



# Automatically Correcting Typing Errors for People with Motor Impairments

## Correcting Typing Errors

TrueKeys is an assistive text entry system that automatically detects and corrects typing errors produced by users. TrueKeys combines a word frequency list and a model of the user's keyboard layout to choose the best candidate for correction.

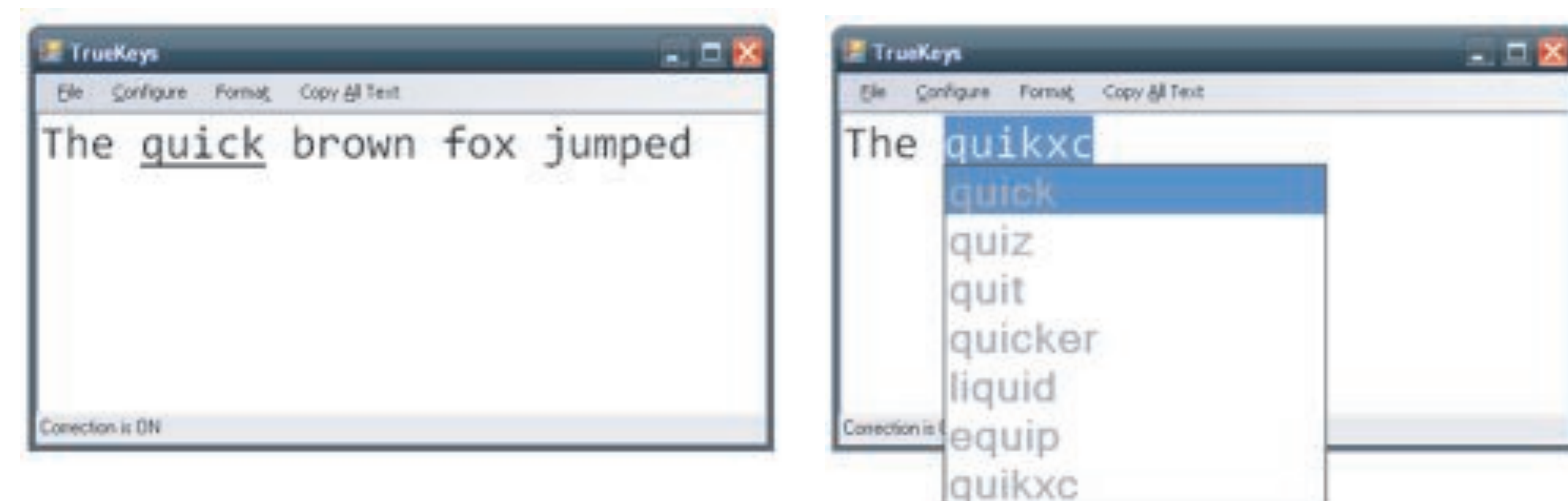
TrueKeys uses a version of the minimum string distance (MSD) metric developed by Levenshtein and Damerau. This distance is equal to the sum of operations needed to transform the entered string to the correction candidate. Our metric is weighted by the distance between keys: typing errors involving keys adjacent to the intended key are weighted more favorably. This weighted MSD ( $MSD_w$ ) score is combined with the word's frequency and the frequency of the bigram to produce the total score:

$$score_{TK} = \alpha * MSD_w(S_{entered}, S_{candidate}) + \beta * f_{word} + \gamma * f_{bigram}$$

This score is calculated for all candidates. The candidate with the lowest distance score replaces the user's input.

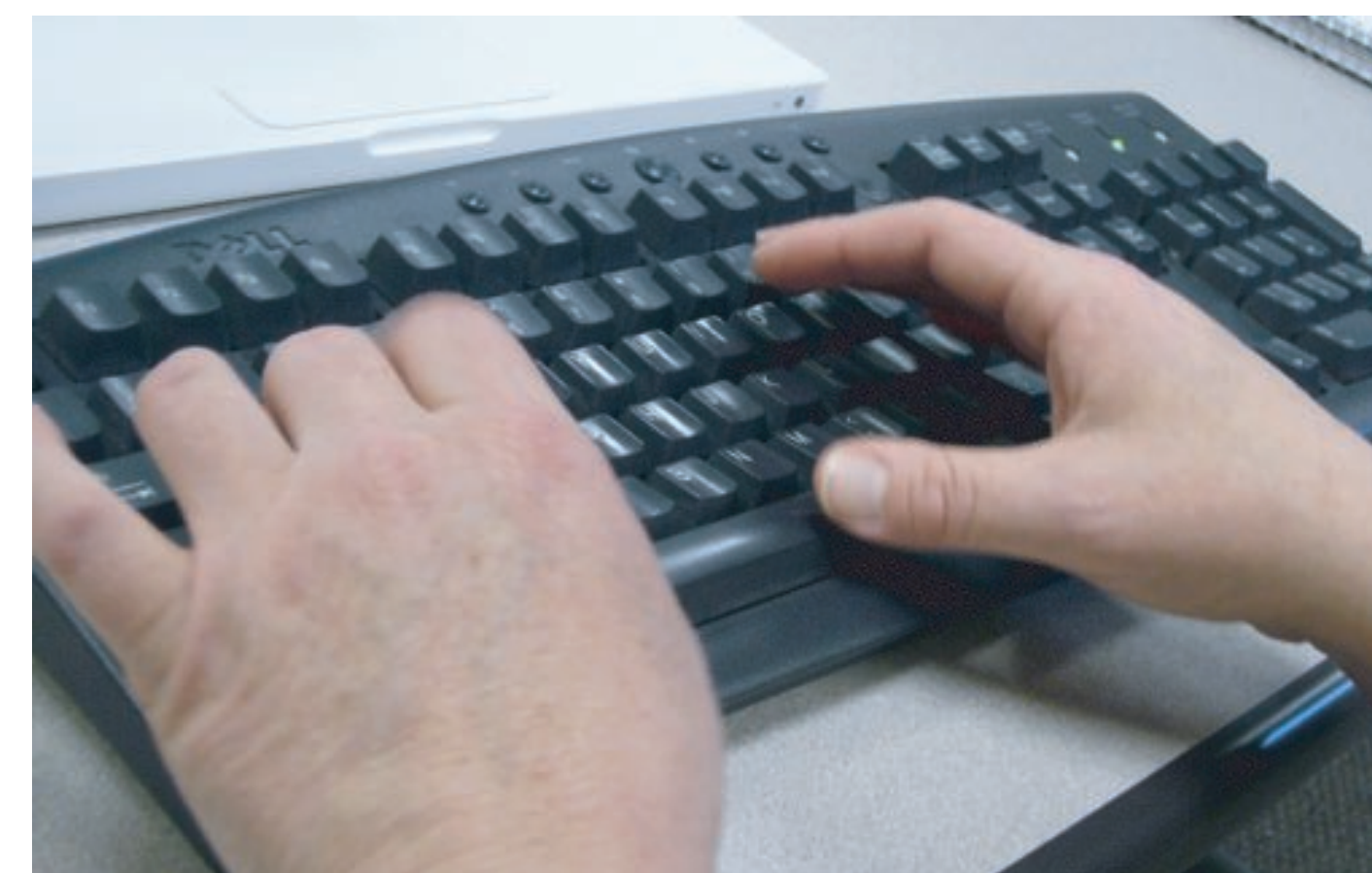
## User Interface

When a user mistypes a word, TrueKeys automatically replaces it with the corrected word. TrueKeys underlines the word to show that it has been changed. If the system guesses incorrectly, the user may choose from an N-best list of correction candidates using the arrow keys.



## User Study

We evaluated TrueKeys with 9 motor-impaired and 9 able-bodied users. Motor-impaired participants had a range of health conditions including arthritis, cerebral palsy, Parkinson's disease, and peripheral neuropathy. Participants transcribed 20 phrases with TrueKeys correction enabled and 20 with correction disabled.



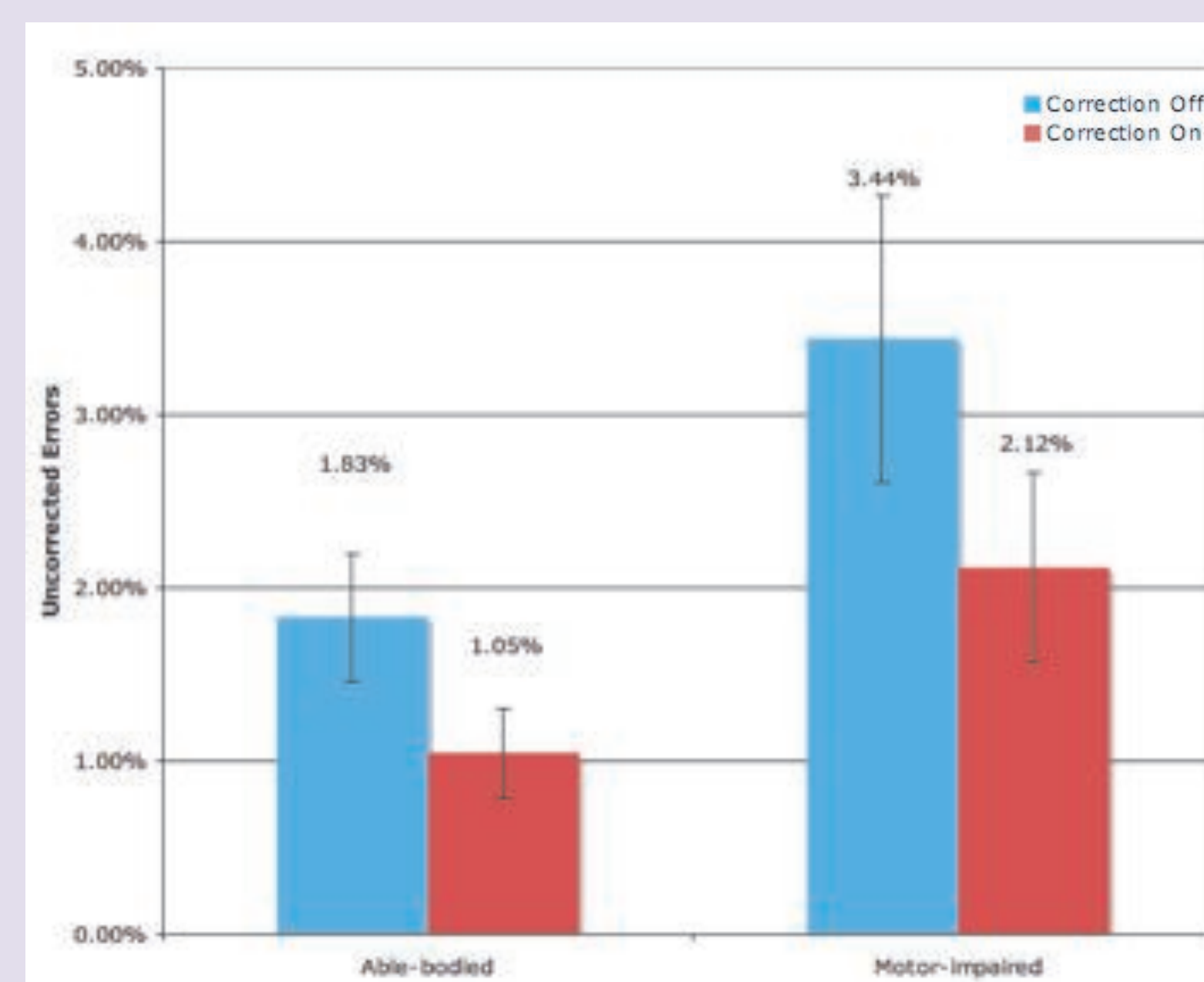
## Future Work

We plan to conduct a longer-term study to better understand how users adapt to TrueKeys over time.

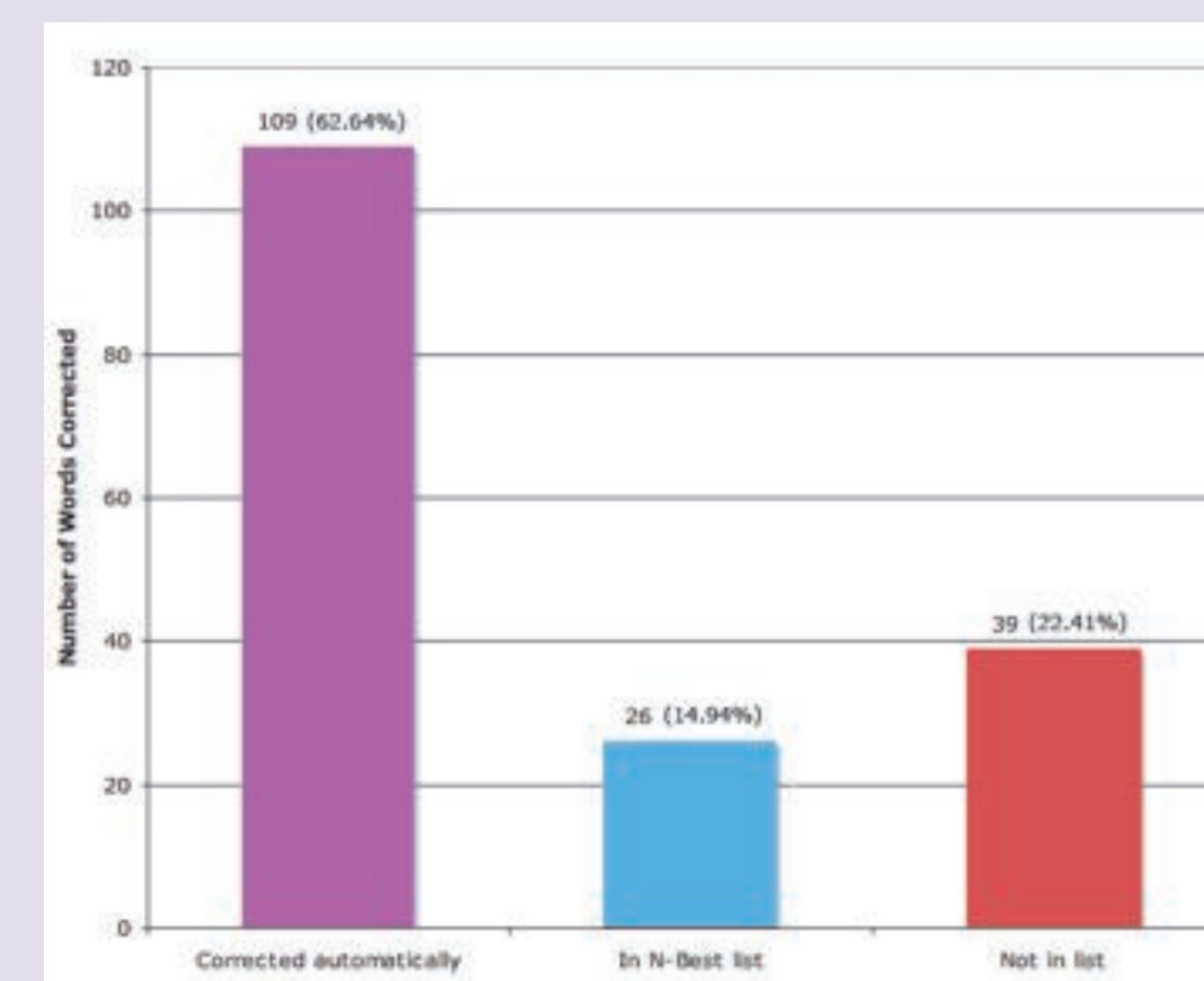
TrueKeys may also be useful as a general typing correction system for mobile devices and other error-prone typing situations. We plan to evaluate TrueKeys as an input method for mobile devices with reduced-size keyboards.



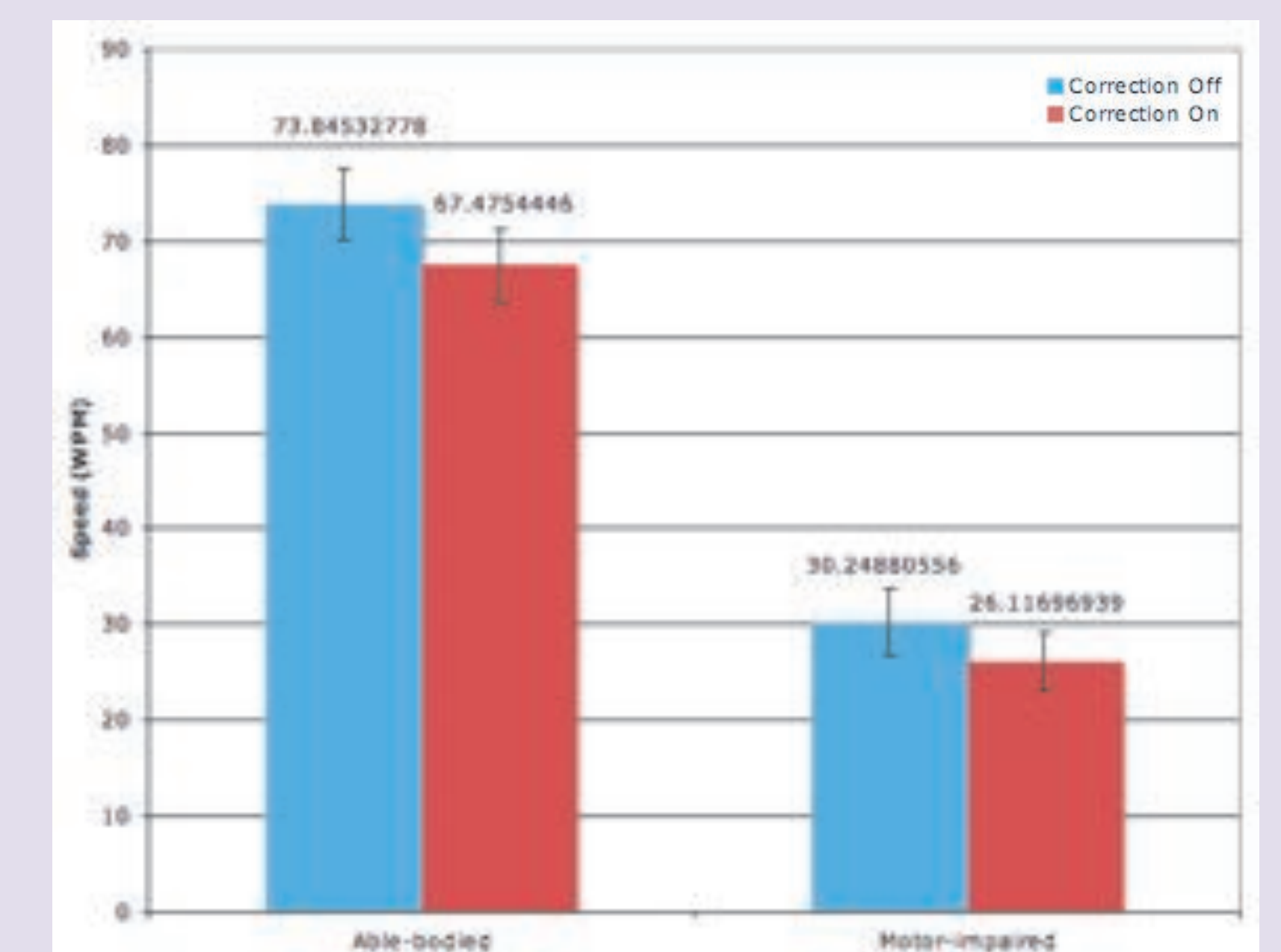
## Results: TrueKeys Reduces Typing Errors



TrueKeys reduces uncorrected typing errors for motor-impaired (2.09% vs. 3.44%) and able-bodied users (1.03% vs. 1.83%) ( $p < .05$ ).



TrueKeys automatically corrects 62.64% of mistyped words and provides the correct word on the N-best list for an additional 14.94% of mistyped words.



However, TrueKeys reduced speed for motor-impaired (26.20 vs. 30.25 wpm) and able-bodied users (67.57 vs. 73.85 wpm) when using TrueKeys interactively ( $p < .05$ ).