

uHearingTest

Self-administered, automated hearing tests using mobile technology

Page 1: “Main” Page

Once uHearingTest app is launched, the app directly enters to the “Main” page. Figure 1 shows the illustration of the “Main” page. The top portion of the main page shows the app name (“uHearingTest”). The bottom portion of the page shows the ear with animated waveform. There are five buttons corresponding to five different pages, including “Start” page, “Preview” page, “Stats” page, “Help” page, and “About” page. Once a button is clicked, the app switches to the corresponding page.

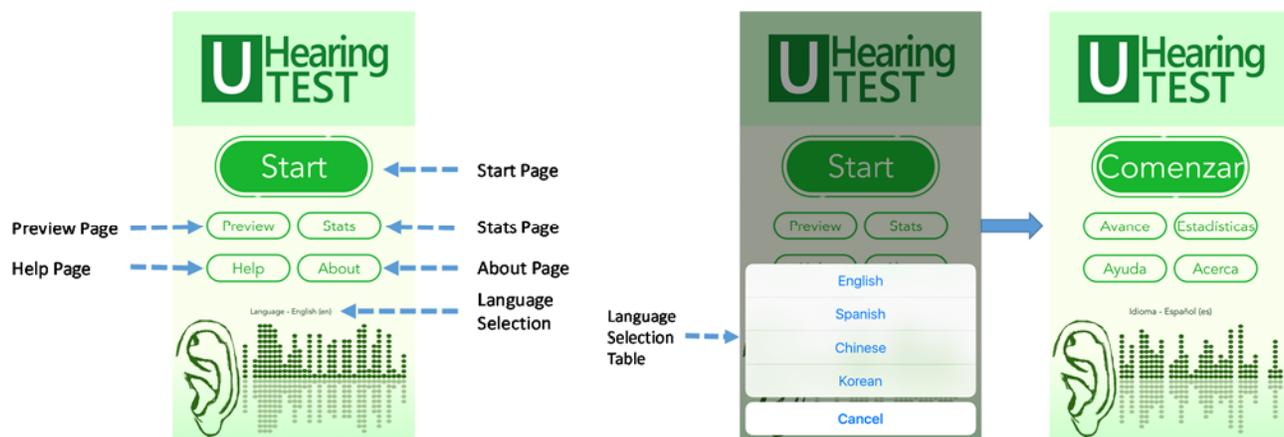


Figure 1: “Main” page illustration

Under the button is the language selection option. The currently selected language is shown in the middle of the page. A table will appear once the language selection option is clicked. Once a language is selected (clicked), the language table will disappear and the “Main” page switches to the selected language.

Page 2: “Start” Page

Once the “Start” button is clicked, the app will switch to the “Start” Page (Figure 2a). The “Start” page contains six selectable (clickable) buttons, including “Back” button, Headphone selection, Testing Ear Selection - Left, Testing Ear Selection - Right, User Selection, and “Start” button. Once the “Back” button is clicked, the app will return back to the “Main” page.

Headphone selection allows the user to select the headphone used for the testing. The default headphone is Apple earphone. Additional research data are required to establish different reference value for different headphone due to the difference in frequency response. Figure 2b shows the headphone selection list. If no headphone is detected, the app will display a warning message on the top of the “Start” page.

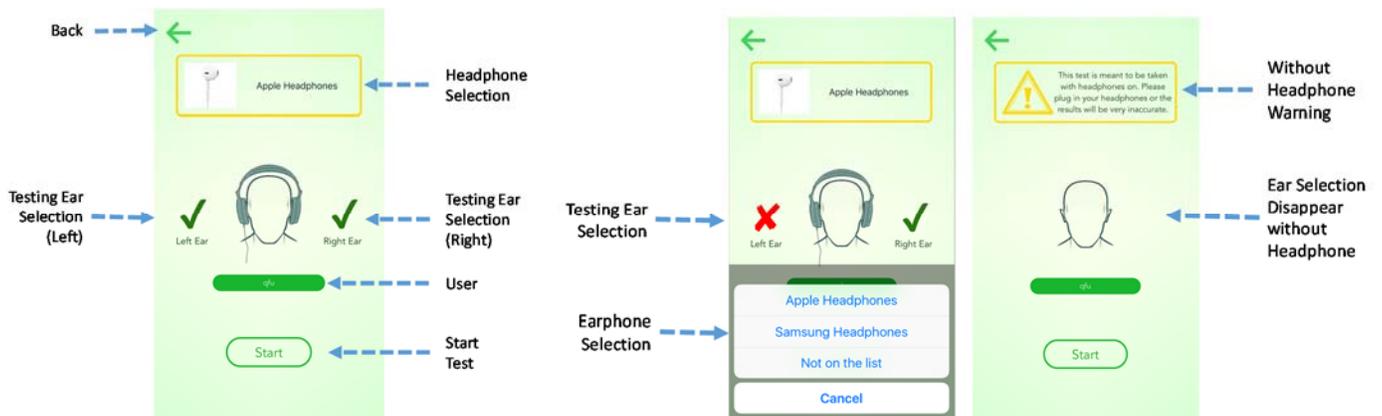


Figure 2: "Start" page illustration (a) and earphone selection and warning (b)

The symbol besides the head is used to select the testing ear. Green check symbol indicates that the corresponding ear will be tested. Red crossed symbol indicates that the corresponding ear will not be tested. If both ears are selected with green check symbol, the testing will be performed sequentially in both ears (left ear first, then right ear). While the test can still continue without the earphone. Left and right ear selection will be disabled (or disappear) so the sound will play via speaker.

The previously selected user will be shown in the "Start" page. If the test will be performed by another existing user or new user, click the "User" button. The app will switch to the "User" page, which is shown in the Figure 3. The "User" page contains "Cancel" button, "+" button (Add new user), and existing user list. Click the corresponding user name in the user list if the existing user is performing the test. If the user is not in the existing user list, click the "+" button to create a new user. A pop out window will appear once "+" button is clicked. Type the user name (any string will be fine) and click "OK". The app will automatically return to the "Start" page with the selected user name. Once the ear and user is selected, click the "Start" button to start the formal test.

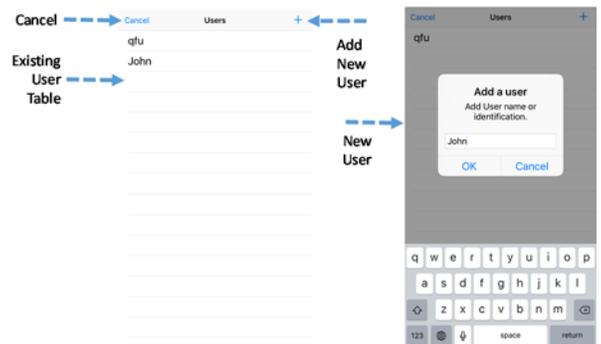


Figure 3: Existing user selection and new user creation.

Page 3: "Test" Page

Once the "Start" button in the "Start" page is clicked, the app will switch to the "Test" Page, which is shown in Figure 4 (a). The "Test" page includes four selectable (clickable) buttons, including "Back" button, "Hear" button, "Did Not Hear" button, and "Repeat" button as well as two status bars. One is the progress bar and the other is the background noise indicator. The "Repeat" button also shows the currently testing frequency.

The app will test the lowest frequency (250 Hz) first. The app will play one sound. If the user hear the sound, click the "Hear" button. Otherwise, click the "Did Not Hear" button. The app will increase or reduce the sound level based on the response of the user and stimulus itself. Once the desired reversal is reached. The app will

automatically switch to the next testing frequency. If both ears are selected, the app will test the threshold of the left ear first and switch to the right ear. The App also automatically detect the current sound level of background noise. After the test is done, the app switch the “Result” page, which is shown in Figure 4(b).

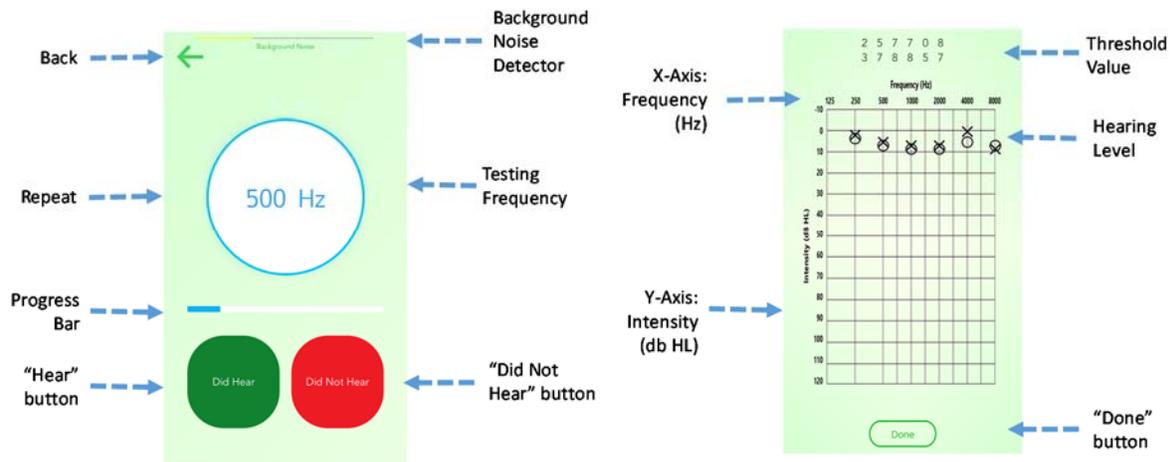


Figure 4: “Test” page illustrations (a) and “Test” result illustration

Page 4: “Preview” Page

“Preview” page is completely redesigned to mimic the traditional audiometry. This page allow the user to listen to sound with customized sound level and frequency. This page also allow the user to test other individuals’ hearing level. Here is the description of the functions of individual buttons.

- “Cancel” button: Switch back to “Main” page;
- “Save” button: Save the currently selected thresholds into the database.
- “Left” and “Right” button: Sound will deliver to the left ear only or right ear only. The symbol shown in the screen will switch to “cross” with left ear selection and “circle” symbol with right ear selection.
- “Cross” or “Circle” symbol: Set sound level for six different frequencies. “Cross” for left ear and “Circle” symbol for right ear.
- “Target” symbol: The currently selected frequency. The “Target” symbol can be switched by directly clicking the “Cross” or “Circle” symbol or clicking the “Lower” or “Higher” button.
- “Lower” and “Higher” button: Select the adjacent lower and higher frequency as testing frequency.
- “Softer” and “Louder” button: Reduce or increase the intensity of sound with the active frequency. The “Target” symbol will move up or down in the screen.

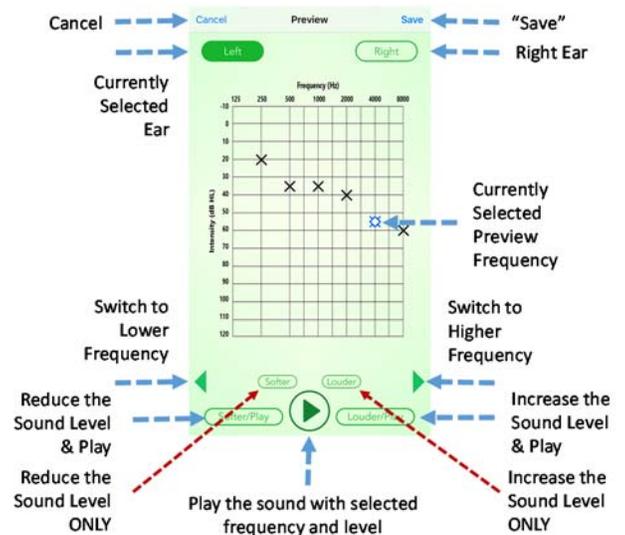


Figure 5: “Preview” page illustration

- “Softer/Play” and “Louder/Play” button: Reduce or increase the intensity of sound with the active frequency. The “Target” symbol will move up or down in the screen. The user will also hear the sound with the reduced or increased sound level.
- “Play” button: The user will also hear the sound with the currently selected sound level.

Page 5: “Stats” Page

“Stats” page allows the user to view the existing testing results. Once the “Stats” button in the main page is clicked, the app will switch to the “Stats” page, which is shown in Figure 6. There are five selectable (clickable) buttons in the “Stats” page, including “Back”, “All Records”, “Pure Tone Average”, “Export Data”, and “Clear All Data” buttons. “All Records” lists all the existing testing data in a table view. The right panel in Figure 6 shows the individual scores in a table view. Each item contains user name, testing date, PTA, and testing ear.

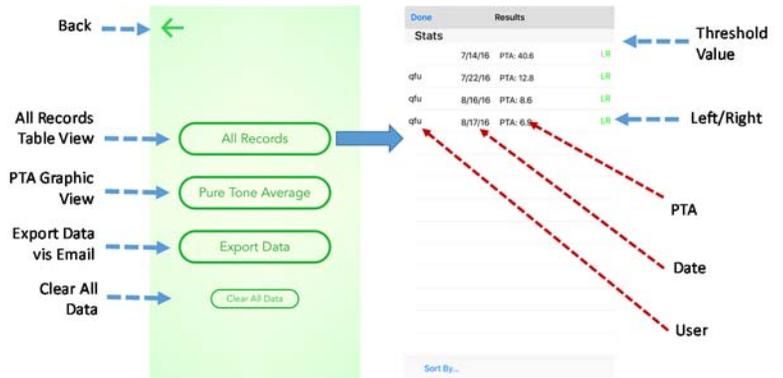


Figure 6: “Stats” page illustration

The app will switch to “Detailed Results” page once any item of the list in the “Result” page is clicked. This page displays the detailed information for the selected test item, including user name, testing date, headphone, device, and device ID. The bottom shows the audiogram of the testing data. The “Edit” button in the top right corner allows the user to change the testing information.

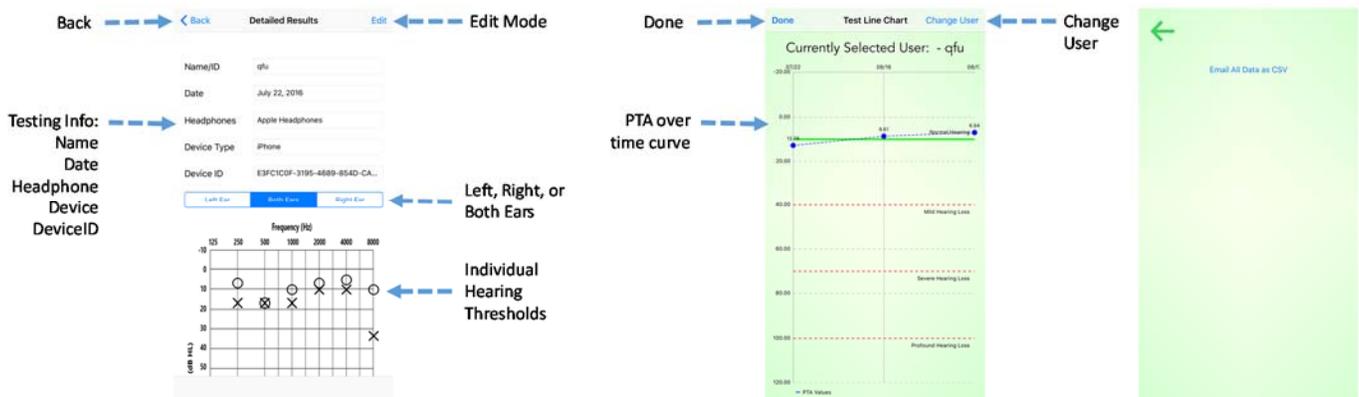


Figure 7: Detailed Results for Individual Test (a) and PTA over time

The app will switch to “PTA” page once the “Pure Tone Average” button in the “Stats” page is clicked. The PTA page shows the PTA over time for the selected user. The user can be selected by clicking the “Change User” button in the top right corner. The user can also view the detailed testing results for each point by clicking the symbol in the graphic view. The right panel in Figure 11 shows the data export page once the

“Export Data” button in the “Stats” page is clicked. The data export page allows the user to send all the testing results via email with attached CSV file.

Page 6: “Help” Page

“Help” page allows the user to see how the app works. Once the “Help” button in the main page is clicked, the app will switch to the “Help” page (Figure 8). There are five selectable buttons in the “Stats” page, including “Back” button, “Test Page” button, “Stats Page” button, “Preview Page” button, and “Important Disclaimer” button. Right panel shows the example of the help for Test and Stats page. The bottom shows the number of pages in the help file. The user can swipe left or right to see the content in the different page.

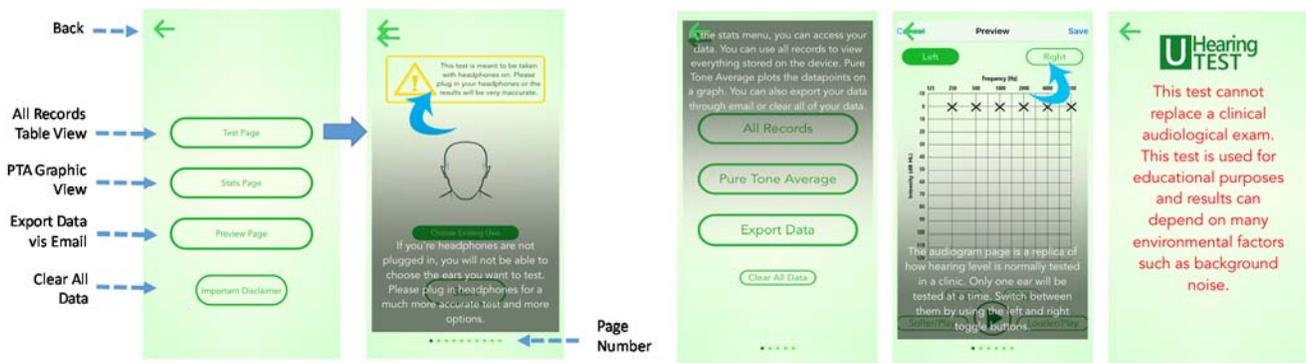


Figure 8: “Help” page illustrations and examples of different help page

Page 7: “About” Page

“About” page shows the simple explanation about the uHearingTest app. The bottom of the page shows the House Ear Institute (HEI) logo and UCLA logo. The copyrights of uHearingTest will be co-owned by HEI and UCLA. Figure 9 shows the “about” page for four different languages.



Figure 9: “About” page for four different languages (English, Spanish, Chinese, and Korean)Figure