APPLIED RESEARCH

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Learning and Performance of Able-Bodied Individuals Using Scanning Systems with and without Word Prediction

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This study examines how the cognitive and perceptual loads introduced by a word prediction feature impact learning and performance. Two groups of able-bodied subjects transcribed text using two row–column scanning systems for 10 consecutive trials each. The two systems differed only in that one system had a word prediction feature. Subject groups differed in their order of system use. The results show that, under the conditions of this study, the word prediction system was not substantially more difficult to learn, but it did not yield a statistically significant improvement in text generation rate. This suggests that the cost of using this word prediction system balanced the benefit of the keystroke savings achieved by these subjects. The relationship between keystroke savings, cost in item selection rate, and improvement in text generation rate is explored in order to provide insight into this outcome.

Key Words: Assistive technology—Augmentative communication—Rate enhancement—Word prediction—User performance modeling.

A wide range of assistive technology systems has been developed to facilitate function in a variety of areas, including powered mobility, environmental control, augmentative communication, and computer access. All of these systems include a user interface, which accepts some type of user input to control the system in the desired fashion. In many instances, the interface is designed with a primary focus on utilizing the motor abilities of the intended user as efficiently as possible.

While the goal of improving motor efficiency is an important one, it has been recognized that this may also place increased cognitive and perceptual requirements on the user, leading to unknown effects on the user's ability to learn and use the system. This dilemma exists in almost every area of assistive technology (1), but it has been discussed most frequently in connection with computer access and augmentative communication (AAC) systems, especially those that employ a rate enhancement feature such as word abbreviations (2), message encoding (3,4), or word prediction (5–7).

This paper focuses on the trade-off between improved motor efficiency and increased cognitive-perceptual loads in the context of word prediction systems. These systems attempt to predict the word intended by the user by presenting the user with a set of word choices. Word prediction choices are typically displayed in a short list and refined as the user selects additional letters. Because many words can be completed by choosing from the list rather than single letter spelling, the number of selections required per word can be substantially reduced.

The motor efficiency of word prediction systems is often measured in percentage of keystrokes saved.[1] Experimental measurements on two different prediction systems show a range of 37–47% keystroke savings over several different types of text samples (8). Clinical data on actual users reveal a broader range of 23–58% keystroke savings (9–11). Many of the clinical reports are anecdotal, with little spe-

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[1] "Keystrokes" are broadly defined to include key presses in a direct selection system, as well as items selected in other ways, such as through scanning or Morse code.