Determining the Role of Visual Signals in the Neurological Aspect of Speech: Implications for the Treatment of Speech Motor Programming Disorders

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Speech is produced by a set of neurological and motor processes, known as speech motor programming. When regions of the brain controlling speech are damaged, speakers are not able to properly move oral muscles to form words. Treatment exists for such disorders, but focuses on motor control. This study proposes a new paradigm of using visual information to influence speech production to determine new methods of treatment. Vowel stimuli were chosen based on distinct tongue movements that could easily be observed. Healthy speakers were asked to say a set of words [“hid”, “head”, and “had”] while watching a tongue avatar of the same words. After baseline frequencies were found, participants were asked to say “head” in time with each visual cue. First the tongue avatar morphed from “head” to “had”, and participants’ F1 frequencies steadily increased. Participants were instructed to continue saying “head” while the visual avatar showed “had”. When participants saw a tongue avatar of “had”, speakers began to shift their F1 frequencies to match the F1 frequency of “had”. When showed a tongue avatar of “head”, participants shifted the F1 frequency back down to match the frequency of “head”. The participants responded to the visual movements with similar movements. As a result of this research, the influence of visual feedback in speech programming was established. In conclusion, the new concept of using visual information to influence speech production can be used as the foundation for future research personalizing and devising more effective treatments for speakers with speech motor programming deficits.

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