

## 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  $T$ .

$$C = \max(|P|, |T|) - MSD(P, T)$$

$INF$  (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  $IS$ .

$$EKS = INF + IF$$

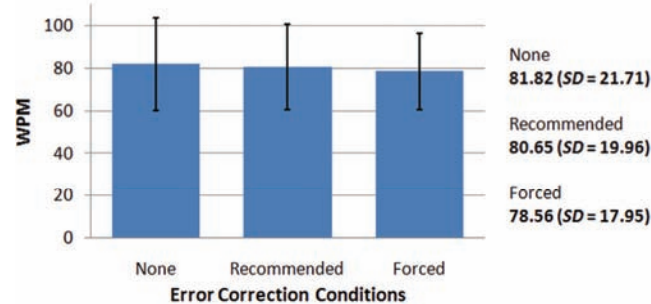
## Three Error Correction Conditions

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

## Experiment and Results

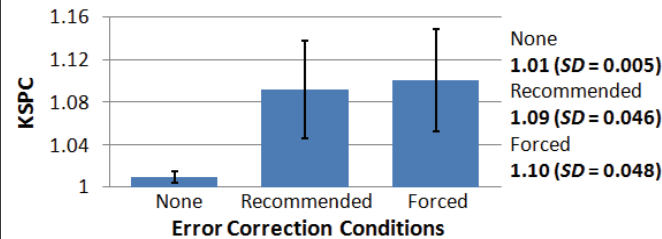
- Do correction conditions have effects on performance metrics?
- Experiment was conducted on standard QWERTY keyboard.
- Within-subjects, 3x3 Latin Square.
- Expert typists (50 or more WPM)
- 12 participants x (3 sessions x (3 blocks x 20 phrases)) = 2160 phrases.

### WPM



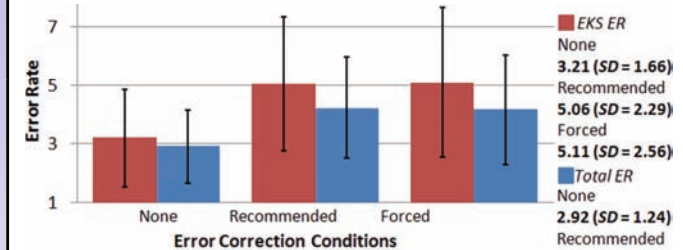
No significant effect of correction conditions on WPM.

### KSPC



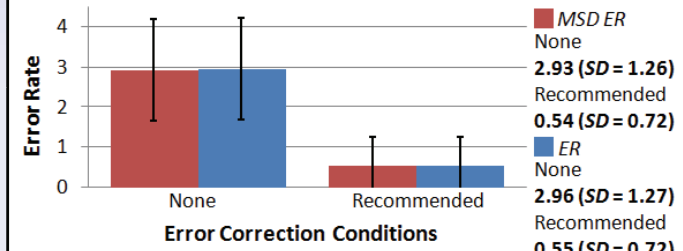
Significant effect of correction condition on KSPC, **recommended** and **forced** significantly higher.

### EKS ER and TotalER



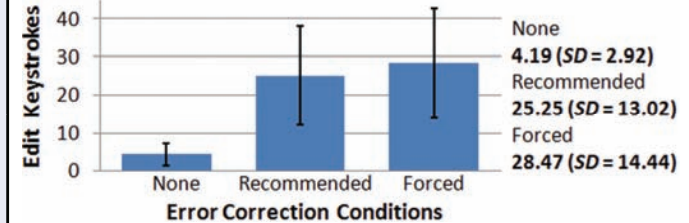
Significant effect of correction conditions, **recommended** and **forced** significantly higher.

### 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.

## 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.