

The Effects of Word Prediction on Communication Rate for AAC

Keith Trnka, Debra Yarrington, John McCaw, Kathleen McCoy
University of Delaware

Christopher Pennington
AgoraNet, Inc.

Background

- Augmentative and Alternative Communication – speaking aids
- Communication rate divide – 10 wpm or lower (AAC) vs. 150 wpm or higher (spoken)
- Word prediction – reducing user input by guessing the intended word and offering completion for 1 keystroke
- Previous work questions the effectiveness of predictions due to increased cognitive load

Hypotheses

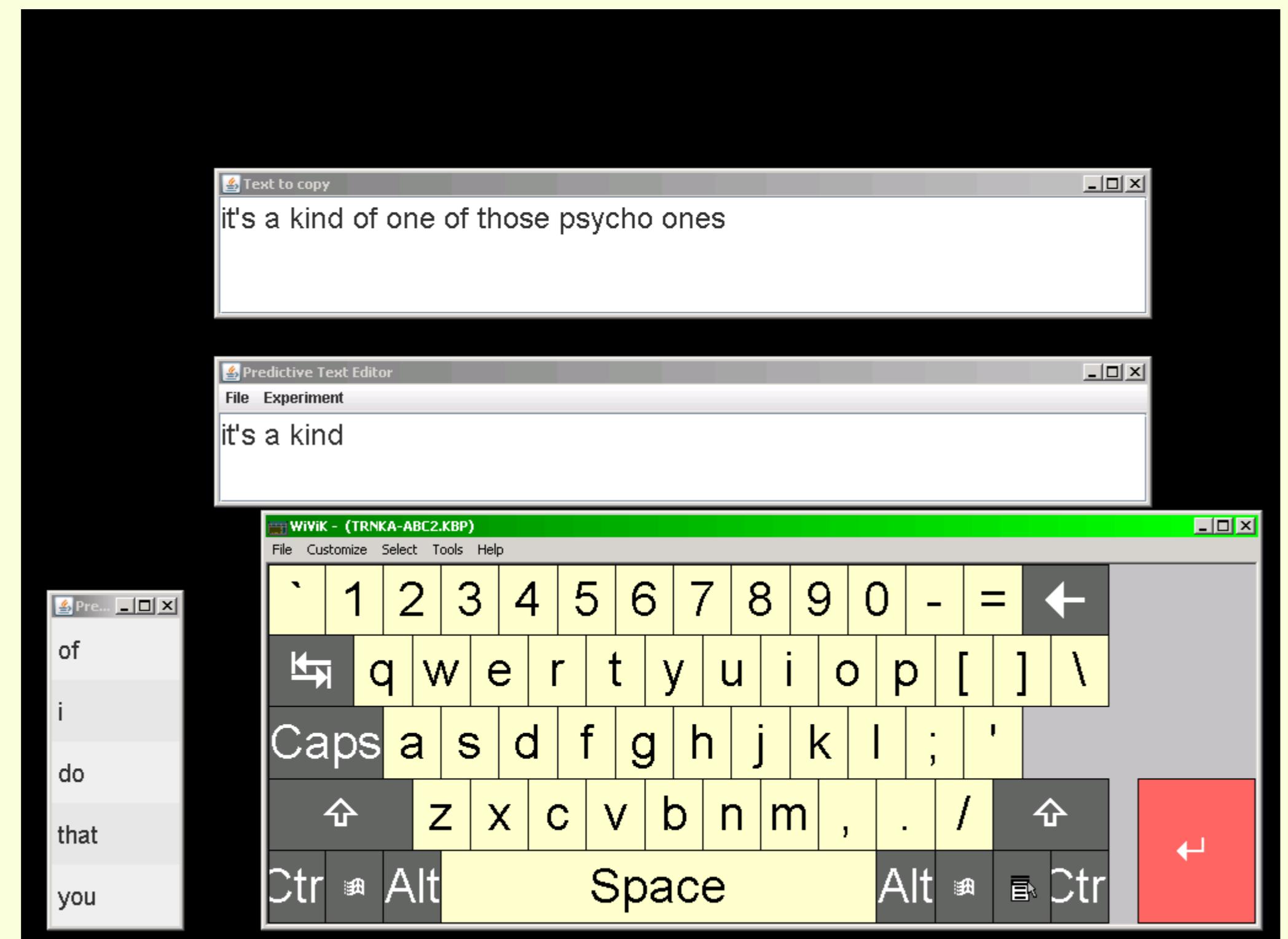
- Advanced word prediction will improve communication rate
- Improvements in word prediction will enhance communication rate more than directly explained by the increase in theoretical keystroke savings

User study

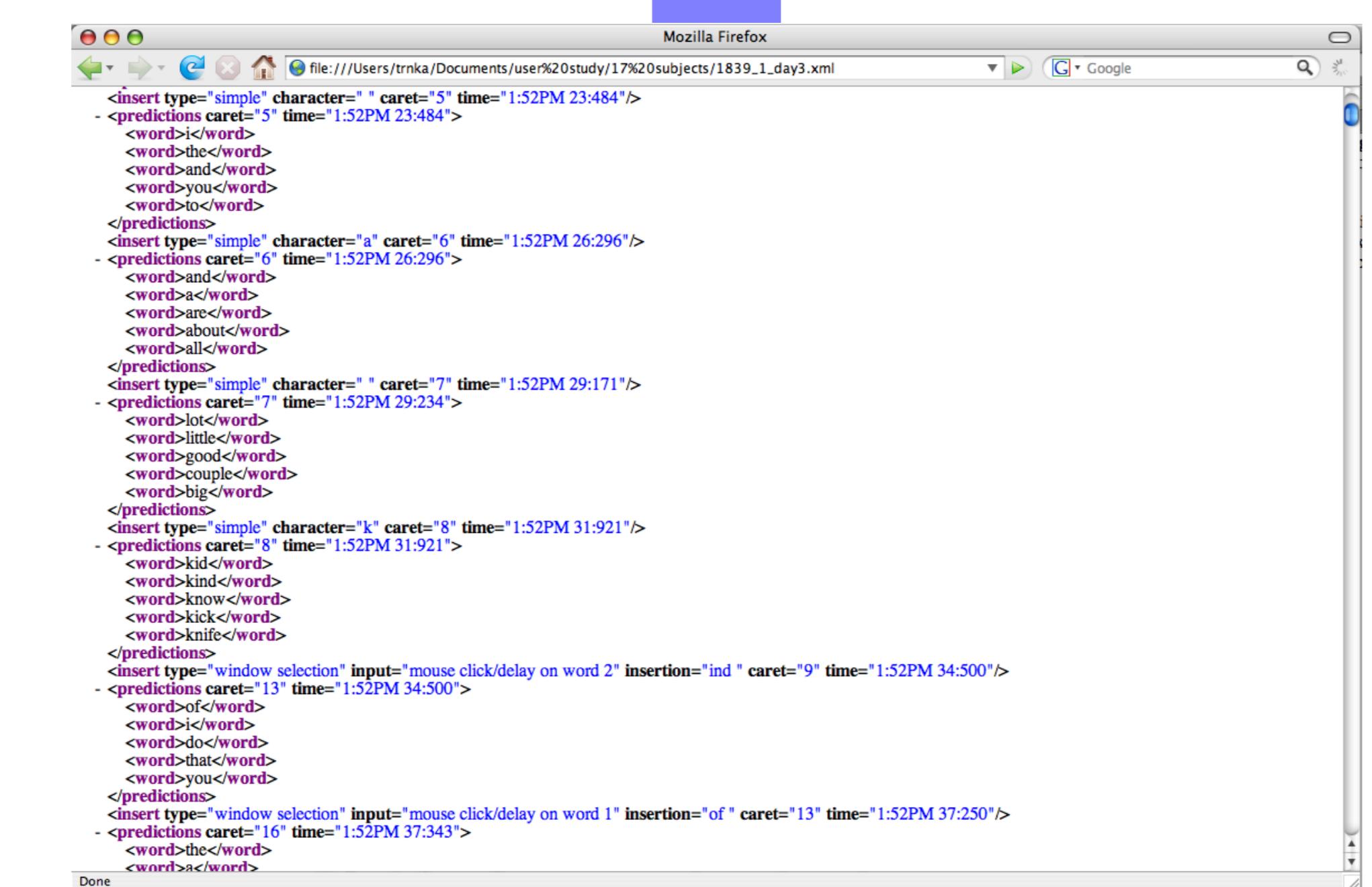
- 17 able-bodied subjects
- Simulated typing disability using delayed keyboard
- Each copied 3 snippets from Switchboard on 3 different days
- Prediction method varied:
 - None – standard typing
 - Basic – unigram recency + dictionary
 - Advanced – trigram + unigram recency + dictionary
- Randomized prediction method into 6 conditions:

Day 1	Day 2	Day 3
(none, basic, advanced)	(none, advanced, basic)	(basic, none, advanced)
...		

Experimental setup

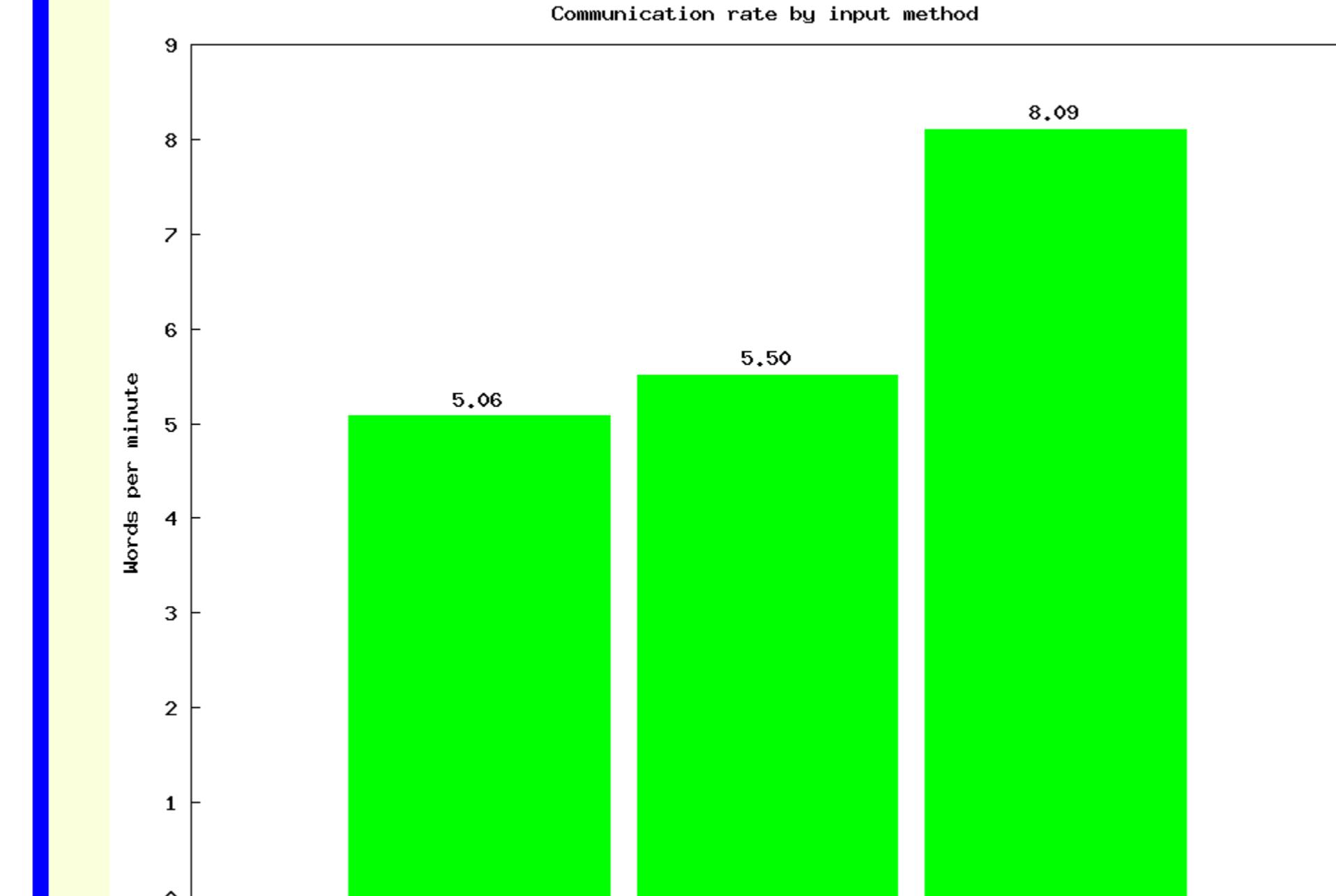


Users are given one sentence at a time to copy. They press a letter or select a predicted word, which enters the word and a space. All keys are delayed 1.5s.



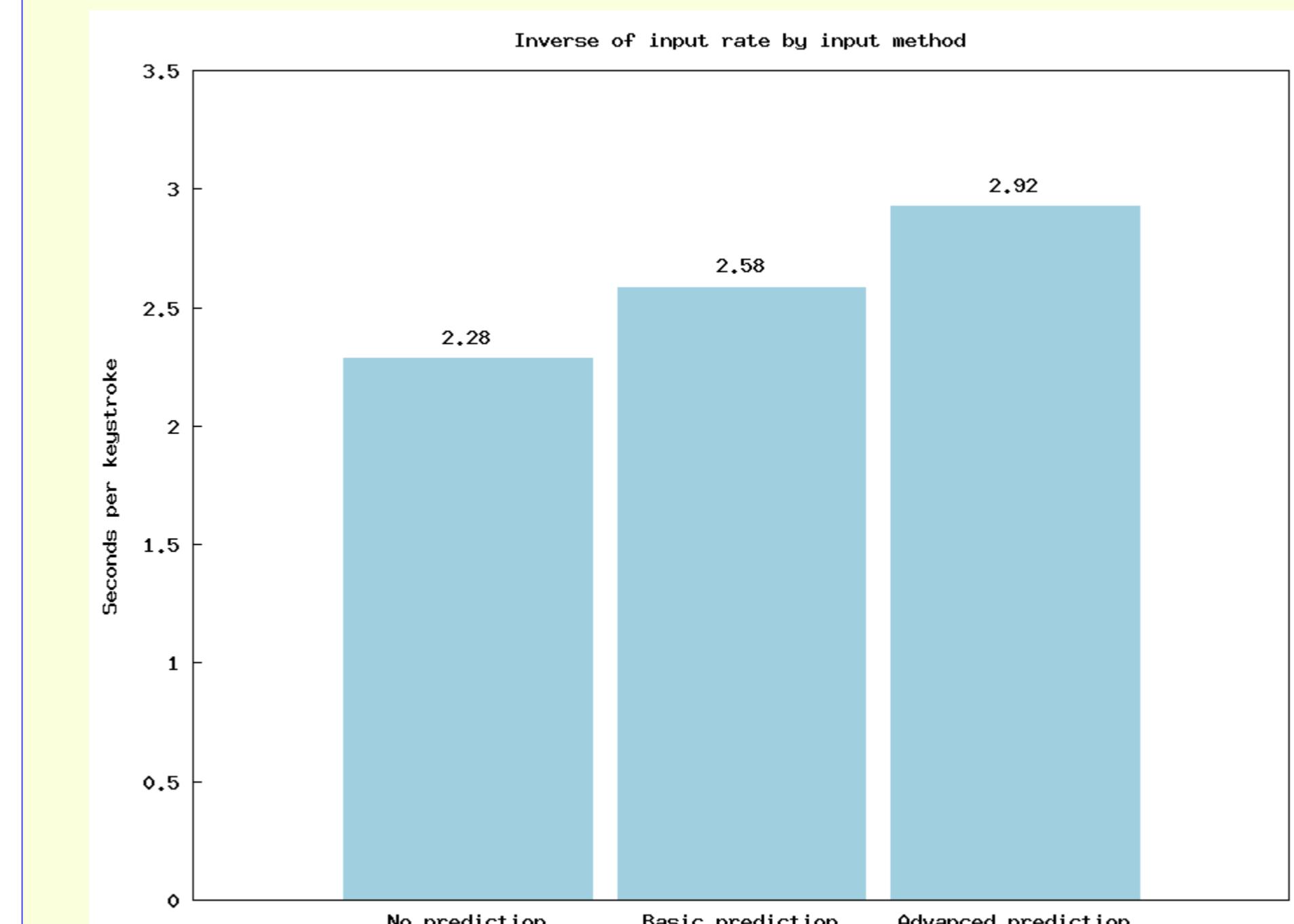
XML logs of keystrokes and predictions

Effect on communication rate



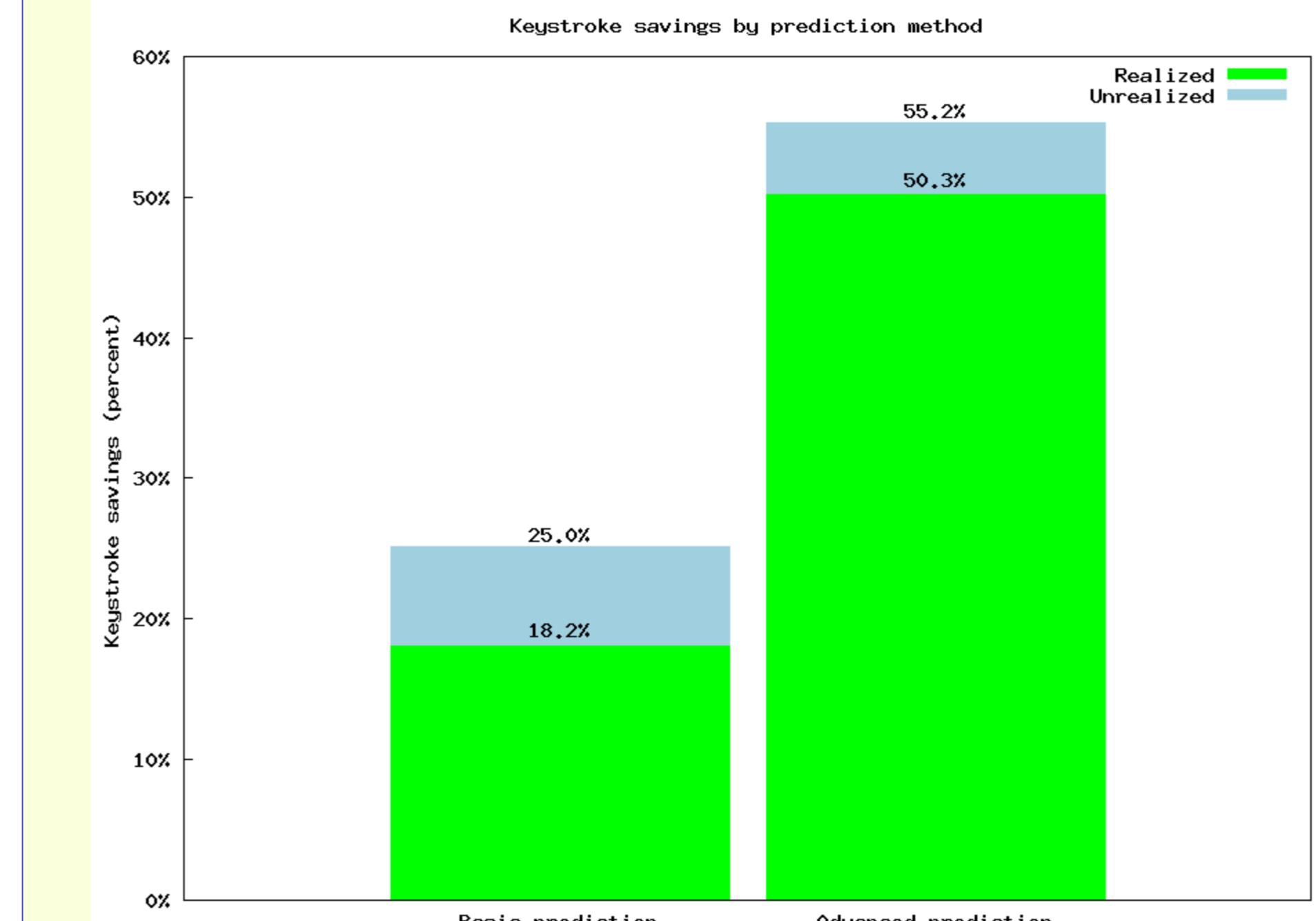
Communication rate increased from better predictions. Also, communication rate was improved over letter-by-letter entry.

Effect on input rate



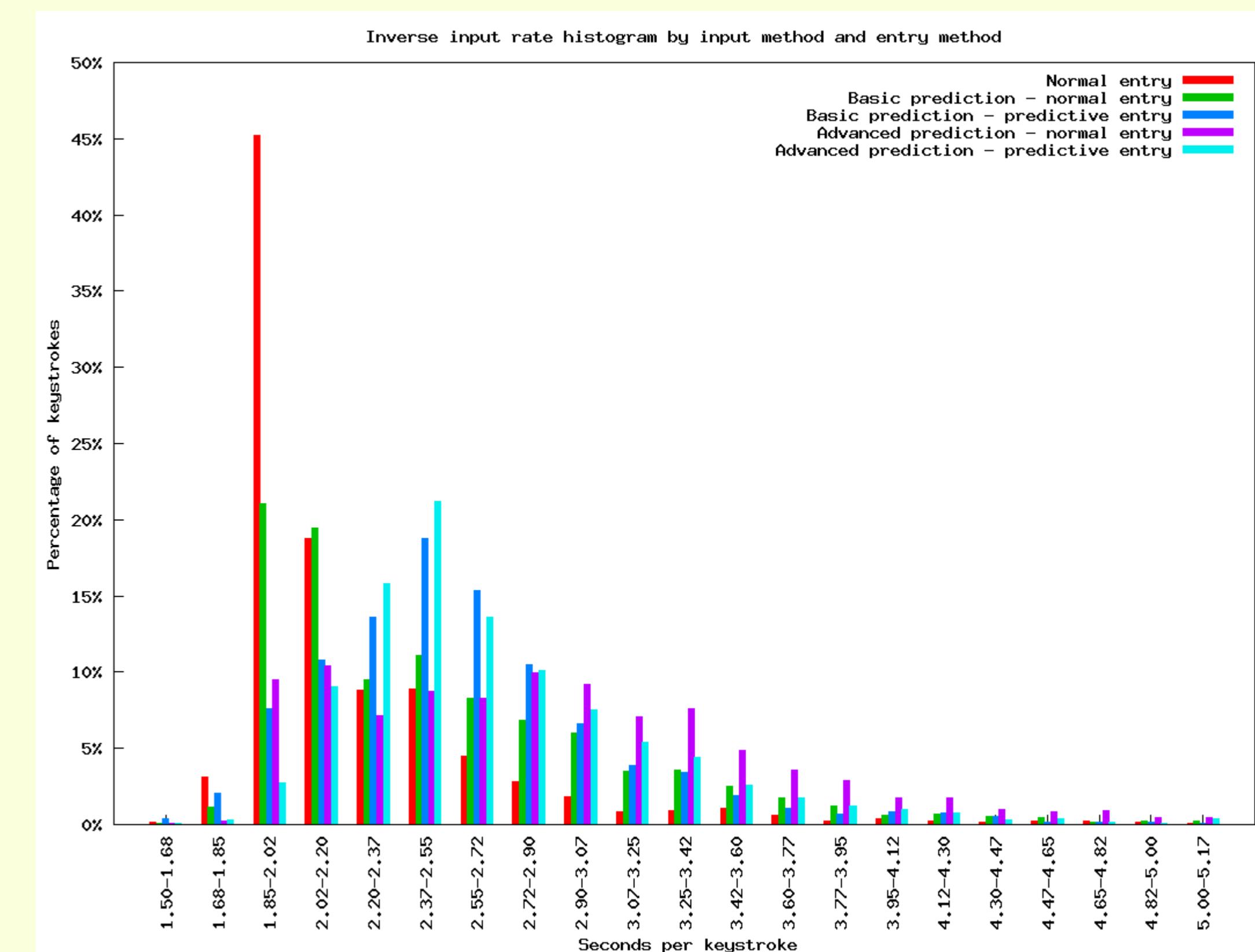
Time between keystrokes increased with more advanced predictions. Input rate decreased with word prediction.

Keystroke savings



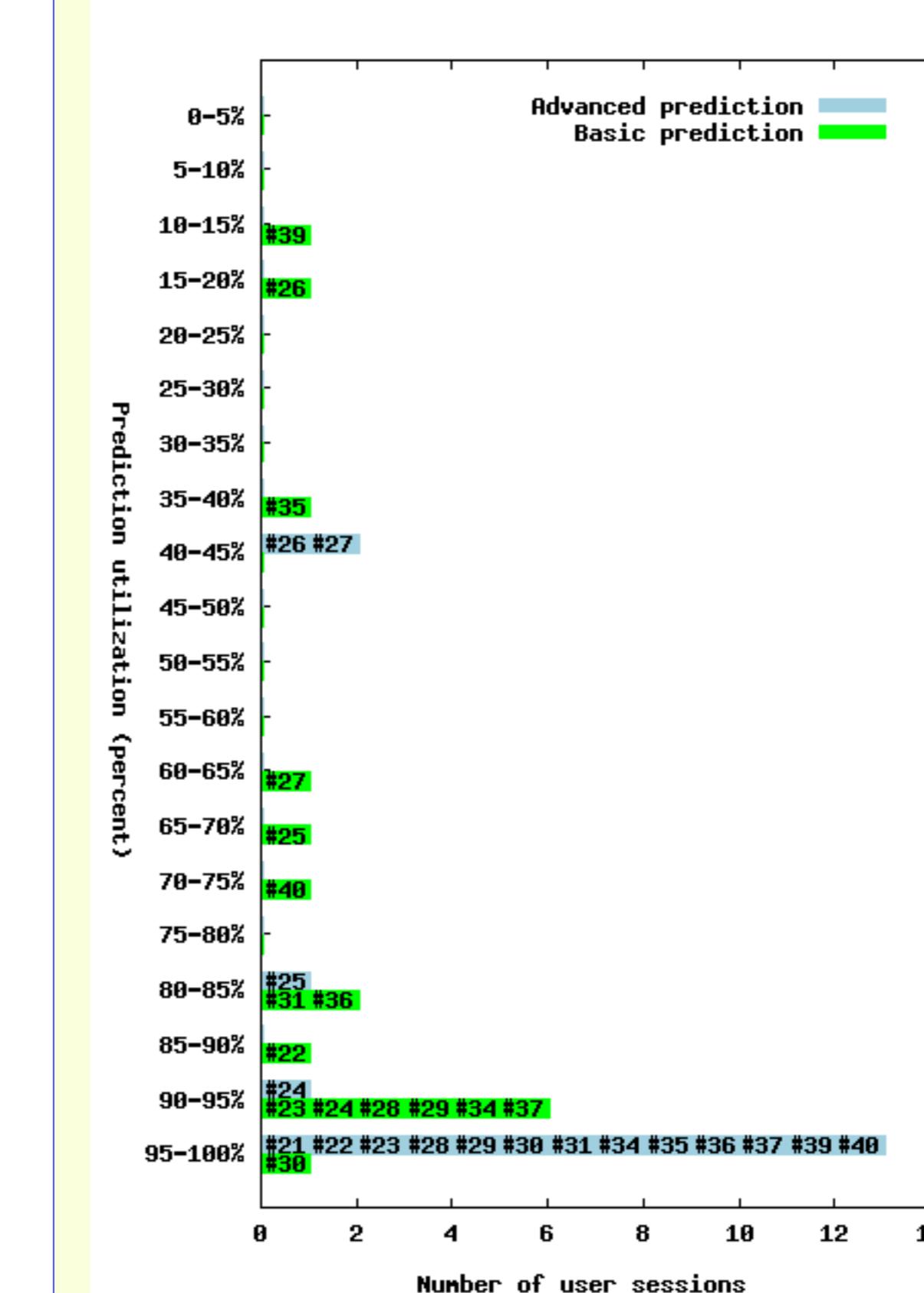
The advanced prediction method offers more keystroke savings and users achieve more savings with it. The prediction utilization of basic is 73.3% whereas the utilization of advanced prediction is 90.9%.

Input rate by method/entry



The amount of time per keystroke is broken down by prediction method and type of keystroke. The average time for pressing letters increases with more prediction.

Prediction utilization by session



Histogram of prediction utilization by user and method

The prediction utilization (actual over potential keystroke savings) is shown to the left. Each user is labeled on the bar of the range their utilization fell in. For example, user #26 fell in the 40-45% utilization range with advanced prediction but the 15-20% range for basic prediction.

This graph shows the higher mean of utilization of advanced prediction. It also shows some user-specific trends, such as not using word prediction much in either setting or dismissing basic prediction almost entirely.

Conclusions

- Better word prediction increases communication rate despite extra overhead
- Even basic word prediction can enhance communication rate over letter-by-letter typing
- Users utilize advanced predictions more fully due to increased trust