A Touch Screen Button Size and Spacing Study with Older Adults

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In 2003 Boston Scientific was planning the release of a touch screen-based in-home monitor for patients with Boston Scientific Implanted Cardioverter Defibrillators (ICD). The demographic of these patients is heavily weighted towards older populations. The research, recommendations, and guidelines at that time were largely based on young healthy users. Hence, a need existed to determine acceptable button size and spacing for aged populations.

The purpose of this study was to determine a minimum touch screen button size for use by older participants with heart conditions. This study used a total of 16 participants: nine females and seven males. The age range was 51 to 79 years old, the mean age = 66.2 (SD=9.6). All of the participants were allowed to wear corrective eyewear if needed and self-reported their vision as 3 or better on a four point scale (with 4 being "excellent").

The results from this study were used to specify: (1) the optimal button height and vertical spacing for a set of buttons stacked vertically and (2) the optimal width and horizontal spacing for a set of buttons laid horizontally. A baseline button size (0.75" wide x 0.75" high) was approximated based on recommendations from the U.S. Army Weapons Systems Human-Computer Interface Style Guide (1999) and a "minimum" button size (0.5" x 0.5") was selected based on the size of the proposed touch screen and the needs of the interface. The optimal button height was determined by holding the button width constant (0.5") and varying the button height (0.5" and .75") while the optimal button width was determined by holding the button height constant (0.5") and varying the button width (0.5", 0.62" and 0.75"). The optimal between-button spacing was determined by randomly varying the between-button spacing (0.11", 0.18". 0.30", and 0.59") for each button size. Seated participants were presented with a touchscreen displaying a set of four identical buttons and a text sentence indicating which button they were to press. Each finger touch resulted in a new instruction being presented. Each participant had 560 button touches with each button/spacing combination having 20 button touches. It was possible for a participant to have more than 560 finger touches as a "miss" was not counted in the button touch total. The buttons were activated "on release". Participants were not allowed to practice with the touchscreen prior to the start of test. Participants were allowed to set the angle of the touchscreen to one that was comfortable and reduced the glare on the screen. The screen was placed on a "standard height" table in front of the participant and participants were allowed to position themselves to interact with the screen. Data from one of the participants was eliminated as they were unable to complete the tasks.

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Accuracy (errors, misses) was collected for every finger touch. An "error" was defined as when a participant pressed the incorrect button and a "miss" was defined as when the participant touched the touch screen but did not press a button. For this study, the following information was examined: (1) percentage of trials containing an error and (2) the overall number of misses. Analysis of the data indicated that there was a less than 1% difference in the number of incorrect button presses across all button sizes and between-button distances. Additional analysis was performed to determine if there was a notable number of button misses between the different button sizes and spacing. This analysis indicated that there was a less than 2% difference in the number of button misses across all button sizes and between-button distances. Therefore, we selected 0.5" x 0.5" for our minimum button size.

Reference

Department of the Army. U.S. Army Weapon Systems Human Computer Interface (WSHCI) Style Guide (Version 3), pp. 6.4–6.5 (1999), `http://www.pnl.gov/wshciweb/Wshciv3.exe` (retrieved March 27, 2009)