

Empirical Evaluation of Communication Interfaces Optimized for Individuals with Motor Speech Disorders

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When motor speech disorders render a speaker unable to communicate orally, individuals with concomitant motor impairments (e.g., amyotrophic lateral sclerosis) may use an alternate access method (e.g., head-tracker) to choose letters or words on an onscreen interface to produce a synthesized speech output. Communication rates can be improved by reducing the motor actions required to complete a message; selecting phonemes as targets can reduce selection rates by 14-20%. Additionally, placing phonemes that are often selected sequentially in close proximity can minimize selection time. Our computer simulations estimate a communication rate improvement of 30.9% when using an optimized interface compared to a randomly arranged interface. However, the end-user benefits are still unclear. Sixteen healthy participants (six fully collected at time of submission) interacted with either the optimized or random interface over twelve sessions. Facial surface electromyography (sEMG) was used as an alternate access method as a model of motor-impaired participants. During each session three probes measured the different components necessary to construct messages with the interface: translating an auditory message to phonemes, finding those phonemes on the interface, and using an access method to select them. Results indicate the efficacy of these optimization strategies in improving communication rates.