

Text Entry Performance Metrics

Entry Speed

$$\text{Word per Minute (WPM)} = \frac{|T| - 1}{S} \times 60 \times \frac{1}{5}$$

Accuracy Metrics

$$\text{Error Rate (ER)} = \frac{INF}{|T|} \times 100\%$$

$$\text{Min. String Distance (MSD) ER} = \frac{MSD(P,T)}{\text{Max}(|P|, |T|)}$$

$$\text{Keystroke per Character (KSPC)} = \frac{|IS|}{|T|}$$

$$\text{Erroneous Keystroke (EKS) ER} = \frac{EKS}{|P|} \times 100\%$$

$$\text{TotalER} = \frac{INF + IF}{C + INF + IF} \times 100\%$$

P (Presented Text) = target text.
 T (Transcribed Text) = entered text.

MSD (Min. String Distance) = min. operations to $T \rightarrow P$.

IS (Input Stream) = keystrokes performed while entering P .

C (Correct) = correct keystrokes in T .
 $C = \text{max}(|P|, |T|) - MSD(P, T)$

INF (Incorrect Not Fixed) = unnoticed errors in T .
 $INF = MSD(P, T)$

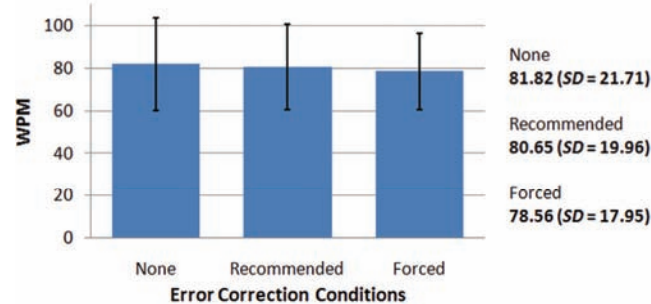
F (Fixes) = edit, modifier, or navigation keystrokes in IS .
 IF (Incorrect Fixed) = keystrokes in IS that aren't in T & not F .

EKS (Erroneous Keystrokes) = erroneous keystrokes in IS .
 $EKS = INF + IF$

Experiment and Results

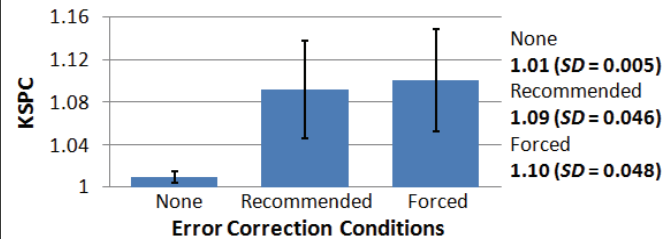
- Do correction conditions have effects on performance metrics?
- Experiment was conducted on standard QWERTY keyboard.
- Within-subjects, 3x3 Latin Square.
- Expert typists (50 or more WPM)
- 12 participants x (3 sessions x (3 blocks x 20 phrases)) = 2160 phrases.

WPM



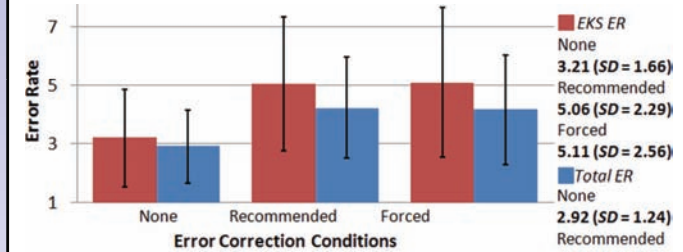
No significant effect of correction conditions on WPM.

KSPC



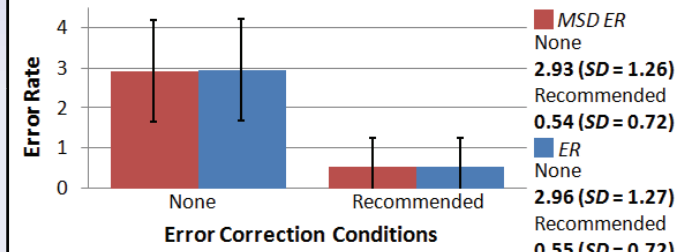
Significant effect of correction condition on KSPC, **recommended** and **forced** significantly higher.

EKS ER and TotalER



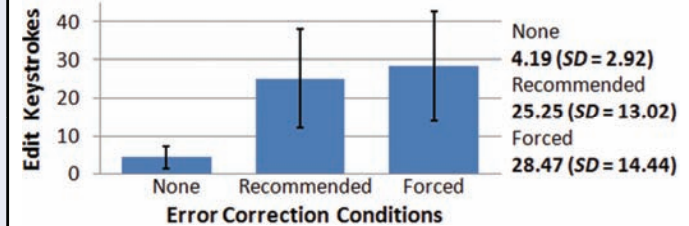
Significant effect of correction conditions, **recommended** and **forced** significantly higher.

ER and MSD ER



Significant effect of correction conditions, **recommended** had 18% lower ER and MSD ER.

Corrective and Edit Keystrokes



99% of all edits were backspace, average visual scan of 298ms.

Three Error Correction Conditions

- None:** no possibility of error correction.
- Recommended:** error correction is recommended.
- Forced:** error correction is forced.

Summary

- The way human errors are handled during experiment has a significant effect on all frequently used error metrics.
- Underlines the importance of presenting error rates along with WPM while presenting a new text entry technology.