

# COMPARISON OF TYPING SPEEDS ON DIFFERENT TYPES OF KEYBOARDS AND FACTORS INFLUENCING IT

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## ABSTRACT

The advent of the soft keyboard/touchscreen keyboard has led to a revolution in the development of typing processes. Earlier the work was done using type writers, which got revolutionized when keyboards came into being. This has been further revolutionized by the introduction of on screen keyboards that came first with the iPad. With touchscreen keyboards billed to be the keyboard of the next century, it becomes vital as to study the whether different characteristics of a keyboard can influence the speed of typing of an experienced typist. To understand this, a study was conducted by us on both hard keyboards and touchscreen keyboards. The following experiment primarily focuses on the influence of size of the keyboard, home row positioning, tactile and auditory feedback.

**Keywords:** Typing Speed, Keyboard Ergonomics, Touchscreen Keyboard, Hard Keyboard, Tactile Feedback, Auditory Feedback, Home Row Positioning

## INTRODUCTION

With the introduction of a wide variety of technology into the market, it has become easier than ever and at the same time, more difficult than ever to choose which form of technology to use to further the prospects of an organization. This is especially true in cases where the use of the technology can impact the balance sheets of companies like never before in the past. One of the industries where the introduction of technology has led to a mass upheaval is the Content Creating industry.

As such it becomes important to know the factors that are influencing typing speeds and to be able to determine how much the change in keyboards is affecting typing speeds. The hypothesis for the purpose of the experiment is –

*“The reduction of home row positioning and the lack of response elicited when pressing a key on soft keyboards are factors responsible for the reduction of speeds of expert typists on soft keypads”*

For the experiment, touchscreen keyboard and Hard Keyboard in both landscape mode and portrait mode were brought in and evaluated. The touchscreen keyboards lacked home row positioning and auditory feedback on striking a key, while the hard keyboard had both. If these factors are important and determine typing speed, then results should show that experienced typists are slower on touchscreen keyboards than hard keyboards. Also to add, if the size of the keyboard matters, then the typists should see a decline in typing speeds from landscape mode to portrait mode. This is because, with a reduced footprint, the amount of eye movement should increase, thereby increasing the time spent on writing a single word. Participants had been given four different conditions of keyboards which were-

1. Hard Keyboard in Portrait Format
2. Hard Keyboard in Landscape Format
3. SoftKeyboard in Portrait Format
4. Soft Keyboard in Landscape Format

This experiment will be used to conclude if the home row positioning and the key strike auditory feedback are making significant and independent contributions to the typing speed on touch screen keyboards which didn't have home row positioning and key strike auditory feedback turned on and on hard keyboards which include both home row positions and key strike auditory feedback. Also the experiment is used to determine if within touch screen keyboards, bigger layouts like landscape improve the typing speeds over touch screen keyboards in portrait layout. This was hypothesised since due to less scanning required larger keyboards provide better home row positioning than smaller keyboards.

## METHOD

### Participants

10 participants were selected, each having done their graduate level education at the minimum, and having worked in a social media prime company for a minimum of 3 years. All the participants have used hard keyboard for a minimum of nine to ten years. Age profile of the participants ranged from 25 years of age to 31 years with an average age of 27.3. There were 6 males and 4 females. In the experiments it was checked that behavior of experience of hard keyboard touch screen typists who had very less or near about zero familiarity with a touch screen keyboard. All the participants were also such that they have no experience in having no typing work done on a tablet. Some amongst them though had initial exposure due to the kind of work profile they are in. For the experiment it was decided to neglect the basic exposure and consider them as amateurs.

### Apparatus

For the experiment, an iPad 2 manufactured in 2012 was used. Both the orientations available i.e. landscape and portrait were used. For a hard keyboard a keyboard of QWERTY layout which is of the same size as the one in portrait mode of iPad2 and a keyboard which is used of QWERTY layout which is of the same size as the one in landscape mode of iPad2 was used. The TECH.COM external keyboard was used for landscape and the APPLE Wireless Keyboard for portrait. The screen resolution of iPad2 is 2048/1536 pixels which works out to 264 pixels per inch. In portrait mode the touch screen keyboard has a height of 528 pixels and is 1536 pixels wide. In landscape mode it is 704 pixels in height and 2048 pixels in width. In the modes, landscape and portrait the keys have 1.43cm and 1.07cm edge. It was ensured that the hard keyboards were approximately of the same size and model. It is to be duly noted that pixels here, is the unit of image in any touch screen display device. Any image which is sharper will have a higher pixel density, but this unit is not used for

physical entities. As a result our physical apparatus had no dimensions in pixels that were specified by APPLE INC.

### 1st Set

1. Lunch room has a large vent through which air passes
2. All hands meeting is held every first week of the
3. Best employee is given a cash prize reward of ten
4. Huge drive for fresher's was organized by the HR depart
5. The industry is opening up to talent that is non
6. Every Saturday is not a working day, but we may
7. The loss of one is the gain of the other one for sure
8. The best employee is the most hard working one always
9. There is a difference between working hard and working smart
10. There is no short cut to hard work but that is not

### 2nd Set

1. Kids are not inherently obedient they have to be trained
2. Explaining yourself is the hardest thing to do when you
3. How to be the most efficient employee that gets noticed
4. Explaining yourself is not always a good idea when confronted
5. Kids are not normally aggressive, they learn from their environment
6. Nothing can prepare you for a tough interview like good
7. Special is, is what special does, special thinks and acts
8. There are paths that have not been walked upon yet
9. Hoping to make best of an opportunity is never enough
10. Evil is, is what evil does and evil thinks and

The table below shows the maximum and minimum number of letters in each sentence set. The average length of all the sentences in a set was also measured. The minimum length refers to the sentence set which is the shortest of all and the maximum length refers to the sentence set which is the longest of all. In set 1, the longest sentence has 60 characters and the shortest has 47 characters. The average number of characters in every sentence is 51.4. In Set 2, the corresponding figures are 67, 46 and 55.5 respectively.

**Table 1** List of Sentence Characteristics

| Sets  | Sentences | min length | max length | Avrg. length |
|-------|-----------|------------|------------|--------------|
| Set 1 | 10        | 47         | 60         | 51.4         |
| Set 2 | 10        | 46         | 67         | 55.5         |

The table below shows comparison in terms of letters. The first set has 103 words, with the length of the words varying from one character 'a' to an eleven character word "difference". The minimum length points to the least letter count and the maximum counts to the most letter count. There are a total of 77 unique words in set number one and 77 unique words in set number two. The average of word length is 7.27 characters per word.

**Table 2** Word Characteristics

| Set   | Words | Min Length | Max Length | Average Length | Unique Words |
|-------|-------|------------|------------|----------------|--------------|
| Set 1 | 103   | 1          | 11         | 7.27           | 77           |
| Set 2 | 100   | 1          | 11         | 6.91           | 77           |

### Design of Experiment

All the participants of the experiments were given an iPad 2 first and then were given a hard keypad. In the first text given to the subjects it was stipulated that it will be tapped on the iPad in landscape orientation, while the second text was to be written on an iPad with portrait orientation. In the same way the subjects were asked to use the larger hard keyboard first and the smaller keyboard second. The passages were given in the same order. The starting time and the ending time of the task were recorded and the participant time was converted to word per minute.

### PROCEDURE

1. Participants were given a brief overview on how the experiment will happen.
2. The typing speed on a hard keyboard was measured in words per minute.
3. The subjects were then evaluated in the four conditions described and explained above.
4. The participants were asked to memorize every sentence before typing it. On making them go through the sentences, the effect of practice was eliminated. Every sentence was displayed on a card placed atop the keyboard.
5. When the participant indicated that he or she has learned the sentence, the card was removed.

### OBSERVATION TABLE

The table 3 on the next page shows the outcome of the experiment. All numbers represent words per minute value.

**Table 3** Typing Speeds of Participants (wpm)

|                   | Soft      |          | Physical |        |
|-------------------|-----------|----------|----------|--------|
|                   | Landscape | Portrait | Large    | Small  |
| <b>Subject 1</b>  | 17.086    | 19.223   | 26.597   | 32.238 |
| <b>Subject 2</b>  | 20.270    | 21.814   | 42.995   | 23.612 |
| <b>Subject 3</b>  | 29.702    | 16.739   | 21.936   | 30.308 |
| <b>Subject 4</b>  | 24.393    | 18.836   | 33.131   | 22.076 |
| <b>Subject 5</b>  | 17.329    | 26.707   | 40.115   | 22.050 |
| <b>Subject 6</b>  | 37.317    | 18.432   | 30.496   | 28.221 |
| <b>Subject 7</b>  | 25.687    | 26.443   | 27.043   | 28.441 |
| <b>Subject 8</b>  | 19.064    | 20.691   | 32.330   | 28.536 |
| <b>Subject 9</b>  | 16.531    | 26.325   | 25.296   | 24.448 |
| <b>Subject 10</b> | 19.923    | 14.645   | 29.802   | 15.614 |
| <b>Mean</b>       | 22.73     | 20.99    | 30.97    | 25.55  |
| <b>Std. Dev.</b>  | 6.66      | 4.27     | 6.54     | 4.94   |

## RESULTS AND CONCLUSIONS

It was observed that the individuals typed faster on landscape layout than on the portrait layout. On both level of keyboard types a repeated measure of analysis of variants was performed. This was also done on both level of keyboard arrangement using SPSS by IBM. There was a strong effect of the type of keyboard,  $F(1, 9) = 24.174$ ,  $P < .001$  (table 2.5). Overall all participants' clocked 28.72 words per minute on a hard keyboard. Whereas all participants could only clock 21.97 words per minute on a touch screen keyboard. The difference observed in the type of keyboard arrangement was slightly significant. The participants were slower on a portrait/small keyboard (24.19 words per minute) than a landscape/large keyboard (26.25 words per minute).

It was interesting to observe if there was a relation between the speeds of typing of the participants on different keyboards or if the keyboards brought in problems which interfered with the typing skills of the users. To analyze this, pair wise correlations were performed. The results of this are given in the table below, please note that a positive value indicates an increase in the speed with which the subjects type on the respective keyboard, when associated with the increase in typing speed on the respective keyboards in the second condition. A negative value thus, would mean an inverse effect that is someone types values faster on one layout than the other.

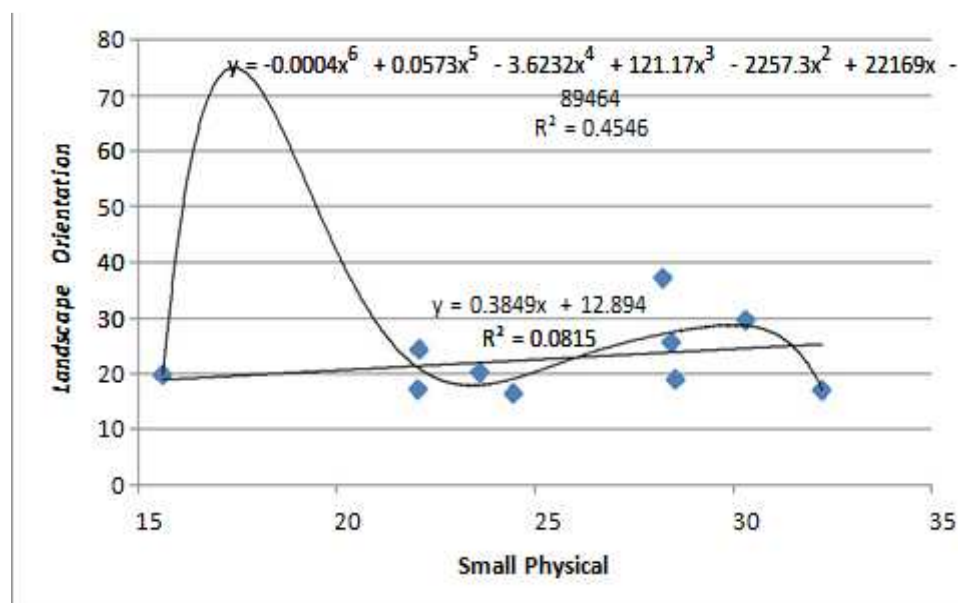
**Table 4.** Within Individual Subject Constraints

| Source      | Soft          | Hard          | SS      | Df | F      | Sig. | ES   |
|-------------|---------------|---------------|---------|----|--------|------|------|
| Soft        | Level 1 vs. 2 |               | 410.421 | 1  | 24.469 | .001 | .713 |
| Hard        |               | Level 1 vs. 2 | 129.319 | 1  | 4.013  | .067 | .301 |
| Soft * Hard | Level 1 vs. 2 | Level 1 vs. 2 | 134.060 | 9  | .582   | .471 | .059 |

**Table 5** Correlation results with different Situations

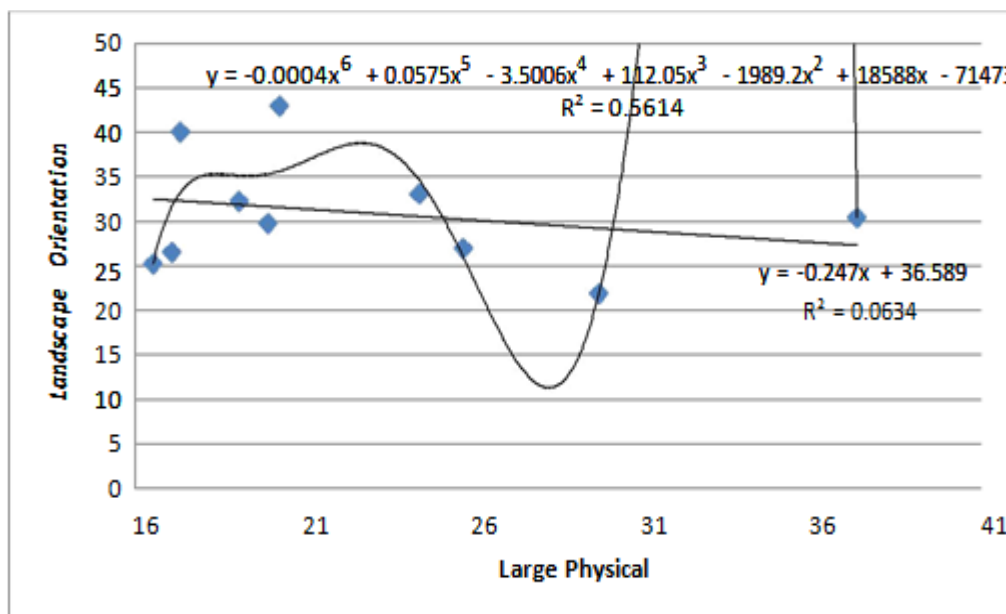
|                    | <i>Landscape</i> | <i>Portrait</i> | <i>Large/Phys.</i> | <i>Small/Phys.</i> |
|--------------------|------------------|-----------------|--------------------|--------------------|
| <i>Landscape</i>   | 1                |                 |                    |                    |
| <i>Portrait</i>    | -0.35704447      | 1               |                    |                    |
| <i>Large/Phys.</i> | -0.25185015      | 0.27249395      | 1                  |                    |
| <i>Small/Phys.</i> | 0.296714587      | 0.1001779       | -0.4564231         | 1                  |

The results of the pairwise correlation for the largest positive correlation of keyboards with different factors are plotted below in figure 2.1. It can be seen that both the curve and the line are fit. The typing speed of the participants in different conditions is plotted as blue dots. The X axis stands for small keyboard and the Y axis stands for the same values but on a larger keyboard.



**Figure 1** Plot Graph of Positive Correlation

The results of the pair wise relations for the largest negative correlation between both keyboards are graphed below. The figure 2 displays relations between the typing speed on landscape orientation touch screen keyboard and large hard keyboard.



**Figure 2** Pair Graph of Negative Correlation

## LIMITATIONS AND DISCUSSIONS

As expected all the participants were faster on hard keyboards (which is usually on which they are habituated on) when compared with touch screen keyboard (on which they are less habituated).

Even though, it was ensured that the dimensions of both the keyboards were as close to each other as practically possible. This clearly shows that the home row positioning and auditory key press feedback is important, even though statistically it is not very significant. This fact above shows that by spreading out all the keys horizontally, it can be ensured that the typist has to make less eye movements to double check if his fingers are on correct position.

The biggest limitation here though was the conditions that were not all counter balanced. They always appeared in the following order.

- I. Large hard keyboard first set sentence
- II. Small hard keyboard second set sentence
- III. Landscape orientation on iPad first set of sentence
- IV. Portrait orientation on iPad second set of sentence

An effect of practice on the iPad during the second time the passages were typed can be ruled out since all the participants are highly experienced. Therefore, it can be presumed that the interval between finger positioning is minimal. Also, all the participants entered every sentence using their memory. Thus, in both the cases the typist couldn't glance back at the sentence.

If it is assumed that the effect of the kind of device that was used to type is real, it can be said that home row positioning and auditory key press feedback can improve performance in touch screen keyboards in the same way they do in hard keyboards.



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