Gamified Design for Creating Strong Passwords

Target Group: 8 – 11-year-olds

Course: F20AD Advanced Human Interaction Design

Coursework: Individual Assignment

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Participants: Mahek Harwani, Syed Ayman, Mohamed Atif

Link to prototype:

https://www.figma.com/file/xhmoMVdpuS2mXo3TXDRo4c/Game-of-Password-Security-Awareness?node-id=0%3A1&t=OJKIyKONEeDmLeYb-1

Student Declaration of Authorship

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Course code and name:	F20AD – Advanced Human Computer Interaction
Type of assessment:	**Individual**
Coursework Title:	Coursework B
Student Name:	Varun Senthil Kumar
Student ID Number:	H00332328

Declaration of authorship. By signing this form:

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Consent Form

PASSWORD HERO

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Consent to act as subject in an Experimental Study

Principal Investigator: Varun Senthil Kumar

The purpose of this study is to test the usability of the prototype. This study is an experimental study conducted within Heriot Watt University. There are minimal risks for you to participate in this study. All personal information will be kept confidential. Participation in the study is voluntary. You are free to decline your participation in this study. You are free to withdraw from the experimental study at any time. Withdrawal from the study will not affect your courses nor your relationship with the University.

I certify that I have read the preceding information and I understand the contents. I accept the conditions and willingly consent to participate in this study.

Name:

Date:

Signature:

1 Table of Contents

1. Introduction

We have created a prototype for a game targeted at kids in the age group 8-11 years for them to learn more about password security. But we also need to know whether the game is appealing for the kids, whether the game is designed keeping in mind any impairments or difficulties the user might face etc.

Before finalizing a user interface design, we need to evaluate the design, both in terms of qualitative and quantitative. User experience is important to validate the quality of an interface, and to study the UX of an interface, evaluation is an essential component. (Díaz-Oreiro *et al.*, 2021)

Evaluation is important as we need to be able to:

- Determine how usable it is for different users.
- Identify liked and disliked features.
- Identify any particular problems with the interface.

The feedback received can be used to improve the interface to suit the users' needs.

To evaluate our prototype, I will be performing two evaluation methods, one qualitative and one quantitative. The quantitative method of evaluation is questionnaires while the qualitative method will be observations.

2. Protocol

2.1. Questionnaires

One of the most commonly used evaluation methods is the questionnaire. What is a questionnaire? It is a set of questions posed by the investigator to the user for them to answer. Questionnaires are widely used for evaluation and research purposes as feedback is provided from the users' point-of-view. The feedback that's provided will have a strong impact on the interface's design. (Kuter and Yilmaz, 2001)

A few advantages of using a questionnaire is that it's relatively easy to collect data from a large number of users in a short span of time. Questionnaires do not need advanced tools and can be done online or even on paper. (Lazar, Feng and Hochheiser, 2017) When evaluating a game, a questionnaire can be particularly useful when assessing the player experience and characteristics as they help improve the game's UI. (Brühlmann and Mekler, 2018)

Using Likert scale based questions help the UX designers get insights into how well the UX has been designed.(Steinmaurer, Sackl and Gütl, 2021) Likert scale questions should ideally have an even number of options, preferably 4-6 options, as this provides more precision. It is also important for the question to not have a middle point, like *Neutral*, as this disturbs the analysis. Its unnecessary as the user should be able to confirm an answer, instead of playing it safe. (Nemoto and Beglar, 2014)

Aim: The objective of the questionnaire is to understand the prototype's design, the user's previous understanding of password security and how their understanding of password security has changed after playing the game. The user is required to go through the prototype, complete simple tasks and provide feedback regarding their experience with the prototype.

The questionnaire is a quantitative method of evaluation, it contains multiple choice questions and questions that use Likert scales. It is designed to be within subjects, that is, all participants perform the same task. Likert scale questions have been given 10 options, an even number, to increase precision and not providing the participant with a neutral option. The questions measure the participant's success rate for each task.

The participants of this questionnaire are students from another group in the same course (F20AD). The questionnaire was created using *Google Forms* and was sent out to the participants through *WhatsApp*.

2.2. Observations

Observations means to observe how users interact with a UI and is a popular method to gain more understanding about the usability and the user experience of the interface. When the researcher explains the purpose of the experiment to the user, it's called a controlled observation. Advantages of this method is that its to easy to analyze and can be conducted quickly. (Dave, 2021)

Observations are more than just recording data. When observing the user use the UI, we are able to understand what the user goes through while trying out the interface. (Fox, 1998) This helps while making design changes.

To evaluate the usability of a game that's designed for kids, observations is the best method as the researcher can get an in-depth understanding of what features needs to be changed and what features the kids prefer. (Diah *et al.*, 2010)

Aim: The objective of the observations is to understand how each participant completes the task and with what ease they are able to complete each task.

The observations that I conducted were of qualitative measure. The questions are focused on the prototype's design, the usability of the prototype and any difficulties faced by the user. The participant's impression, understanding of the game and usability of the game were recorded in the observations.

The participants of this evaluation are students from another group in the same course (F20AD). The evaluation was conducted on *Microsoft Teams*, with each participant individually. The participants were asked to play the game while sharing their screen and their interactions with the game were recorded and used to answer the questions.

2.3. Interviews

Feedback received directly from the participants is useful to help make design changes that improve the interface's usability. Interviews are conducted face-to-face and direct conversations can help understand the perspective of the user. (Lazar, Feng and Hochheiser, 2017)

They are popular as interviews are flexible, meaning the order of questions can be rearranged according to the user. Interviews are also interactive, as the user and researcher need to converse to conduct the interview. (Kuter and Yilmaz, 2001)

But interviews have drawbacks also. Conducting interviews can be time consuming and costly. Spending time with the participant for prolonged periods of time can lead to the researcher losing interest. In certain cases, there can be biases due to the participants' caste, race, religion or even their relationship with the researcher. Interviews also provide less anonymity than the other methods. (Bailey, 1994)

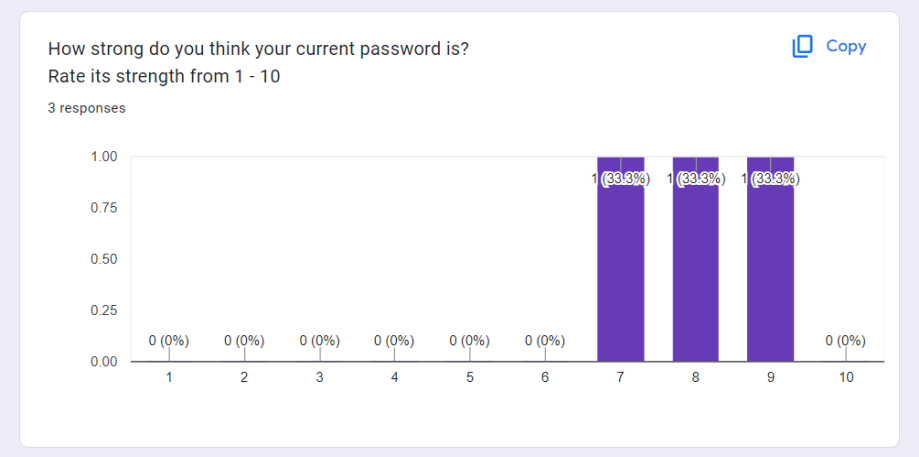
Analyzing the results of an interview can also be challenging as raw notes and open ended responses have to be filtered to know what is important and what isn't. This can be time-consuming. (Robson, 2002)

Due to these reasons, evaluation using interviews was not chosen.

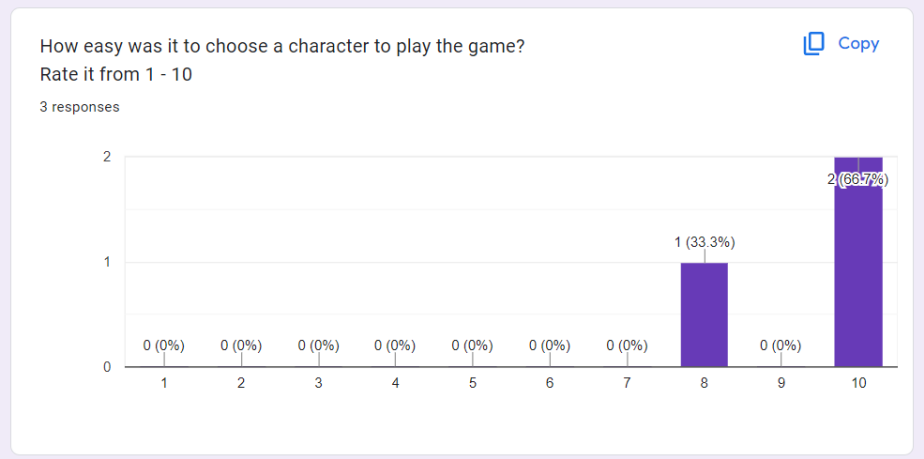
3. Results

3.1 Questionnaire Results

All participants answered differently when asked to rate their current password's strength. But they all have rated it in the upper scale, meaning that all participants have a good previous knowledge of password security.

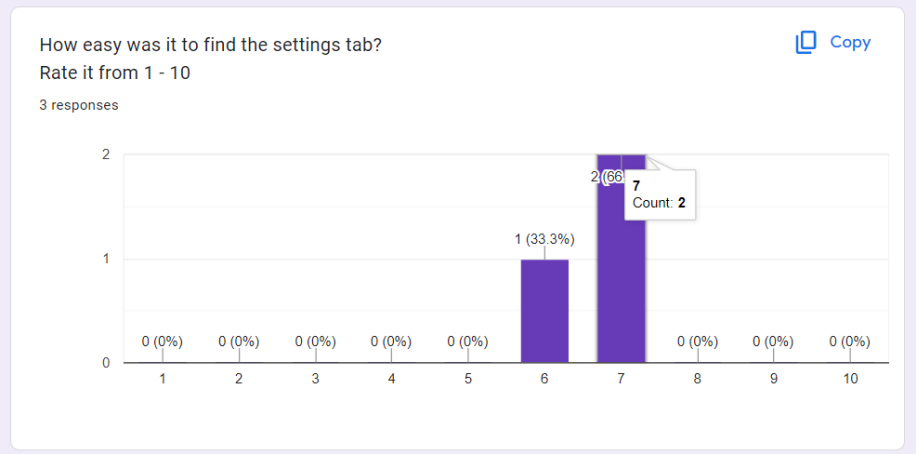


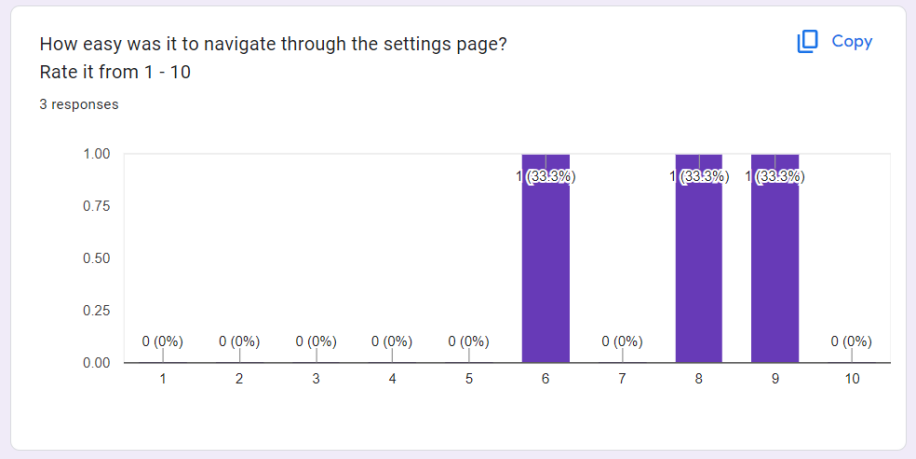
66.7% of the participants said it was very easy to choose a character while 33.3% of the participants had an issue with choosing a character.



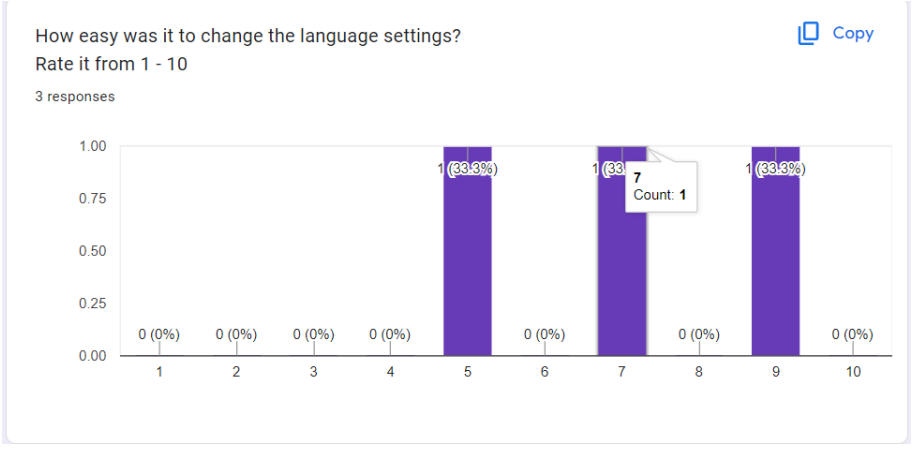
All participants found it moderately easy to find the settings tab. This could be due to the settings tab using a hamburger menu icon, instead of the traditional settings icon.

33.3% of the users found it a little hard to navigate through the settings page while 66.7% found it easier to navigate through the settings page.

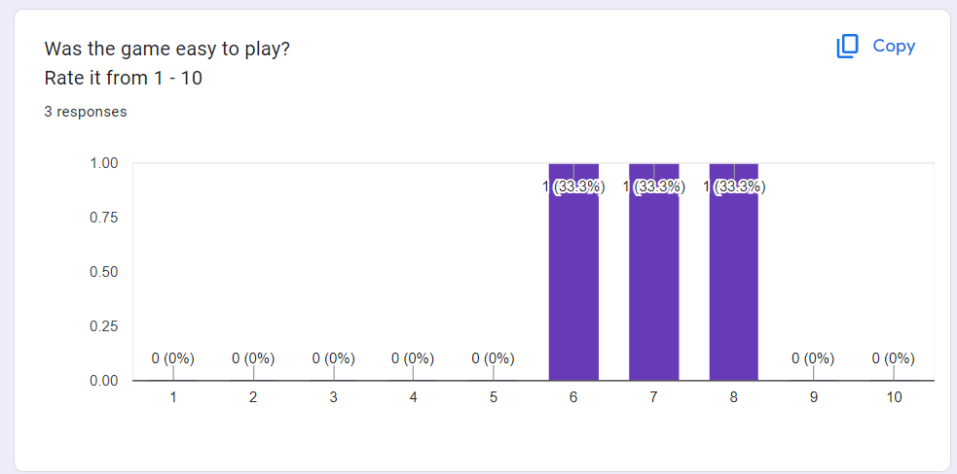




All participants had different difficulties in changing the language settings. 33.3% found it slightly hard, 33.3% found it moderately easy and 33.3% found it easy to change the language settings.

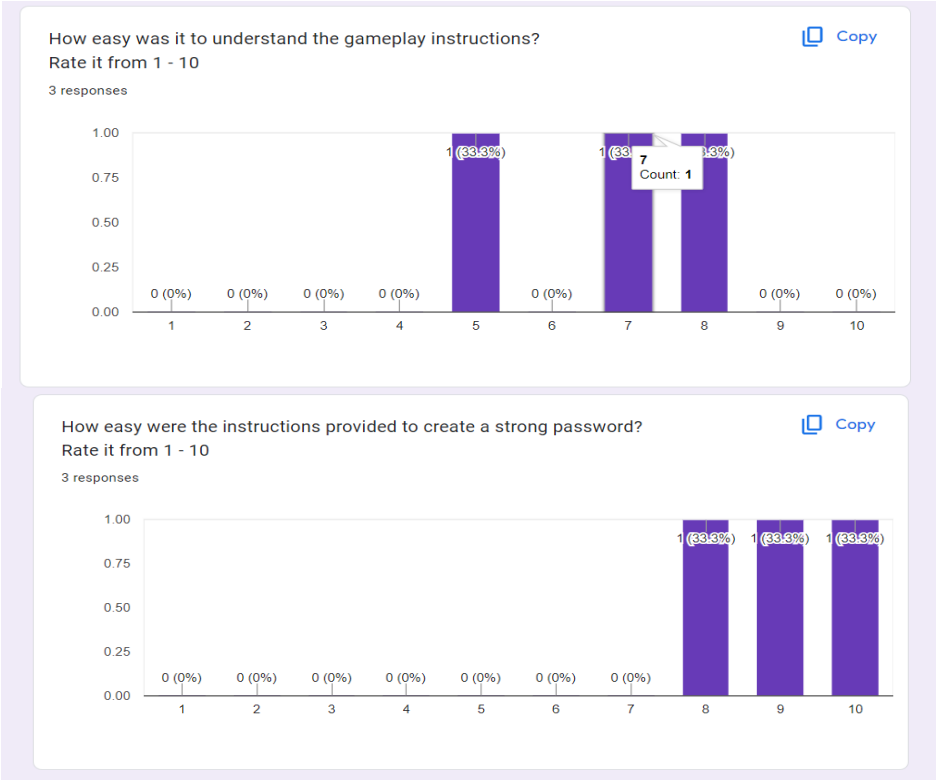


33.3% of the participants found slight difficulty in playing the game. All participants rated the game towards the “Easy” end of the Likert scale.

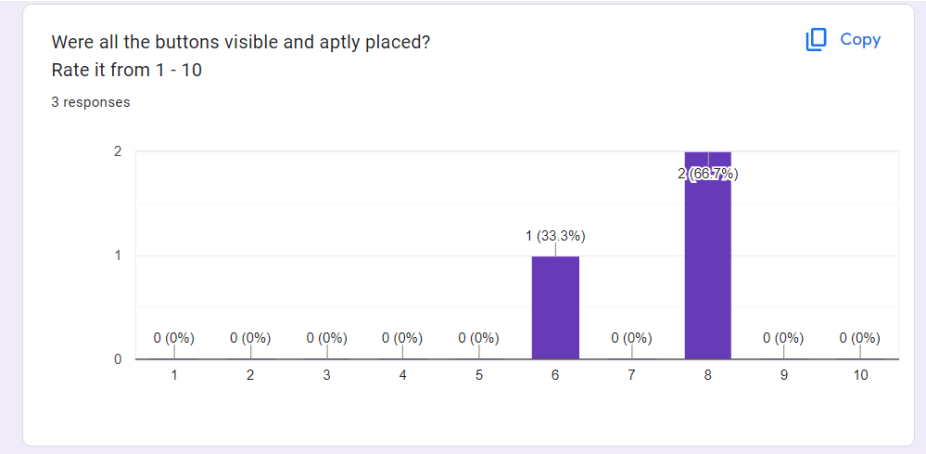


33.3% of the respondents said that they found it slightly hard to understand the gameplay instructions while 33.3% responded they found it slightly easy or modestly easy.

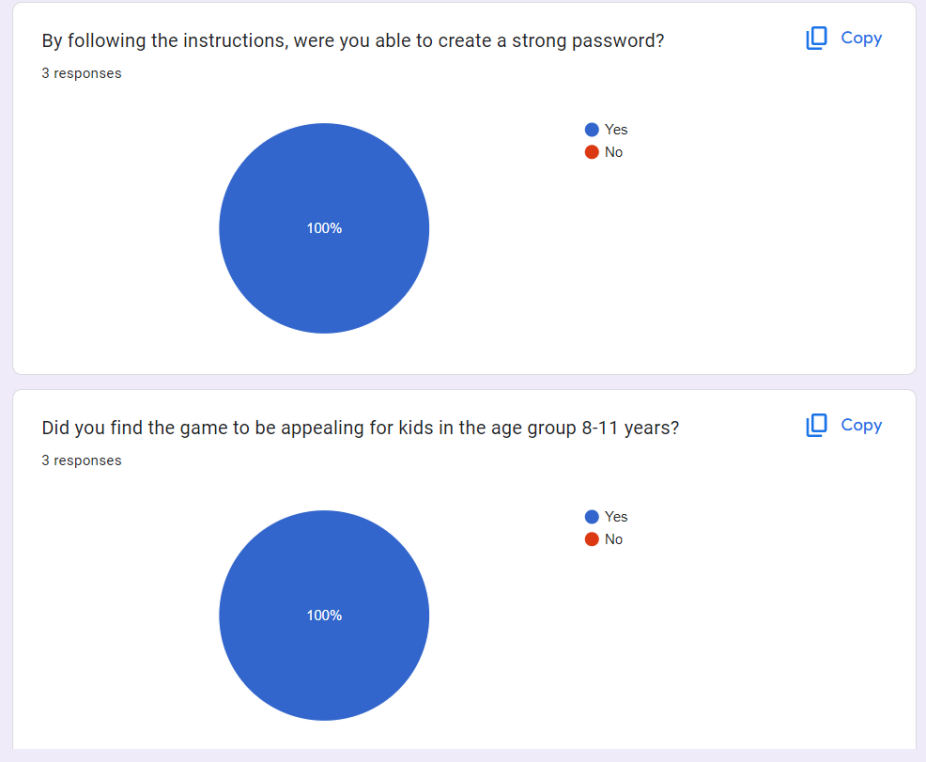
All respondents rated the instructions provided to create a strong password on the ‘Easy’ end of the Likert scale.



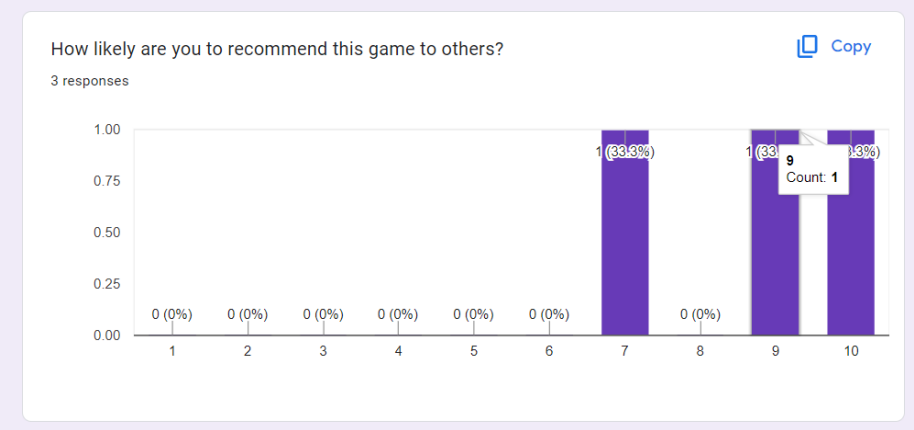
33.3% of the participants felt that all buttons were not visible or aptly placed, while 66.7% of the participants felt all buttons were visible and aptly placed. This could be due to some buttons being either small in size or the color of the buttons being similar to the background.



100% of the participants reported that the tips provided in the game helped them create strong passwords. All participants also found the theme of the game appealing for kids between 8-11 years.



All participants rated that they would likely or more likely recommend the game to others. With a few design changes, the game would be useful to teach kids about the importance of password security.



3.2 Observation Results

During the observations, it was noted that all participants had some kind of difficulty in finding the settings page. They scrambled across the page before they could find it. One participant found the language settings tab very easily, one participant took some time, while another participant took a lot of time to find the language settings tab.

Most participants were able to choose their characters very easily while one participant scrolled around the page a few times before choosing a character. Most of them found the game easy to play with no difficulties. One participant did not know the objective of each level and that he had to click on the shield or the character to get a password tip and kept running through the level for some time before figuring it out.

All participants could understand the password tips given in the game and were able to create strong passwords at the end of the game using the tips they learnt. Most participants could exit the game midway through, but one participant had difficulty in finding the exit button and scrambled across the page. All participants could see the screen reader icon and tried clicking on them.

The participants took 9.23 minutes, 12.34 minutes and 7.22 minutes respectively to complete the game. The average time to complete the game is 9 minutes and 46 seconds.

The participants said that they would like the exit button's color to be changed to be more visible. They also suggested changing the images provided for the characters as they don't represent the characters in the game. They suggested adding a settings icon instead of a hamburger icon for the settings page. The participants felt that the game's theme was appealing to kids aged 8-11 years and that the tips provided in-game are useful in learning about password security.

4. Conclusions and Design Changes

Based on the feedback received from the participants, we were able to find out which parts of the interface were liked by them and which parts needs changes.

From the analysis of the evaluation results, it can be concluded that the settings page and the language tab caused difficulties for all the participants. Few participants had difficulty in understanding the gameplay instructions and on how to play the game. Some participants had issues in exiting the game while playing. Most participants found all the buttons visible and felt they were aptly placed. All participants found that the game followed the brief and helped them create strong passwords. They also felt that the game was appealing to kids in the age group 8-11 years. All the participants felt that they would likely recommend this game to others. The average time to complete the game was 9 mins and 46 seconds. This benefits kids as they have a short attention span, and therefore will be able to focus on the game without losing interest.

A few design changes can be implemented to make the game more user-friendly.

- The settings tab is currently a hamburger menu. This can be changed to a traditional settings icon to make it easier for the users to understand.
- The language tab does not have a dropdown arrow. Adding this arrow can make it more accessible.
- Some participants found the instructions difficult. Using simpler vocabulary and adding clearer instructions will make it easy to understand.
- The exit button in-game is blue, which slightly blends into the background. Changing its color from blue to black will make it more visible.

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Appendices

Raw data for Questionnaires

The questions that were asked in the questionnaires sent out to the participants are given below.

Q1. How strong do you think your current password is? Rate its strength from 1 - 10.

Q2. How easy was it to choose a character to play the game? Rate it from 1 – 10.

Q3. How easy was it to find the settings page? Rate it from 1 – 10.

Q4. How easy was it to navigate through the settings page? Rate it from 1 – 10.

Q5. How easy was it to change the language settings? Rate it from 1 – 10.

Q6. How easy was it to understand the gameplay instructions? Rate it from 1 – 10.

Q7. Was the game easy to play? Rate it from 1 – 10.

Q8. How easy were the instructions provided to create a strong password? Rate it from 1 – 10.

Q9. Were all buttons visible and aptly placed? Rate it from 1 – 10.

Q10. By following the instructions, were you able to create a strong password?

Q11. Did you find the game to be appealing for kids in the age group 8-11 years?

Q12. How likely are you to recommend this game to others?

Raw data for Observations

The questions below were answered by observing the participants play the game.

Q1. Did the participants find the settings page?

Q2. Were the participants able to find the language tab?

Q3. Were the participants able to choose their character easily to play the game?

Q4. Did the participants understand the gameplay instructions and play the game accordingly?

Q5. Could the participants see the screen reader icon and try clicking them?

Q6. Did the participants understand the password creation tips provided by the game?

Q7. Could the participants exit the game at any point while playing the game?

Q8. How long did the participant take to play the game?

Q9. Did the participants give any feedback after playing the game?