

One-handed Thumb Text-message through different Vertical position of Touchscreen QWERTY keyboard

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Abstract. Most of physical QWERTY keyboard on PDA and mobile phone was located at bottom of device. According to orthopedics research, this bottom placement of the physical QWERTY keyboard can create unhealthy finger typing experience. Even though smartphone Touchscreen QWERTY keyboard can improve this placement limitation, most of the current smartphone's Touchscreen QWERTY keyboards are still located at bottom of the Touchscreen. We made prototype Touchscreen QWERTY keyboards that can be placed on top, middle and bottom of iPhone5. We collected one-hand operated typing performance data from three different positions to measure typo-error frequency and time for sending. Outcome of result was the bottom position was the least preferred vertical position to smartphone users. This result suggests the Touchscreen QWERTY keyboard need to be repositioned either to middle or to top of the device to improve user experience.

Keywords: Smartphone, Touchscreen QWERTY keyboard, iPhone5, Thumb typing, one-hand typing, usability, user experience

1 Introduction

Majority smartphone user prefers to use mobile phone with one-hand [1], and 90% of smartphone users demand larger screen size [2] that enhances readability. First generation of the mobile phone, PDA and smartphone had relatively small Touchscreen size compared to current trend of large screen smartphones. But one-hand user interaction with larger Touchscreen gets weakened. History of smartphone can be tracked from Nokia 9119 Communicator in 1998 and ever since the size of Touchscreen has a tendency to larger Touchscreen. Apple's iPhone5 (4-inch) adapts longer Touchscreen compare to precede models of iPhone 3, 4 and 4s (3.5-inch).

When screen is larger than 4-inch, user may start to lose their one-hand thumb typing capability. Since smartphone Touchscreen QWERTY keyboard and position on screen inherits from earlier mobile phone's physical QWERTY keyboard and position, it forces

user to splint their thumb angle more than 0 ~ 15 degrees. Our research will focus on vertical position of Touchscreen QWERTY keyboard on screen to investigate the improvement of usability for one-hand thumb typing.

2 Methods

We developed a prototypes smartphone mobile app of Touchscreen QWERTY keyboard that can be replaced to desired vertical position with iPhone5.



Fig.4. Vertical position of Touch QWERTY keyboard (top/middle/bottom)

The prototype Touchscreen QWERTY keyboard mobile app collects data when participants input text messages with one-hand thumb texting.

3 Participants and procedure

A group of fifteen participants were randomly selected to make six groups and each group was randomly assigned to one of the three different vertical position of Touchscreen QWERTY keyboard position. **Thirty-nine** participants, 29 females and 10 males. None of the participants had visual or motor impairments and all of them familiar with QWERTY touch keypad typing. All of the participants were using smartphone mobile operating system for their text-message, which was iOS or Android. Participant was asked with instruction that he/she have two minutes of practice time to get familiar with smartphone devices, and then one of three vertical positions was given to the participant. Participant was asked to sit on chair in front of table to text messaging, and was not allowed leaning or putting their hand on the table while typing. Participant was asked to use only one-hand thumb text method for entire session. When the experiment session started, participant completed typing of three given text-messages for each session. After completing the given messages, participant was asked to press send button to complete each text-message. Then participant repeated the same process until completing two other text-messages.

Duration of text-message was counted from typing of the first letter of word to pressing the send message button. After completing the QWERTY keyboard, data was collected from device to Internet server, which was programmed to collect corresponding data from smartphone device. After the typing, the participant asked to take a survey, which was to measure usefulness, ease of use, comfort, grip balance and thumb movement. After completion of the survey they were asked to input their name, age and gender.

4 Results / Apple i-Phone 5 (iOS)

A one-way ANOVA was carried out to measure whether there were significant differences of the numbers of typo errors among the different vertical positions. The results showed that overall, the numbers of typo errors of the top and middle positions are lower than the down, but it was not significant, $F(2, 36)=1.015$, $p=0.373$. It is similar to a one-way ANOVA on time for sending. The result revealed that overall, time of the top and middle positions are shorter than the down, but it was not significant, $F(2, 36)=1.201$, $p=0.313$. Although the hypothesis 1 (smartphone user's one-hand thumb text messaging performance will be enhanced by moving Touchscreen QWERTY keyboard to the higher position from bottom position) was not statistically supported by the experiment, results indicated that participants overall made fewer typo errors and spent less time for sending a message when the keyboard was located at the top position.

Table:1. Number of typo errors / Time for sending

Number of typo errors				Time for sending (time in Second)			
Position	N	Mean	Std. Deviation	Position	N	Mean	Std. Deviation
Top	14	13.1	9.14	Top	14	97.8	21.45
Middle	13	13.3	8.61	Middle	13	101.7	26.16
Bottom	12	19.5	18.67	Down	12	118.9	55.12

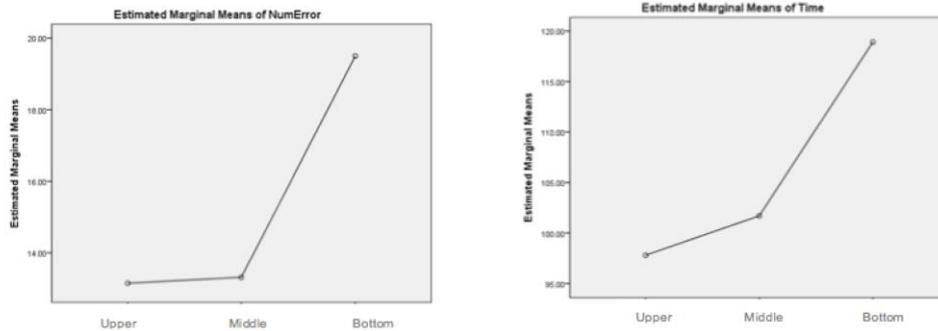


Fig. 5. Number of typo errors / Means of time

5 Conclusion

The vertical position of one-hand smartphone Touchscreen QWERTY keyboard affects the result of typo-errors, which showed the top and the middle position have significant results than the default position (bottom) of the Touchscreen QWERTY keyboard. And this paper will conduct further research about ease of use, satisfaction, and usefulness.

References

1. Karlson, A., Bederson, B., Contreras-Vidal, J.: Understanding Single-Handed Mobile Device Interaction, MobileHCI' 12 Proceedings of the 14th international conference on Human-computer interaction with mobile devices and services, pp 39--48 (2012)
2. Brown, P.: Smartphone owners want thin devices with larger displays, Strategic Analysis, Buyer Analysis report, pp. 14, May 2012.
3. Yao, J., Park, M. J., MMSc; Drew Davis, MD; James, Ideal Position for Thumb Interphalangeal Arthrodesis in the Era of Smartphones and Text Communication, Orthopedics| Healio.com; Vol 35. Number 11, November (2012)
4. Nicolau, H., Jorge, J.: Touch Typing using Thumbs: Understanding the Effect of Mobility and Hand Posture, CHI 2012, May 5--10, 2012, Austin, Texas, USA
5. Karlson, A., Bederson, B.: Human-Computer Interaction – INTERACT 2007 Lecture Notes in Computer Science Volume 4662, 2007, pp 324--338