Visual Feedback Therapy for Children with Speech Sound Disorders

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BACKGROUND
• Speech Sound Disorders (SSDs) are the most common communication impairment in childhood
• Intervention usually relies heavily on auditory skills, but visual feedback may benefit people for whom visual skills are strong
• Three types:
  1. A visual representation of the acoustic characteristics of speech, such as a spectrographic analysis
  2. An abstracted visual representation of articulation, such as electropalatography
  3. An anatomically-correct representation of articulation, such as a mirror (the “outside”: lips, jaw and a partial view of the tongue) or ultrasound (the “inside”: tongue movements)

ACOUSTIC ANALYSIS

ULTRAX
Real-time tongue tracking for speech therapy using ultrasound

Advantages
• Cheap, no recurring costs
• “Game” format with obvious reward
• Information on voicing, pitch, intensity, friction and formant values.
• Home practice

Disadvantages
• Shows no advantage over feedback from a skilled SLT
• Not robust above segment level
• No direct articulatory or place information
• No information in silent phases

WHAT: three-year project which aims to create a method of real-time tongue tracking to overcomes the limitations of standard ultrasound
HOW: Use MRI to fully image the parts of the tongue ultrasound can’t, integrating this into an algorithm designed to track the tongue in real-time via an ultrasound-driven animation

ARTICULATORY ANALYSIS

MIRRORS: ANATOMICALLY-CORRECT REPRESENTATIONS

Ultrasound

Advantages
• No recurring costs
• No need for stable dentition
• Articulations can be modelled by anyone
• Provides a direct anatomical model, individualised for the speaker

Disadvantages
• Tongue movement is difficult to interpret
• Tongue tip information is often lost
• Hard palate is not referenced
• Effectiveness largely unknown

PARTICIPANTS
• 12 Adults: Matched MRI and Ultrasound database
• 90 Typically-developing children: Ultrasound database and evaluation of the therapeutic value of ultrasound
• 9 Children with SSDs: Single-subject design clinical case series

Grant no: EP/I027696/1