

## Videogame Rehabilitation of Velopharyngeal Mislearning M. Cler, C. Stepp

Velopharyngeal (VP) mislearning can lead to hyper- and hypo-nasality and thus poor speech intelligibility. When VP mislearning is caused by hearing impairment, cleft palate (post-repair), or motor learning impairments, therapy can lead to improvements in velopharyngeal control. Velopharyngeal port control is not aided by typical visual feedback since the relevant anatomy is not visible by the speaker or the listener. In this proposal, we present initial results from a novel, game-based speech rehabilitation platform designed for children with VP mislearning, in which online feedback of speech nasalization is provided based on measurements of nasal skin vibration and speech acoustics. Feasibility testing in nine typically developing pediatric participants and three participants with VP mislearning showed that the game was motivating, with 92% of the participants reporting that the game was "very fun" or "kind of fun", and 100% of the parents surveyed reporting that they thought their child could use the game at home. Long-term use from one child (8 years old, VP mislearning due to craniofacial anomalies and hearing impairment) showed a reduction in hypernasality after 8 sessions of game use during weekly speech therapy. An adolescent with severe hypernasality (15 years old, VP mislearning due to suspected apraxia and concurrent language and social impairments) used the game at home and showed a reduction in hypernasality during non-nasal syllable strings, but not during prolonged vowels or in sentences. Testing in additional children with VP mislearning is ongoing.