Word Prediction and Communication Rate in AAC

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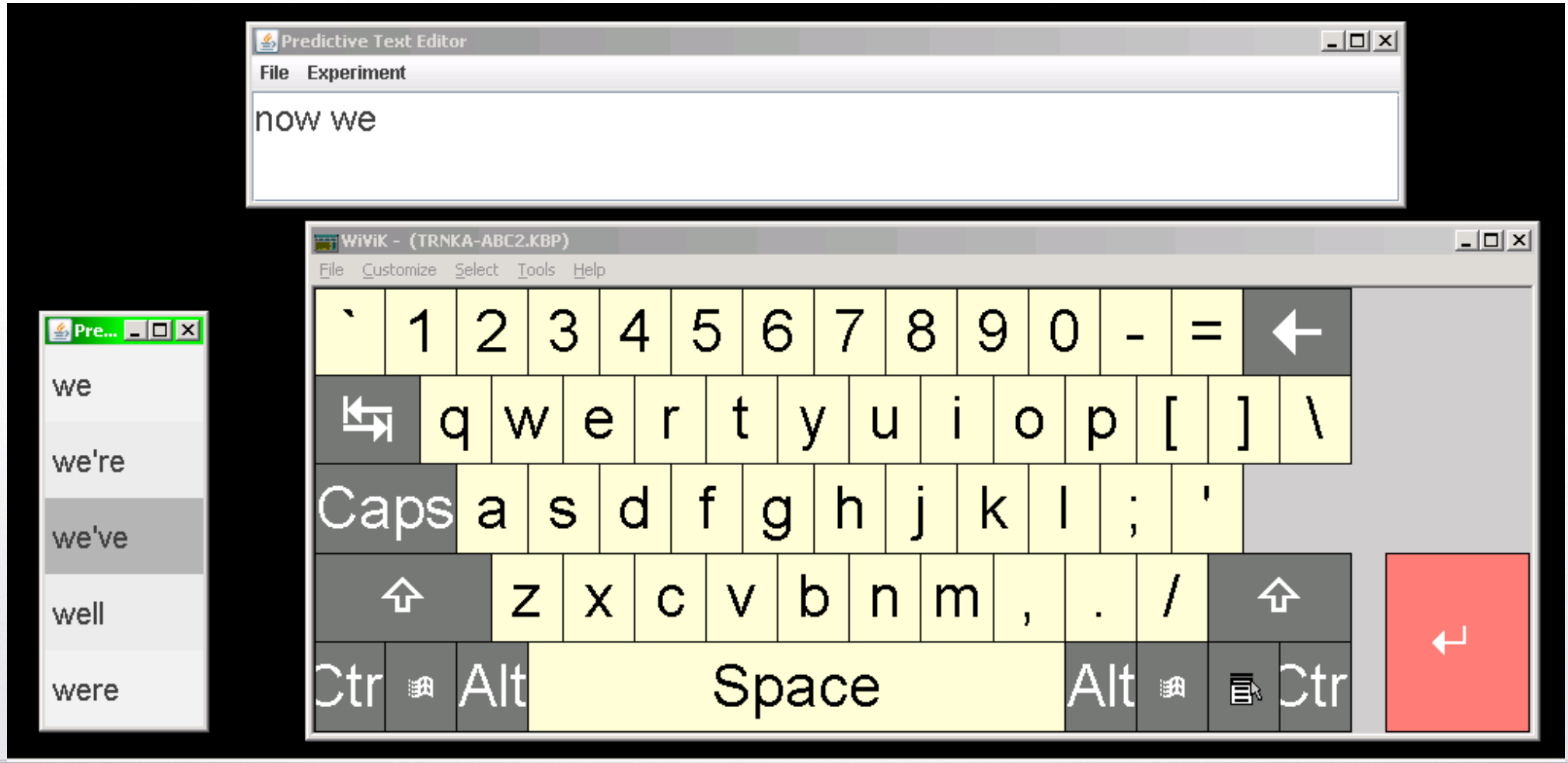
Augmentative and Alternative Communication (AAC)

- communicating with speech and/or motor impairments
- AAC devices
  - high-tech devices - word/letter/phrase, speech synthesis output
- the ***communication rate divide*** and fatigue

Word Prediction

- reduce the number of keystrokes
- guess the word currently being typed:
  - the part of the word typed so far (can be no letters)
  - a language model

Example


Predictive Text Editor
File Experiment
now we
Pre...
we
we're
we've
well
were
WiViK - (TRNKA-ABC2.KBP)
File Customize Select Tools Help
` 1 2 3 4 5 6 7 8 9 0 - =
q w e r t y u i o p [ ] \
Caps a s d f g h j k l ; '
z x c v b n m , . /
Ctr Alt Space Alt Ctr

Does prediction help?

- reduces the number of keystrokes
  - less physical fatigue
- increase communication rate?
  - not significantly different (Venkatagiri, 1993)
  - Spinal Cord Injury (SCI) participants decreased, non-SCI increased (Koester and Levine, 1994)
  - 10% speedup, but frustrating (Anson et al., 2004)

Hypotheses

- word prediction will increase communication rate ***if the predictions are good***
- users will trust a better system more
- implicit hypotheses
  - cognitive overhead has an effect on input rate
  - better prediction methods will show more increase

User study

- 28 adult participants
  - simulated motor impairment
  - no prior AAC device experience
- copy task

Copy task


Text to copy
now we've got people scattered all over the country
Predictive Text Editor
File Experiment
now we've got p
Pre...
people
pretty
plenty
paid
pregnant
WiViK - (TRNKA-ABC2.KBP)
File Customize Select Tools Help
` 1 2 3 4 5 6 7 8 9 0 - =
q w e r t y u i o p [ ] \
Caps a s d f g h j k l ; '
z x c v b n m , . /
Ctr Alt Space Alt Ctr

Independent variables

- text entry method
  - letter-by-letter
  - basic prediction - recency plus a word list
  - advanced prediction - also takes into account the previous two words
- text to type: 3 different samples

Controls

- Bias for/against prediction - varied treatment orders of entry methods
- Bias to testing data - 3 text samples evenly distributed across treatments
- Learning bias - training session before each session
- Fatigue, forgetting biases - each session on separate day, but within a week

Does prediction help?

	basic prediction
keystroke savings	19.8%
communication rate words per minute	9.1%
user trust utilization of the potential benefit	78.2%
input rate time to hit each key	14.6%

Does prediction help?

	basic prediction	advanced prediction
keystroke savings	19.8%	52.1%
communication rate words per minute	9.1%	**58.6%**
user trust utilization of the potential benefit	78.2%	**93.6%**
input rate time to hit each key	14.6%	30.5%

Conclusions

- Input rate
  longer to press each key with more reliance on word prediction
- Communication rate
  increases with either prediction method, much more with better predictions
- User trust
  increases with better predictions, measured in utilization of potential keystroke savings

Future Work

- Validate findings on a small AAC user group
- Examine data in more detail
  - (Learning) Does utilization increase over a conversation?
  - (Bias) Does the treatment order affect utilization?
  - (Errors) Does word prediction reduce typos?
  - (Cognitive load) How/when is there extra load?

Questions?

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