rubber band’, a ‘micro-cheap’ and a projector embedded in the bracelet, we consider that manufacturing of the final version could use less resources that may affect the pollution of the environment.

Futuristic design: By providing an innovative approach and design to quitting smoking, we try to elicit the experience of ‘pride’ on participants. Understanding that by raising participants’ awareness about using an innovative device may boost their self-esteem and confidence to use the system and motivate its use.

Simplicity design: By providing gesture as a way to navigate through the system we try to elicit an ease of use of the prototype. In turn, this will provide fast support participants as we understand that a ‘craving’ episode can unfold in seconds and an immediate response from the system is vital.

Concise dialogue: The digital prototype is consistent with the paper version as it provides a clear and precise dialogue to the user.

Hand Projection GUI Considerations:

The interface projected on the participant’s palm presented a set of design challenges, which are not present in common screen interfaces:

1. Luminosity and ambient light: The system interface visibility was greatly influenced by the ambient light. The higher the ambient light the less visible interface graphics is. To have a reliable interface we considered very high contrast text, objects and graphics.
2. Palm's color: We used two main colors: white and cyan to achieve better visibility and contrast on almost all palm's color.
3. Tilted projection: the system was set such that the projection was not orthogonal to the projection screen (i.e., on the palm). The projector was tilted with a smaller angle, which caused a graphical distortion. The system screens had to be reverse-projected to prevent the distortion.

Figure 2: Snapshots of the digital prototype: welcome screen and setup menu

USER BASED EVALUATION METHOD

Below we describe how we performed the user evaluation.

Research Methods

To the best of our knowledge, the technology to support hand-based interactions has not yet matured. Recently, David et al. (2012) developed a prototype, which covers the 3D pose of user's hand with a wrist-worn sensor. However, the absence of this resource motivated us to utilize 'Wizard of Oz' (Maulsby et al., 1993) as a research method to evaluate our system.

We also used *participant observation* and *interviews* to get better understanding of the context under study. Participant observation is a popular tool in qualitative research to collect data about people, process, and technology placed in context in the natural setting (Kawulich, 2005). Therefore, we observed our participants while they were performing the given tasks. Observations allowed us to gather such data that was not expressed by the participants verbally during the interviews. We made notes of the observations during the evaluation. Additionally, we used interviews to understand the interactions of a user with technology (Neuman, 2006). Since interviews provide insights on the user experience, which cannot be measured through quantitative data, we therefore, conducted open-ended post interviews with participants. We asked 4-5 questions related to different features of the prototype and how they felt while interacting with it. At the end, we cleared doubts or confusions that participants had about the working of our prototype. We video recorded all the interviews for later analysis.

Lab Setup

The prototype was implemented through the use of a pocket projector that was positioned near the user on a tripod stand. The projector was set up in such a way that it could project the prototype views on the participant's left hand palm. The projector was plugged in to a laptop from where the prototype was controlled by one of the team members. We used Microsoft PowerPoint for making the system views, where each view was represented by a slide. The slides were projected with a two-end method

where the slides were changed and manipulated from the laptop. Changes were happening on real-time based on observed user interactions. Since the PowerPoint slides allow only a linear interaction, we needed something to fill the gap between a user's action and system's response to the participants' non-linear choice such as choosing third menu out of the list (all the list menus were presented sequentially on one slide of the presentation). Therefore, we kept our desktop background as shown below to give users a frame to operate the prototype.

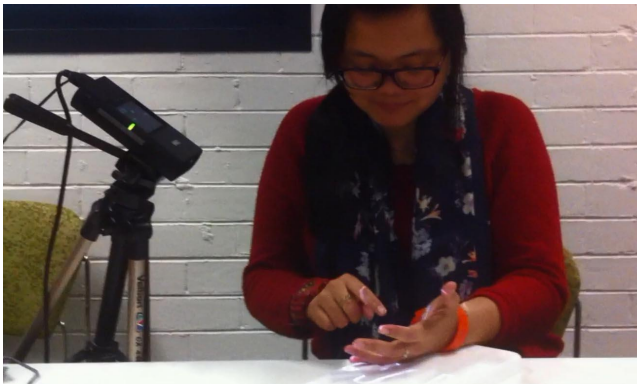

Figure 3: Arrangement of pocket projector on the tripod stand

We conducted the user testing in the Interaction Design lab at Melbourne University. Participants for the testing were the members of group A (three in number). We used a chair for the user to sit and a table where the user could rest his/her arm. At all times our team members were present with the participants where one member was working as a (pseudo) system, another was giving the tasks to the participants along with observing them and the third was filming the session (Figure 4).

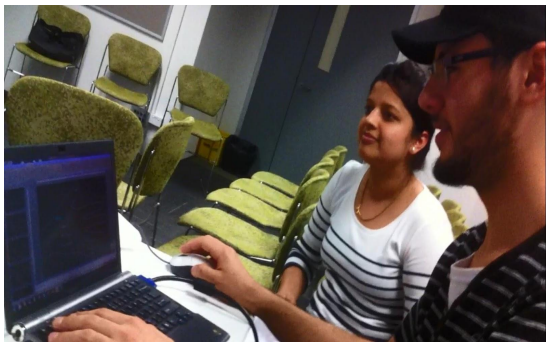

Figure 4: A snapshot of our (pseudo) system responding to user's actions.

Procedure of evaluation

Below we mention the step-wise procedure on different phases of evaluation.

a) Each participant was welcomed and asked to take their seat. Then, the participant was lectured with a brief oral introduction of the purpose and scope of the prototype followed with a 'demo' of the prototype. The demo consisted of a guided presentation of the various menus included in the digital prototype.
b) The participant was encouraged to 'speak out' their mind at all times.
c) The participant was presented with the tasks to be done on an A4 sheet. Each participant performed 6 tasks related to our system (as defined in the tasks section). The participant was asked to do the task and a printed copy with the named task was set on the desk visible to the participant. This process was done for each one of the tasks the participant was asked to do.
d) The participant was greeted after finishing all tasks followed by a short interview (video recorded).
e) Lastly, we thanked all participants for participating and gave them chocolates as a token of appreciation.

Issues faced during setting up the user evaluation:

1. *Where to place our 'pseudo' digital prototype:* For our prototype to work, we were required to clearly see the participants' actions on their palm. However, the cameras placed in the room did not provide us with a clear view of what the user was doing. Therefore, we had to sit beside the user, which slightly defeated the purpose of 'Wizard of oz' as the participants were able at all time to see how our 'pseudo' prototype worked.

2. *How much support to the participant:* Within the group, we were a bit unsure about how and how much help we should offered the participants when they were stuck while testing the prototype (as they were not able to recall the specific interactions defined for our prototype). We found ourselves inconsistent in helping our participants. For example, we helped participant 1 with cues and verbal comments on what is valid and invalid for our prototype; we became more

reluctant in doing so as we reached participant 3 . However, we cleared all the doubts once the participant was done with the tasks.

3. *How to give crucial feedback if missing from the prototype*: While testing the prototype, we found that some of the crucial feedback such as error messages and backward/forward buttons were missing from our prototype. The lack of such feedback created some moments when our participants found themselves completely stuck with some stages of the prototype. We allowed them to explore their own way when such issues were raised with almost no verbal help, however, it would be interesting to know how such situations can be tackled carefully. For example, the Tic-tac-toe game in our prototype is a multi-player game, which the user plays with his/her friend. For the purpose of user evaluation, our participants played the game with the system. User 2 started by placing the crosses (X) to which the system placed a nought (O). However, in her second chance, she wanted to place the nought, which is against the rule of the game but our prototype does not specify any such rules. She tried to do the same multiple times but did not get any feedback from the system. As there was no error message to this user's action, user 2 got confused with what to do next. Later, she chose to check the 'Help' menu.

4. *How to keep the novelty experience when all the users are present:* all three participants arrived before the scheduled time. Since the user evaluation was happening in the same room where the users were waiting, we had no choice but to let them listen (but not to see the actual prototype) the ongoing session. As a result, we don't know how much this affected the experiment other than participants' being more efficient in using the prototype.

5. *How to create the testing environment with non-users of the system:* The prototype was not tested with the target users, therefore, the participants' tasks could not fulfill the underlying intentions. For example, two of the user tasks, namely, playing games and analyzing the progress charts, were specifically

defined to divert the user thoughts at the time of cravings. Since there was no such episode of craving, they were taken just as ‘some’ tasks to be performed with the system.

USER BASED EVALUATION RESULTS

Participants had mixed feelings after interacting with our system. On one hand, they found the system very innovative and appreciated it for its purpose; while on the other hand, they could not understand the relevance of different functions of the system. Apart from this, our system had several issues related to the navigation (back and forth of the menus), and clear framing of the Help menu (defining system based interactions) and games' rules.

Below we mention the insights gained from observing and interviewing the participants.

1. *Every participant had a different notion of the system's interactions:* We observed that every participant had a different notion of the prototype's interactions, probably, because all participants were not native English speakers. For instance, 'pulling the little finger' brings the Help menu, however, one participant repeatedly bent their finger to do the same and the rest of the participants were not clear with what to do at the first instance.

2. *Participants were unable to recall the system interactions:* Our prototype introduced new interactions (different movements of hand such as waving, rubbing, and clapping) with new interface (user's hand) for a user to engage with the prototype. We found that users were not able to recall the interactions when required. As a result, the participants' actions with the prototype did not match with their intentions. However, when participants were done with all the tasks, they performed different actions to 'close' the interaction with the prototype: two participants clapped and the third one directly removed off her hand from the projector. Our (pseudo) digital prototype had to accept those interactions to make the participants comfortable.

3. *Thinking aloud (speech) was considered as an input modality to the system:* During the evaluation, we asked participants to think aloud while interacting with the prototype. Due to the lack of proper cameras, thinking aloud was the only medium for our (pseudo) digital prototype to act according to participant's

actions. Since our (pseudo) digital prototype was sitting beside the participant, after a while, participants noticed the functioning of our prototype. Later, we noticed that our participants considered speech as an input modality to the system and started to give commands in speech itself (without interacting). And when the prototype did not respond accordingly, they became confused with its working. When participant 2 was stuck with Tic-tac-toe game, the participant gave speech based commands to the prototype, "*I want to move it now"*, and seeing no prototype response after a few trials, she said, "*I want to see Help"*. Later, one of us told the participant to move further.

4. *Waiting was found confusing:* The prototype reaction to the user's actions was by freezing the screen. For example, when the participant chose to play second game instead of 1, the (pseudo) digital prototype had to pull up the respective slide from the PowerPoint presentation. To fill this time lag, we projected a calibration screen (having boundary of hand) on the participant's hand just to give him a notion that the system is working. However, we found that the participants found this waiting as confusing and did not take any further action until the prototype was physically manipulated. By implication, the prototype should make clear to the participant what to do next at all time.

5. *Using hand as an interactive space is tricky:* We found that using hand as an interface made the projection bit tricky. Everyone has a different tone of skin color, which makes it difficult to participants to always have a clear projection. As a consequence, participants could not notice the menus lying on their hand almost all the time. For example, our prototype always shows the Help menu on the little finger; however, our participants rarely used it. Furthermore, we observed that our participants interacted with the prototype as a 'mobile' device browsing the palm with a finger. Consequently, the prototype needs to consider novel interactions to ensure it is not considered a mobile device.

6. *Relevance of the tasks was unclear*: Since our study participants were not the target users of the system, the participants did not find the system very much helpful. Two participants were confused about the relevance of the prototype itself and its aim to prevent smoking. One of them wondered why the prototype provided games and what is the need for understanding unconscious thoughts. As a response, one participant suggested that our system should give an advice like "*you should play games to divert your thoughts*".

CONCLUSIONS & RECOMMENDATIONS

In this report, we developed a low fidelity digital prototype using Microsoft PowerPoint as software and a pocket projector as hardware. Although we used 'Wizard of Oz' to evaluate our system, we anticipate that the technology to support it will be available in the near future. The lab testing provided a rich understanding on how users interacted with the digital prototype and how they felt the experience. We were able to confirm that as an innovative artifact embedded on user's palm it was well accepted by participants because it was perceived as a novel approach and participants' feedback was positive. However, having tested the prototype with non-smokers did not provide us with contextual data, as our participants could not ideally understand the relevance of the tasks and functionalities of the system.

Challenges of using hand as an interface: Using a palm as an interface has different implications. On one hand, it provides a secure interaction that is convenient for the users even at public places, while on the other hand, skin color and hand movements pose challenges to develop an immersive user experience.

Challenges of using Wizard of oz technique: Simulating the environment to evaluate our prototype using Wizard of Oz was challenging, as it required a number of spontaneous decisions taken according to the immediate circumstances.

Challenges of conducting lab based testing: Since we tested our prototype in a lab environment, we acknowledge that the findings we obtained may be different from the field-testing done with target users of the system. Additionally, having tested it only once with participants might have introduced the Hawthorne effect because participants liked or disliked different features of our system.

Limitations of the study

The prototype provides support on users palm and is to be used by users that have no arm, hand or sight impairment. However, we understand the importance to design for

various physical requirements. For instance, if the user has hand cuts the interaction could feel difficult.

Additionally, we need to consider how the prototype can support users without interfering them in their daily activities. For instance, users doing a physical activity, such as painting, sculpting, trade work or swimming; or users doing activities such as washing their hands, sleeping etc.

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Tic-tac-toe game: http://en.wikipedia.org/wiki/Tic-tac-toe

APPENDIX

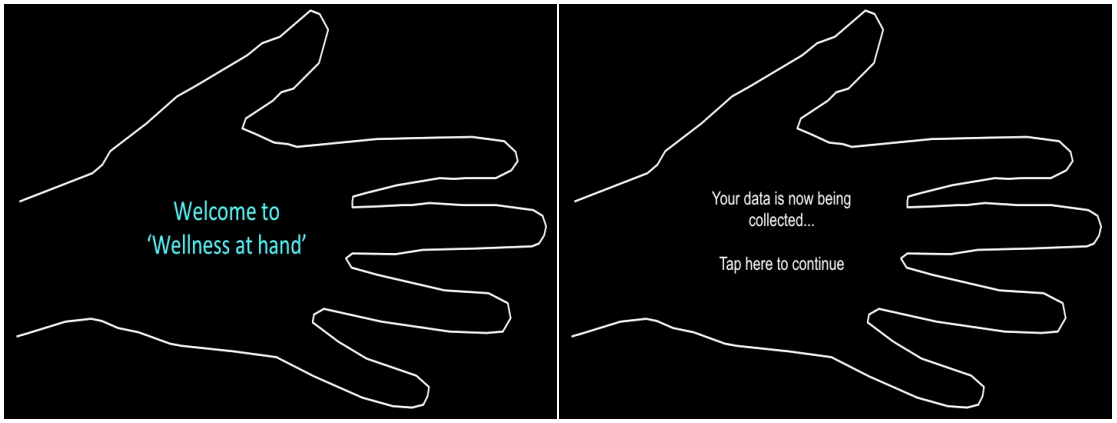
Appendix A

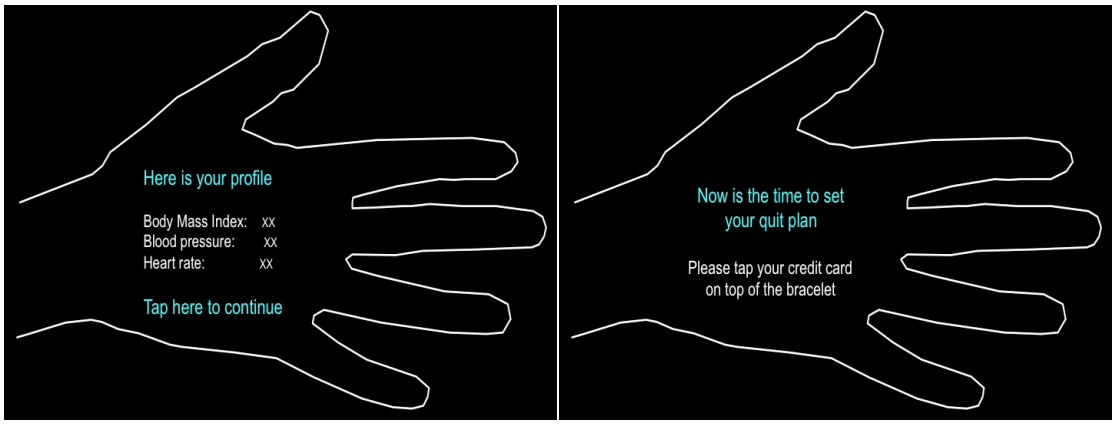
Meetings

We conducted a brainstorming session for general ideas which followed five meetings to address the creation, implementation, user-based evaluation and final report of the digital prototype.

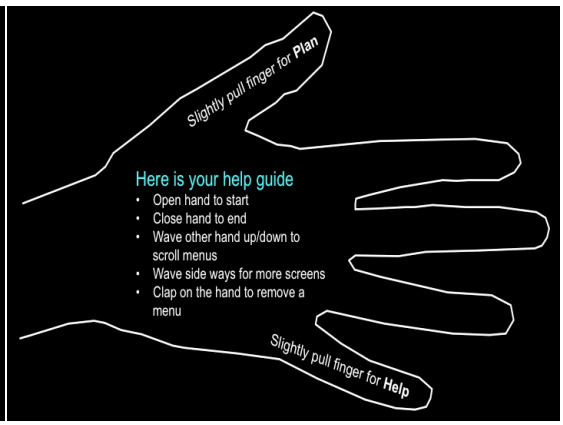
Appendix B

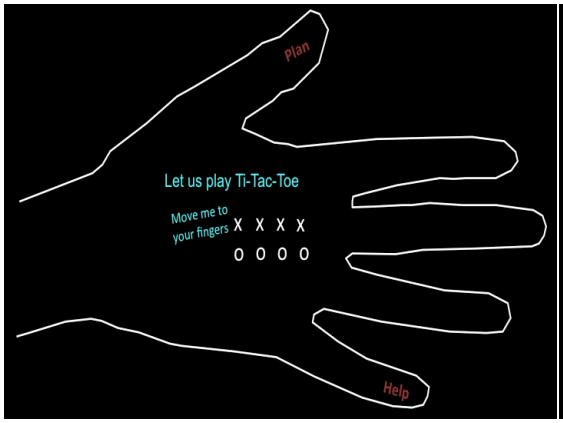
Screenshots of the prototype

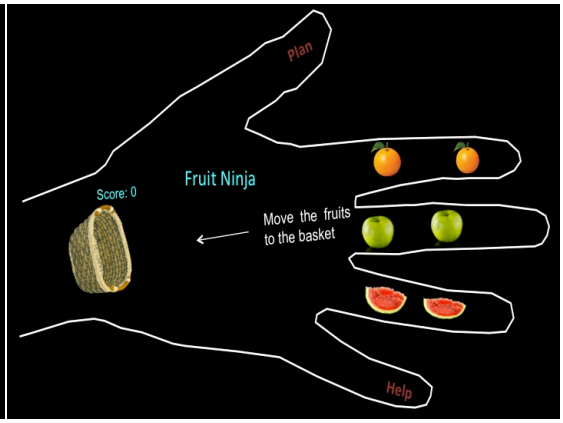




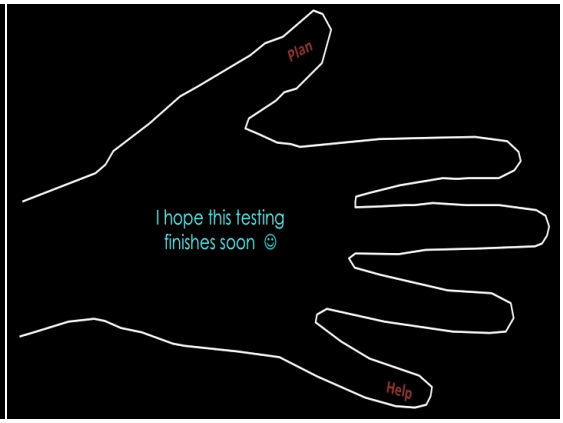

Please complete your plan
I need ___ days to quit
I may have ___cigarettes a day
I will donate $_____ to charity
Tap here to continue
1 2 3
4 5 6
7 8 9
0

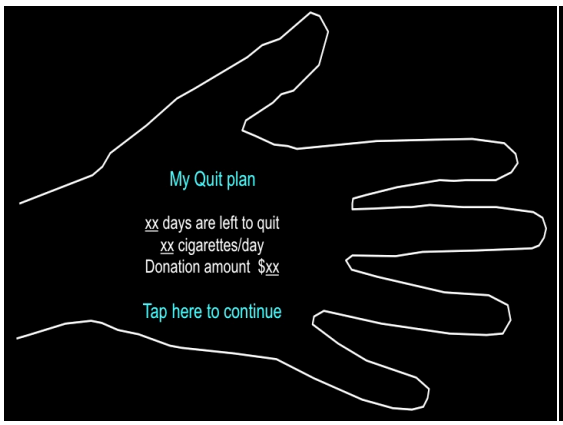

Slightly pull finger for Plan
Here is your help guide
• Open hand to start
• Close hand to end
• Wave other hand up/down to scroll menus
• Wave side ways for more screens
• Clap on the hand to remove a menu
Slightly pull finger for Help

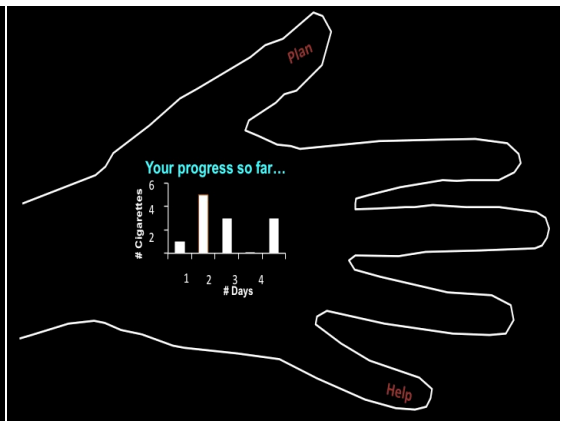

Plan
Let us play Ti-Tac-Toe
Move me to your fingers
X X X X
0 0 0 0
Help

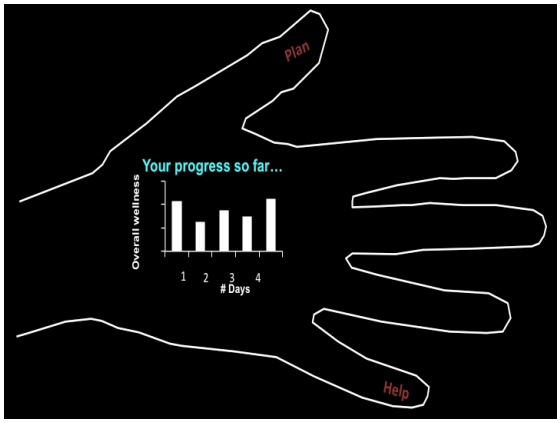

Plan
Score: 0
Fruit Ninja
Move the fruits to the basket
Help


Plan
I am still thinking about yesterday.
It's time to relax and enjoy this awesome prototype.
Help


Plan
I hope this testing finishes soon ☺
Help


My Quit plan
xx days are left to quit
xx cigarettes/day
Donation amount $xx
Tap here to continue


Plan
Your progress so far...
Cigarettes
6
4
2
1
2
3
4
Days
Help


Plan
Your progress so far...
Overall wellness
1
2
3
4
Days
Help