ECE1778H Creative Mobile Application

Project Name: Psychology Experiment Creator

Final Report

April 12th/2012

(Total words: 1975)

Nanxuan Wang (999373636)

Peng Liang (998752121)

1. Introduction:

Psychology Experiment Creator is an application developed on Android platform, which mainly includes psychology experiment in three categories: Hearing Divide-Attention, Stroop-Effect Experiment and Short-Term Memory Experiment. The purpose of the application is to assist psychologists in testing Acquired Brain Injured (ABI) patients' abilities such as:

- Distinguish each individual sound while an audio chip with a mixture of multiple sounds was played
- Differentiate different colors with distraction of text
- Memory capability for a short period of time

Instead of conventional psychology paper writing experiments, Psychology Experiment Creator allows patient create their profiles, do experiments and save their experiment results easier and more efficient. Also, this application is able to allow psychologist review and analyze each patient's performance.

2. Overall Design:

The overall design block diagram shows in **Figure 1**.

Functionalities of each part:

- ***Psychology Experiment Creator:*** Introduction of this application and a button navigate user to Create Patient Profile Screen
- ***Patient Profile:*** collect and save patient's information such as name, age, gender, test date, etc.
- ***Hearing Experiment:*** Hearing divided attention experiment module contains 3 sub-tests. For each test, patient will be asked to answer the question, and then the result will be stored into hearing database table
- ***Stroop Experiment:*** Stroop-effect experiment module contains 4 sub-tests. For each test, patient will see the test of a color name, but the text color is painted with different color. Patient will be asked to answer what is font color. The result is stored into Stroop database table
- ***Memory Experiment:*** Short-memory experiment module contains 3 sub-tests. Patient will see words array in a short time. Then, the multiple choices will show up. Patient will be asked what the words were. Also, result will be stored in memory database table
- ***Database:*** Create SQLite database which is embedded in android mobile device. It contains 4 tables (patient profile, hearing performance, Stroop performance, and memory performance). For each table, it contains following data columns:
    - Patient Table: name, age, disease history, gender, and test date

Note: colored circle is for highlight purpose. It will not show up during application running time

- Hearing Performance Table: result, elapsed time, and wrong answers
- Stroop Performance Table: result, elapsed time, and wrong answers
- Memory Performance Table: result, elapsed time, and wrong answers

- ***Summary:*** This is test results review screen. It contains login screen, patients list, and results

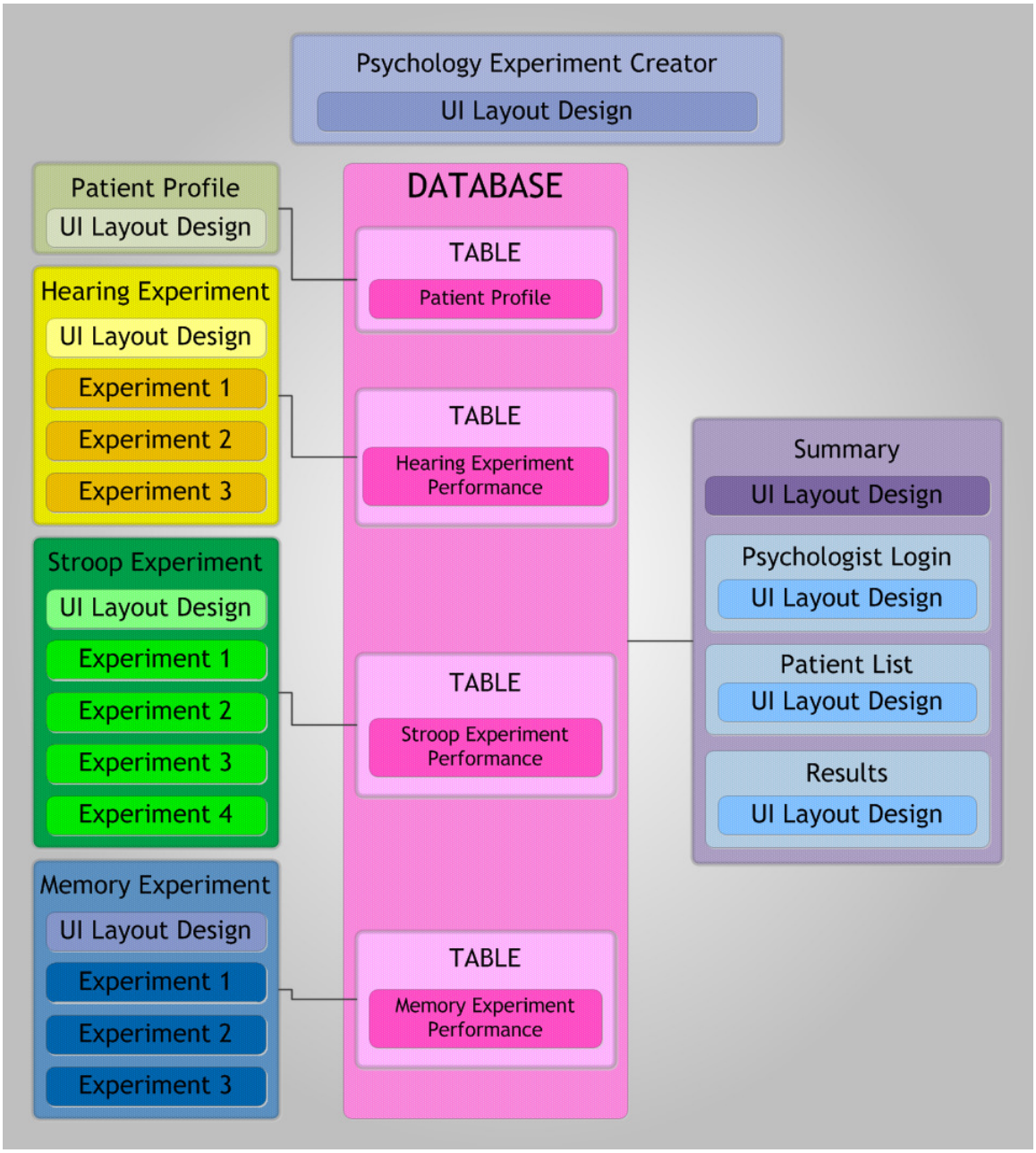

Figure 1 Block Diagram

Note: colored circle is for highlight purpose. It will not show up during application running time

3. Statement of Functionality & Screen Shots from App:

All functionalities of the application work well.

When the application starts, it enters Main Page screen (**Figure 2**). It includes a short description, a Create User's Profile button and an Exit button. We integrated WebView feature to show the paragraph. In this HTML way, paragraph alignment of right and left side can be perfectly achieved. Exit button will terminate program. If Create User's profile button is pushed, the program will direct to Create New Profile screen (**Figure 3**). Participants will be able to enter their information such as name, age, gender, disease history and test date. Patient can click calendar icon, then an alert dialog will pop-up (**Figure 4**). Click Save button, a toast message is popped up showing user profile's information entered and the information will be saved in Profile Database. In the meanwhile, save button will be disabled (**Figure 6**). Start Experiment button will bring participants to Experiment Options page (**Figure 7**).

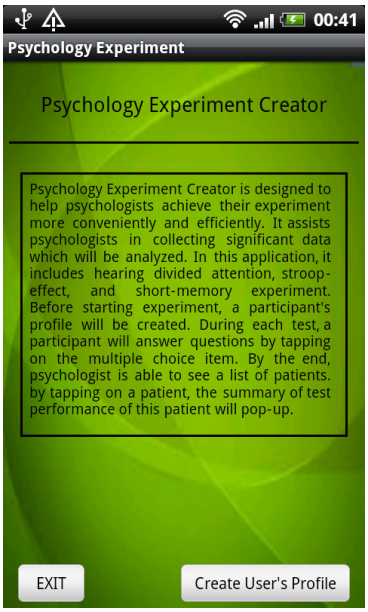

Figure 2 Intro Page

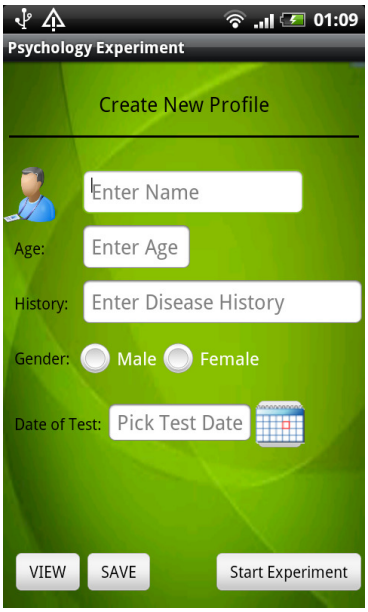

Figure 3 User Profile Page

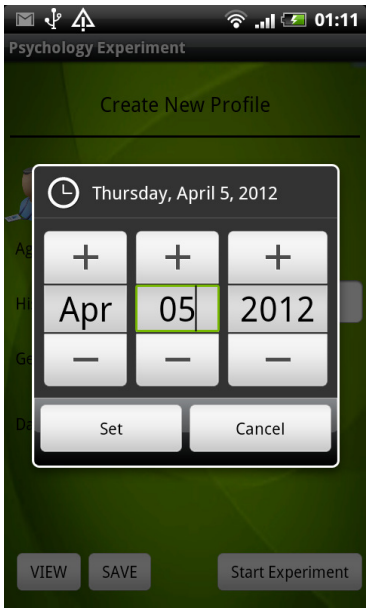

Figure 4 Test Date Set

Note: colored circle is for highlight purpose. It will not show up during application running time

Figure 5 Fill info

Figure 6 Save Profile

There are 3 categories of experiment: Divide Attention Experiment, Stroop Effect Experiment and Short-Term Memory Experiment. If one of three buttons is pushed, program will jump to related experiment page. Participants can start any of them. After button Divide-Attention Experiment is pushed, the program jumps to Divide-Attention Experiment test category (**Figure 8**). It contains a short description and two buttons (EXPERIMENT OPTION and START). Patient can either start tests by clicking START or go back to experiment option screen by clicking EXPERIMENT OPTION.

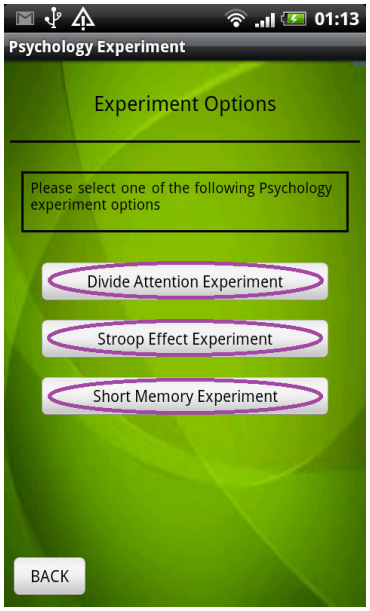

Figure 7 Experiment Options

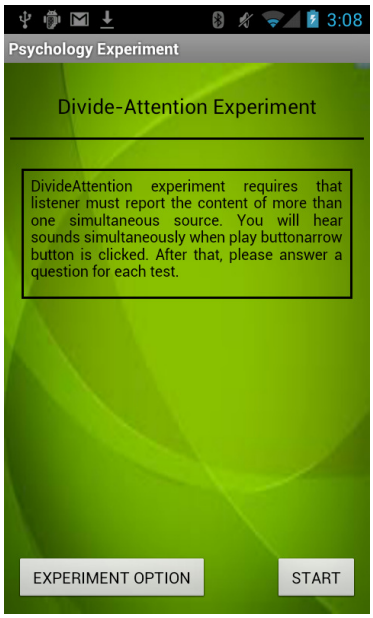

Figure 8 Divide-Attention Experiment Screen

Note: colored circle is for highlight purpose. It will not show up during application running time

Test-1 includes a question in the black box asking “Please answer how many sound sources you heard” and audio chip for participants to play (**Figure 9**). After button play clicked, participants will see three multiple-choice: 1, 2 and 3 (**Figure 10**). Patient needs to tap the multiple-choice item to answer the question. After item is tapped, a toast message pops-up showing what patient just answered. The answer will be stored to database and bring participant to Test 2 (**Figure 11**). The format of Test-2 is similar to Test-1 (**Figure 12**). After answered the question, the program will automatically bring participant to Test-3 (**Figure 13**). Similarly, repeat the same steps for Test-3 (**Figure 14**). After patient selects an answer, the answer is stored into database. The program will automatically bring the patient to experiment option screen (**Figure 15**). In the meantime, the program evaluates patient’s answer and stores the performance into database as well. In evaluation process, the program will do the following steps:

- Compare patient’s tests with correct answers
- Calculate overall score of Hearing Experiment and store into database
- Calculate elapsed test time and store into database
- Store wrong questions into database

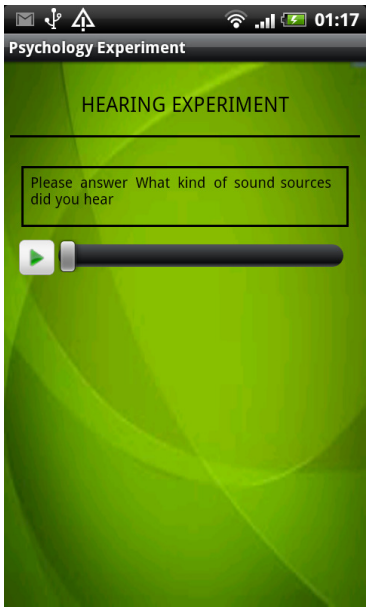

Figure 9

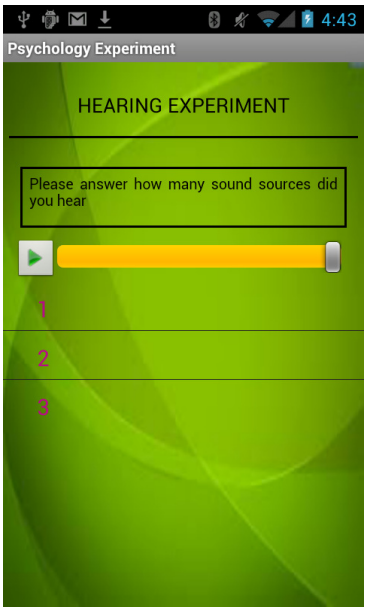

Figure 10

Figure 11

Note: colored circle is for highlight purpose. It will not show up during application running time

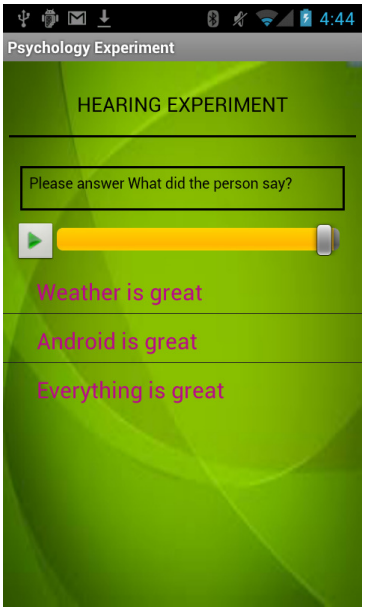

Figure 12

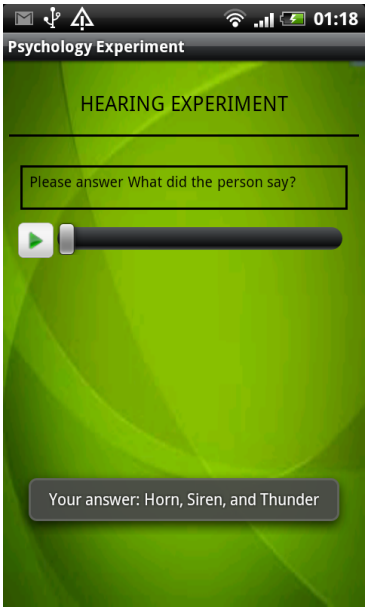

Figure 13

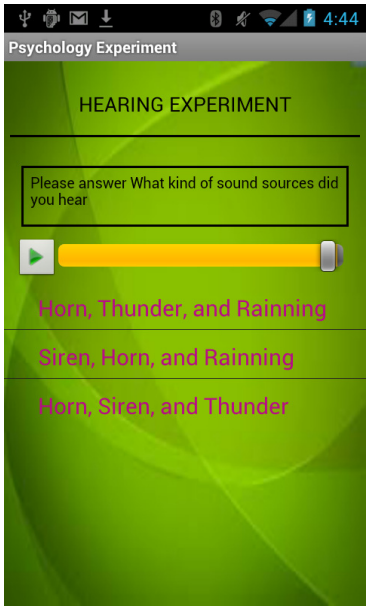

Figure 14

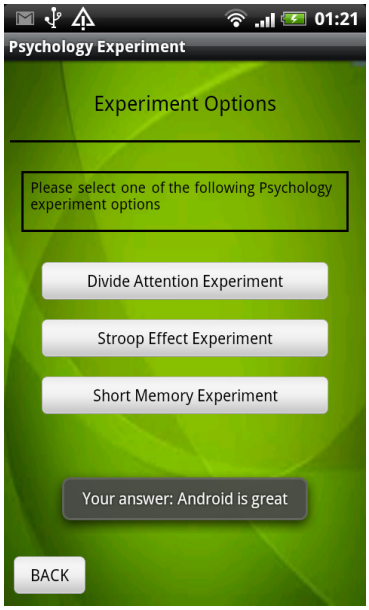

Figure 15

If Stroop Effect Experiment button is pushed, the application will enter screen of Stroop Experiment (**Figure 16**). It contains a short instruction and two buttons: EXPERIMENT OPTION and START. Similarly, pushing EXPERIMENT OPTION will return back to Experiment Option Screen and pushing START will start Stroop Experiment Test-1. In Stroop Test-1, a word “BLACK” in blue ink is shown and will be disappear in 2 seconds (**Figure 17**). After the word is gone, multiple-choices show up (**Figure 18**). Patient can tap an item to answer the question. A toast message pops-up showing what patient just

Note: colored circle is for highlight purpose. It will not show up during application running time

answered and then the program will automatically enter Stroop Test-2 (**Figure 19**). Do the same procedure for rest tests. After patient finishes last question, the program will automatically bring the patient to experiment option screen (**Figure 20**).

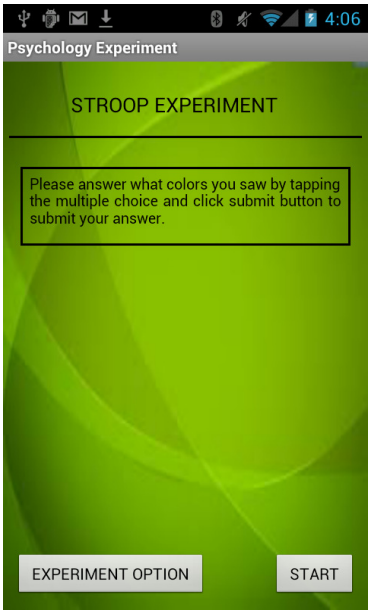

Figure 5 Stroop Experiment

Figure 6 Test-1

Figure 7 Multiple-choice

Figure 19 Submit Answer

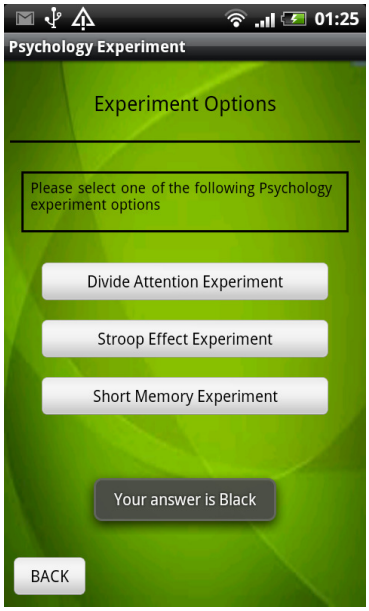

Figure 20 Finish Test

Similarly, the program evaluates these Stroop tests and stores all the performance data into database.

Note: colored circle is for highlight purpose. It will not show up during application running time

Short Memory Experiment is the last category. By clicking Short Memory Experiment button, the program brings patient to Short-Term Memory (**Figure 21**). There are a short instruction and two buttons: EXPERIMENT OPTION and START. By pushing START, the program will start Short-Term Memory test-1 (**Figure 22**).

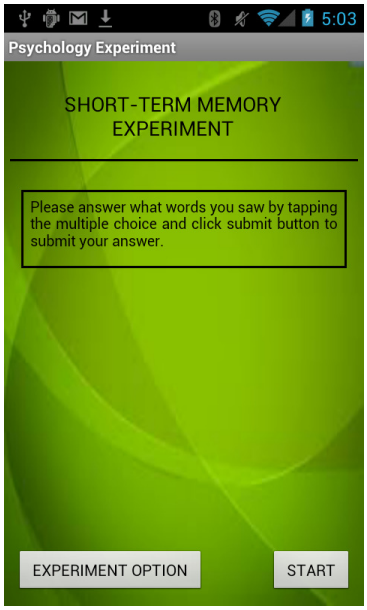

Figure 21 Short Memory Exp.

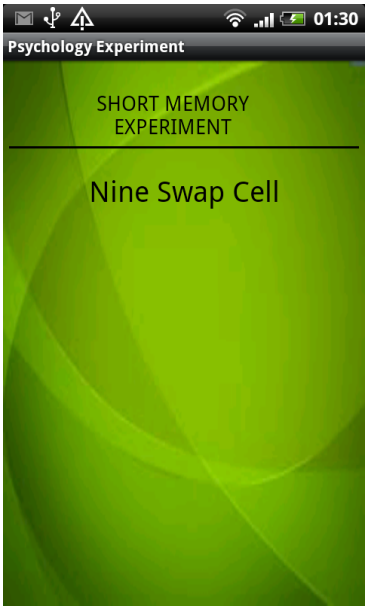

Figure 22 Memory Test-1

Figure 23 Multiple-choices

In Short-Term Memory Test 1, three words “Nice Swap Cell” are shown and will be disappear in roughly 2 seconds. Then, four possible answers show up (**Figure 23**). Participant can tap answer regarding to what they memorized. As soon as the answer was tapped, the program will automatically enter Short-Term Memory Tes-2 (**Figure 24**). Do the same steps for rest of tests until patient finishes. The program will direct patient to experiment options screen (**Figure 25**). The program evaluates performance as well. Patient can click BACK button return to user profile screen. At this moment, the patient has finished all psychology experiments.

Now, psychologist can review patient’s performances simply by clicking VIEW button (**Figure 26**). Psychologist will see Summary screen (**Figure 27**). In this screen, psychologist can click PERFORMANCE SUMMARY to login into patients list screen. After clicking PERFORMANCE SUMMARY, an alert dialog shows up. It asks enter the password provided by department (we set to “password”). After psychologist entered the pin, the program checks the password. If it is wrong, then throws an toast message shown WRONG PIN (**Figure 28**). If it is correct, then will move to patient list screen (**Figure 29**).

Note: colored circle is for highlight purpose. It will not show up during application running time

Figure 24 Submit Answer

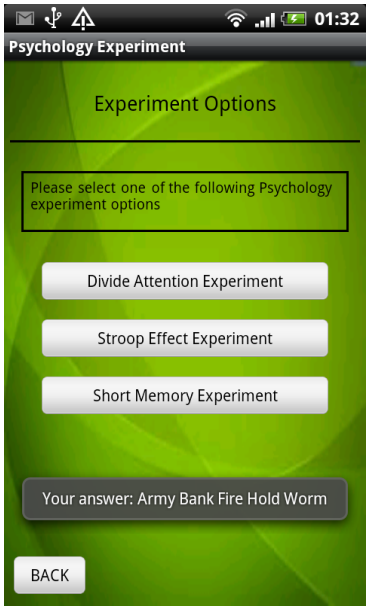

Figure 25 Finish Test

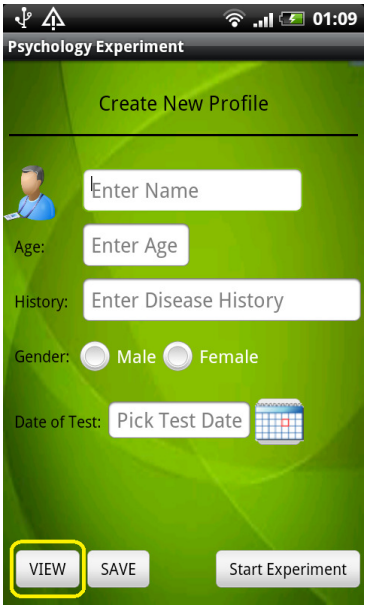

Figure 26 Click View

Figure 27 Summary

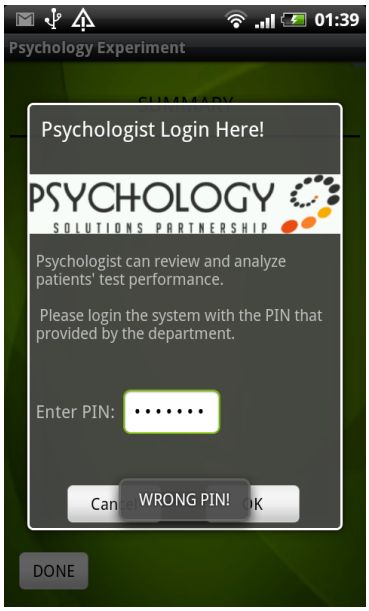

Figure 28 Login Dialog

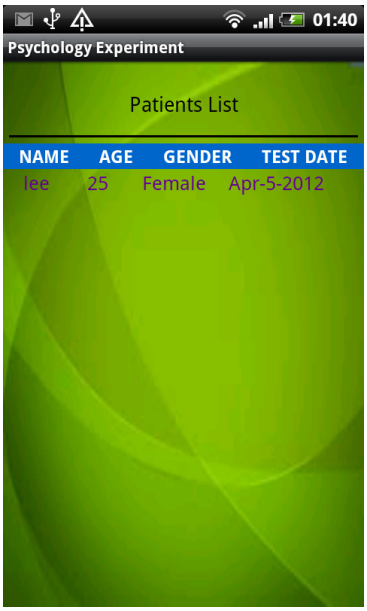

Figure 29 Patient List

Psychologist can click the patient item to see his/her overall results (**Figure 30-32**). For each experiment, it shows patient's name, score (correct answer), elapsed time and wrong questions. This will help psychologist analyze more efficient and easier.

Note: colored circle is for highlight purpose. It will not show up during application running time

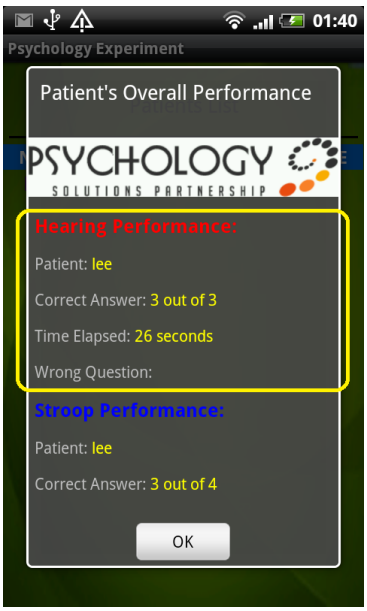

Figure 30 Hearing Result

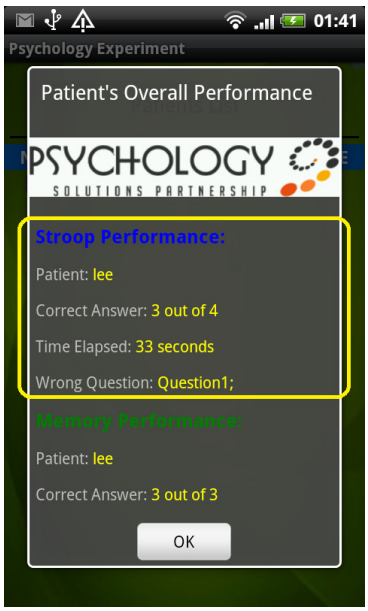

Figure 31 Stroop Result

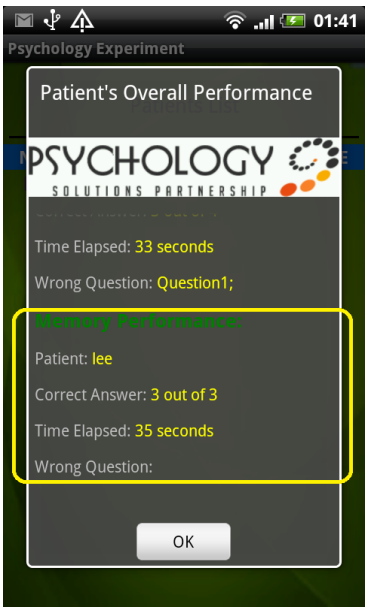

Figure 32 Memory Result

4.What We Learnt & What We Do Differently:

Even though apper resigned, what needed to do at the beginning was to understand what purpose of psycholoy experiment designed in app and then design an appropriate algothm. Adding Voice Recognition and Blue Tooth features into app was irrelavent to the purpose of experiment. After we went through the development cycle, we learnt following:

- How to develop Android appcation using eclipse environment
- Android layout UI design
- Media embedded (Audio clip and Picture)
- Alert dialog layout UI design
- SQLite Database integrated in Android
- Retrieve and insert data into database
- Update database
- Set timer for text fade in/out
- Button event trigger
- Test and score system
- Software development full cycle using waterfall methodology

Wecould develop quiz games, or teaching lessons on Android application development using the techniques I learn from this project.

5.Contribution by Group Memebers:

Note: colored circle is for highlight purpose. It will not show up during application running time

Nanxuan Wang:

- Responsible for all UI graphic design
  - Main Screen
  - Create User's Profile
  - Experiment Option
  - All experiement screen
  - Summary performance
- Contributed on high level of guidance of development of app:
  - Researched and collected best psychology experiement ideas for ABI patient through reading academic paper and e-jounals
  - Finalized three main experiment for the app
  - Designed Divide-Attention Hearing Expreriment
  - Designed Stroop Effect Expreriment
  - Designed Short-Term Memory Expreriment
- Responsible for programming on Divide-Attention Hearing Experiment (Test 1 to 3)integrating audio-playing feature
- Responsible for programming on Short-Term Memeory Experiment(Test 1 to 3)
- Assisted in updating and finalizing all codes for the app and captured most of screen-shots
- Contributed on writing and updating all documentations in this course - all presentation slides, proposal, plan and final report

Peng Liang:

- Overall design block diagram
- Programmed on all UI layouts for the following screens:
  - Application Introduction (where the application starts)
  - Create User's Profile
  - Experiment Option
  - Stroop-Effect Experiment includes Test-1 to Test-4
  - Summary
  - Login page
  - Patient list view
  - Performance results view
- Make mixed sound mp3 audio clips for Hearing divided attention experiment
- Database structure designing and programming:
  - ✓ User Profile Table

Note: colored circle is for highlight purpose. It will not show up during application running time

  - ✓ Hearing Experiment Table
  - ✓ Stroop-Effect Experiemtn Table
  - ✓ Memory Experiment Table
  - ✓ Retrieve and insert data to/from database
  - ✓ Update table data
- Programmed on score calculation function
- Programmed on Text fade in/fade out effects and timer set up
- Contributed on final reports writing, modifying, capturing screen-shot, highlighting features of screen-shot, and formating
- Preparing for all presentations

6.Future Work:

- **UI Upgrade**
  1. Incorporate better graphic, pictures and icons
  2. Consider adding experiment tutorials UI(include animation) to help participants understand how to answer questions
- **Bulid Up Frame**

  Bulid frames to conveniently manage multiple catogaries of experiment
- **Set Up Timer**

  Set up timer for each individual test(such as 20 seconds for one question) so that it would be easier for psychologists to control time of experiment and also it would be fair for every paticipant
- **Add new Experiment**

  Add Path tracing experiment. The experiment requires a participant draws a line between the 2 solid lines of a designed trail as accurately as possible and without lifting the pen. The idea of application is to provide psychologists designed shapes of trails (i.e. flower trail) on mobile screen

7. Commercialization Potential:

We are interesting in making Psychology Experiment Creator more robust and commercialize it. In order to make it commercialization, we probably need to create an framework for experiment creator. In this way, it will allow user to create their own test or quiz in any field not just Psychology.

Note: colored circle is for highlight purpose. It will not show up during application running time