

Game Controller Text Entry with Alphabetic and Multi-Tap Selection Keyboards

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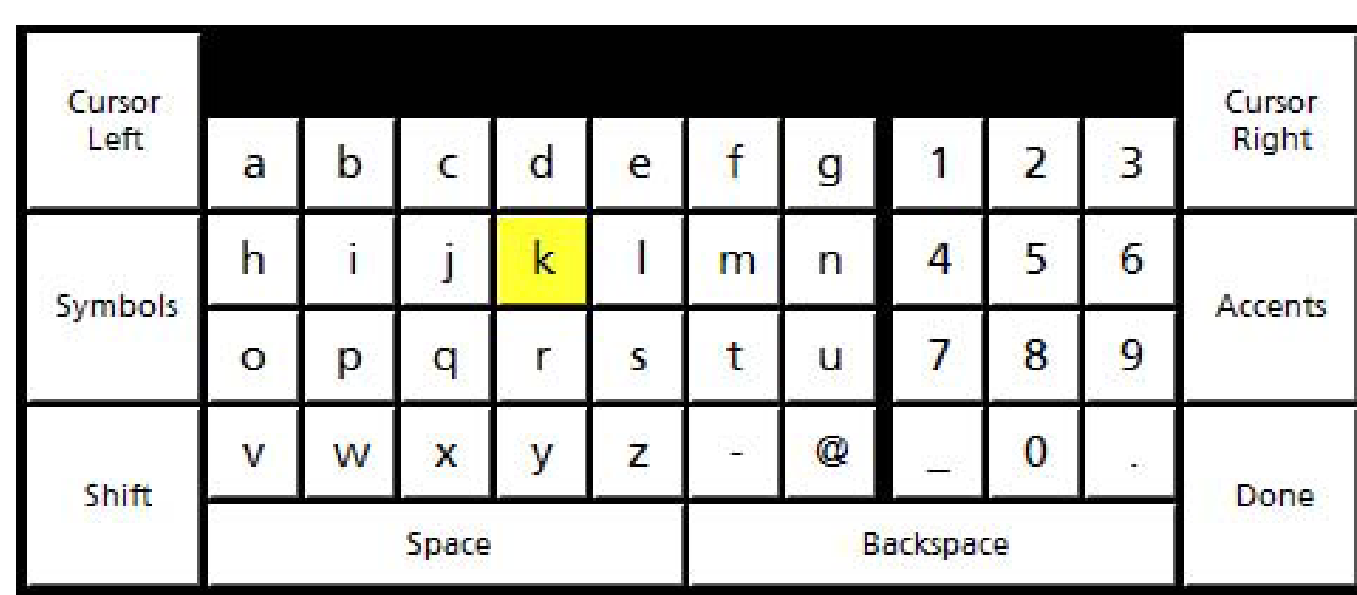
We present a longitudinal study comparing an alphabetical selection keyboard to a multi-tap selection keyboard using a game controller as input device. Our experiment showed the alphabetical selection keyboard to be faster for novice and expert users. The multi-tap selection keyboard was more error prone than the alphabetical selection keyboard. Qualitative results showed that over time the alphabetical selection keyboard was preferred by the users.



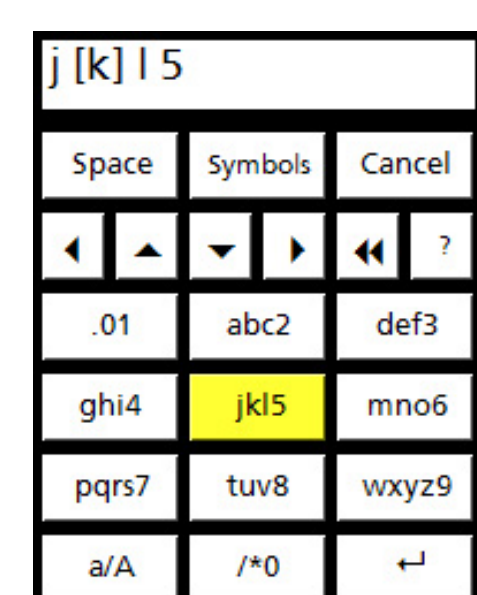
Motivation

Novel techniques for text entry using a game controller have been published, but unfortunately not been adopted by the industry. The goal of this paper is to evaluate the most widely used game controller text entry methods. We evaluated an alphabetical selection keyboard and compared it to a multi-tap selection keyboard focusing at novice and expert users. Main issues were speed, error rate and preferences correlated with potential changes over time.

Keyboard Designs



Alphabetic selection keyboard similar to the keyboard implemented in the Xbox 360 dashboard



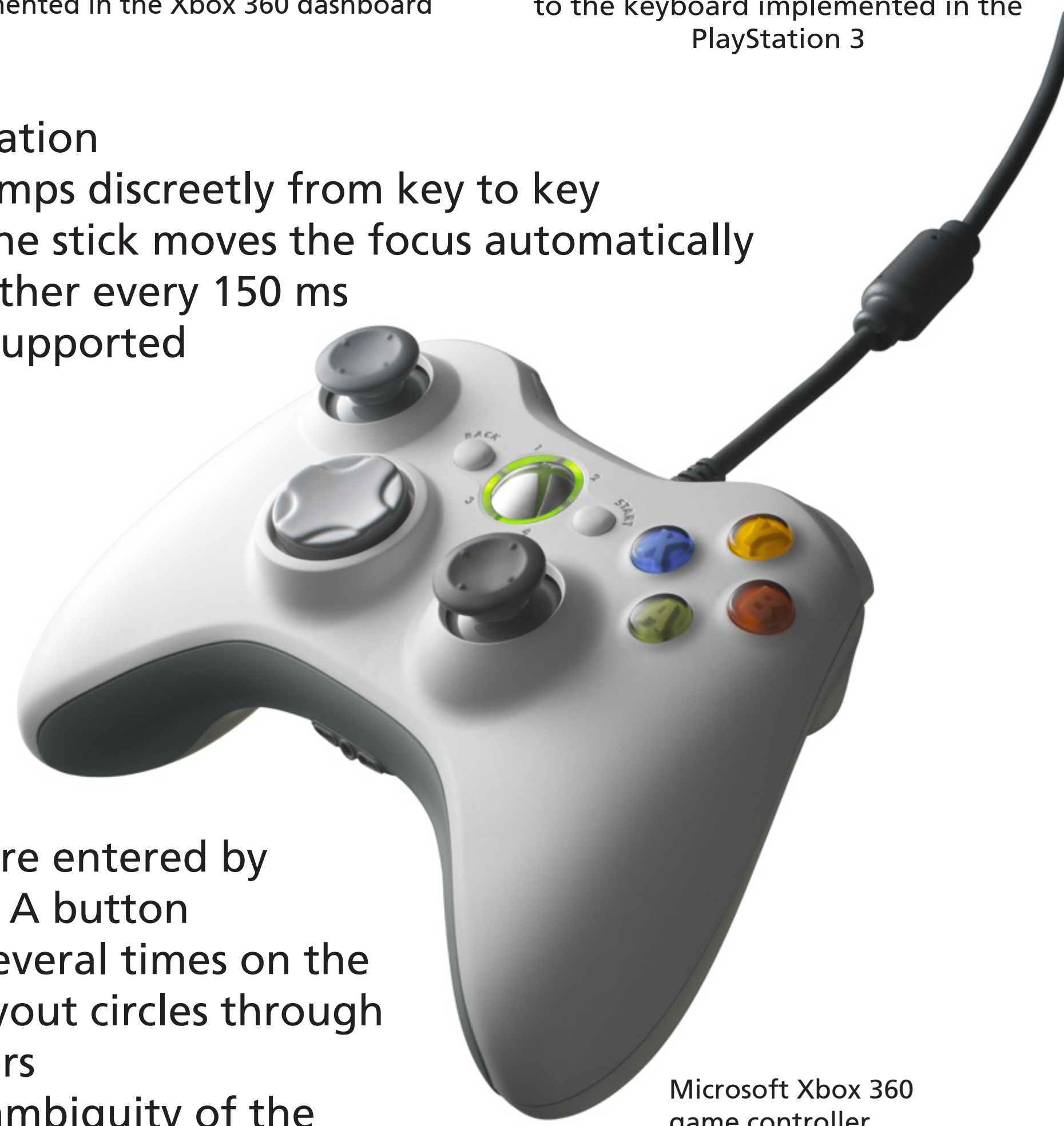
Multi-Tap selection keyboard similar to the keyboard implemented in the PlayStation 3

Left Stick

- ◆ 4-way navigation
- ◆ The focus jumps discreetly from key to key
- ◆ Deflecting the stick moves the focus automatically one step further every 150 ms
- ◆ The design supported wrapping

Buttons

- ◆ Characters are entered by pressing the A button
- ◆ Pressing A several times on the multi-tap layout circles through the characters
- ◆ Due to the ambiguity of the multi-tap layout characters were entered after a 55 ms time-out or using a time-out kill.
- ◆ Shortcut buttons: X-Space, B-Backspace, Y-Shift



Microsoft Xbox 360 game controller

Experimental Setting

Participants

- ◆ 10 volunteer participants (4 female, 6 male)
- ◆ Mean age 27.3, SD=3.6
- ◆ Novice game controller users
- ◆ No regular console gamers

Apparatus

- ◆ Implementation in C# using DirectInput
- ◆ Microsoft Xbox 360 game controller via USB
- ◆ TextText and Streamanalyzer by Wobrock and Myers
- ◆ We used the built in corpus of TextTest

Procedure

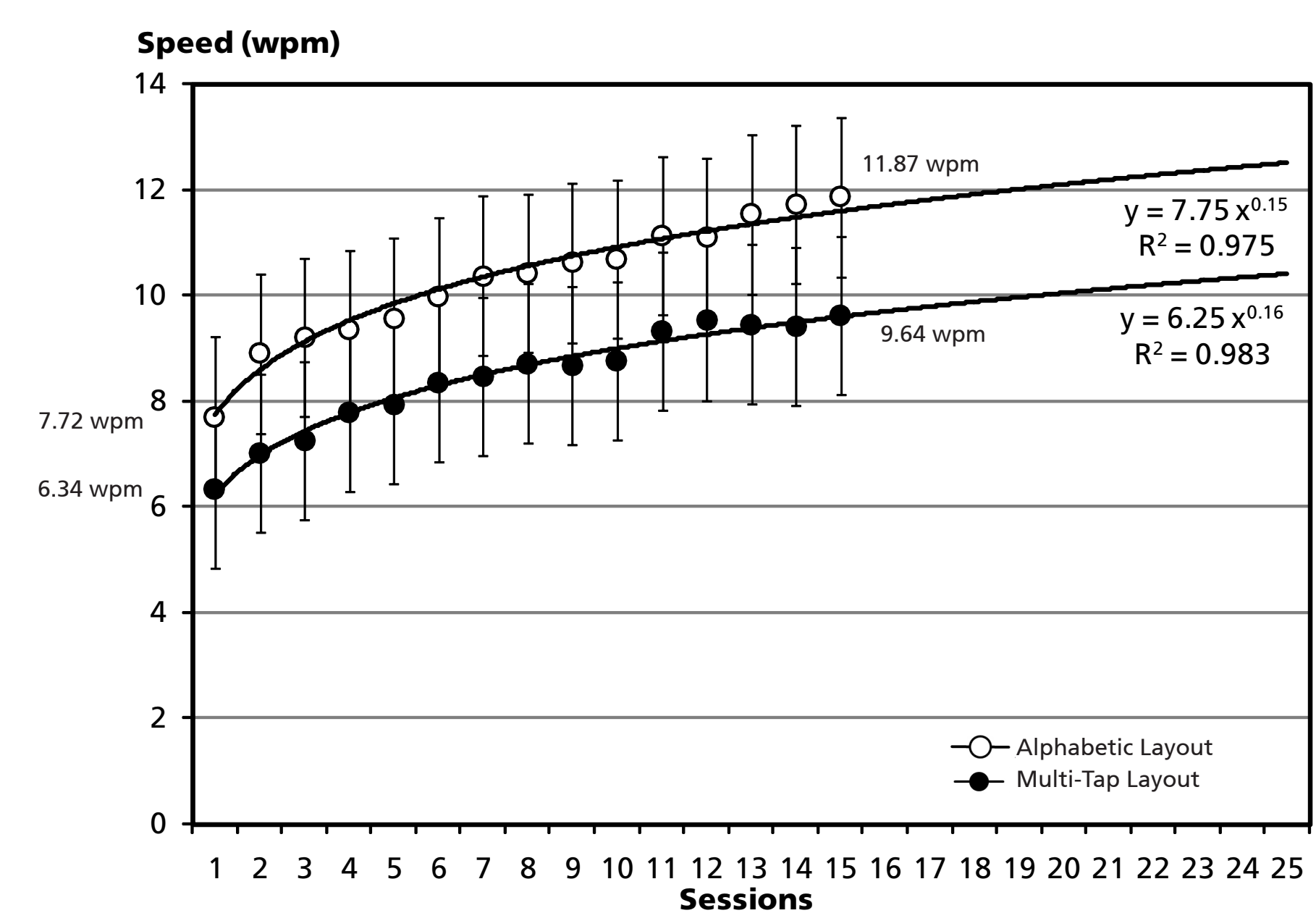
- ◆ Introduction and explanation
- ◆ Experimental task: transcription of presented phrases as fast as possible not making too much errors
- ◆ 15 sessions of text entry
- ◆ One session consisted of two sub-sessions for multi-tap and alphabetical layout
- ◆ Counterbalance of the layouts
- ◆ Every sub-session: 2 test phrases + 20 experimental phrases

Empirical Results

The participants transcribed in total 6,000 phrases over 62.91 hours, which resulted in 186,238 characters in the input stream for further analyses. For the alphabetical selection keyboard the mean time for one session was 11.38 minutes and for the multi-tap layout 13.78 minutes.

Performance

- ◆ A main effect of method on text entry speed was statistically significant
- ◆ Performance improved over time
- ◆ In the first and last session participants were significantly faster using the alphabetic layout.
- ◆ Fastest mean text entry speeds were: alphabetic 17.13 wpm, multi-tap 13.53 wpm



Questionnaire and Interview Data

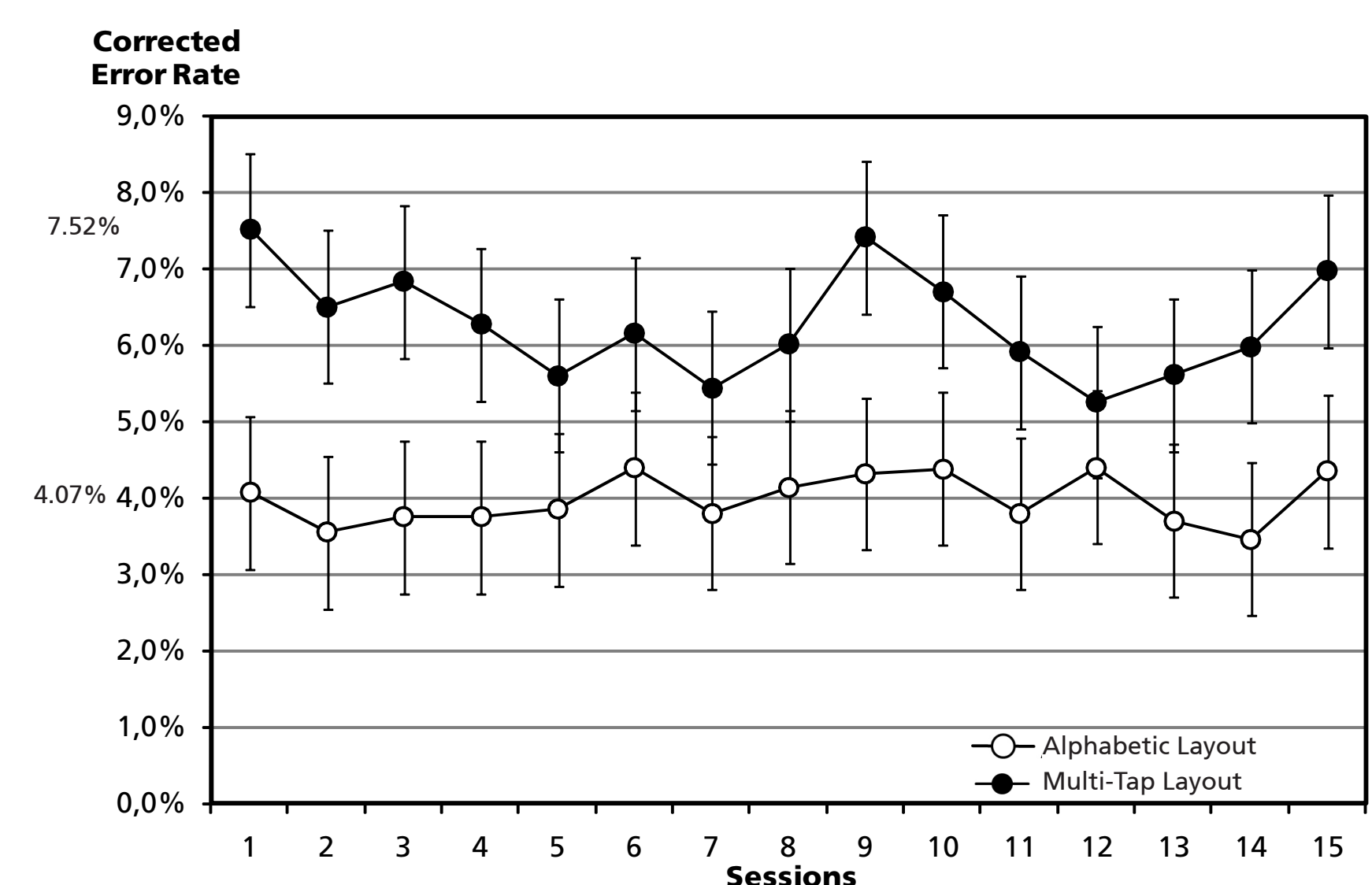
- ◆ After the first session participants preferred the multi-tap layout
- ◆ After the last session nine out of ten participants preferred the alphabetic layout. It was also liked more than the multi-tap layout.
- ◆ Participants stated to make more errors and it was more exhausting typing with multi-tap during the last session.
- ◆ Participants noted that they already were skilled in using a multi-tap selection keyboard due to the frequently used mobile phone text entry.

Questions	Session 1		Session 15	
	ABC	Multi-Tap	ABC	Multi-Tap
Speed of writing was ... very fast (1) - very slow (5)	2.3 (1.06)	2.4 (0.97)	1.8 (1.03)	2.7 (0.67)
While writing I felt that I made ... no errors (1) - many errors (5)	2.2 (0.92)	2.4 (0.97)	1.9 (0.74)	2.9 (0.88)
While writing I felt like I was ... having a lot of fun (1) - bored (5)	2.5 (0.85)	2.1 (0.99)	1.9 (0.57)	2.5 (1.18)
Writing was ... facile (1) - exhausting (5)	2.90 (1.20)	2.9 (0.74)	2.5 (0.71)	3.7 (1.16)
I like this text entry method ... very much (1) - do not like it (5)	2.8 (0.79)	2.1 (0.57)	2.0 (0.47)	2.8 (0.63)
I preferred ... ABC (1) - Multi-Tap (5)	3.4 (2.07)		1.4 (1.26)	

Means (and standard deviations) of the questionnaires. Statistically significant results are bold

Corrected Error Rate

- ◆ Overall participants correct a different number of errors with different methods
- ◆ In the first session the corrected error rate was significantly higher with multi-tap
- ◆ In the last session corrected error rate was significantly higher with multi-tap
- ◆ Mean corrected error rate over all sessions: alphabetic 3.98%, multi-tap: 6.28%



Uncorrected Error Rate

- ◆ Overall participants left more errors in the text using the multi-tap layout.
- ◆ In the last session participants left more errors in the text with multi-tap than with the alphabetic layout.
- ◆ Mean uncorrected error rate over all sessions: alphabetic: 0.28%, multi-tap: 0.52%

