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BACKGROUND

Problems with producing clear, intelligible speech can occur in cleft lip and palate (CLP), even after successful surgery to repair the palate.

Current methods of assessment:
- Perception-based phonetic transcription: unreliable in CLP due to range and type of errors
- Electropalatography (EPG): recommended by Royal College of Speech and Language Therapists
  - can reveal covert contrasts and errors
  - requires custom-made artificial palate
  - images only tongue-palate contact from the alveolar region to the boundary of the hard and soft palate
- Advantages of Ultrasound Tongue Imaging (UTI) over EPG:
  - cheaper
  - images from near the tongue tip to the root
  - pharyngeal articulations, common in CLP, are visible
  - does not require individualised equipment
  - can continue to be used as child grows or following surgery

Therapy

Ultrasound can be used as a visual biofeedback tool (U-VBF), to provide children with real-time feedback on their articulations. This can lead to quick remediation of deeply engrained articulatory patterns demonstrated by a growing evidence base (~30 small studies, e.g. 2-3, 4). However, only one small study has focussed on the CLP population, with just two children with sub-mucous cleft.

ERROR TYPES REVEALED BY ULTRASOUND: Examples form Children with Speech Sound Disorders.

<table>
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<tr>
<th>PARTICIPANTS</th>
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<th>ANALYSES</th>
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</table>
| Study 1 Assessment | ~48 children  
Aged 3-15  
Non-syndromic or syndromic CLP | • Head set stabilises probe under chin  
• Micro high-speed cineloop system at 100fps over a 150 degree field of view  
• Data collected:  
  - spontaneous counting  
  - all consonants in /aCa/  
  - minimal sets contrasting common substitutions  
  - Sentences from the CleftNet Protocol | • Perceptual analysis - phonetic transcriptions  
• Visual analysis of ultrasound – documented live  
• Quantitative analysis of ultrasound using Articulate Assistant Advanced software
  - a range of measures:  
    - Dorsum Excursion Index  
    - LOC\textsubscript{ac}  
    - Modified Curvature Index  
    - Nearest Neighbour Distances |
| Study 2 Intervention | ~8 children from study 1  
with lingual speech errors | • Single subject multiple baseline across participants  
• 10x 45 minute weekly therapy sessions  
• Target specific untreated probes: 3 baseline, mid-therapy, post-therapy, 3 month post-therapy | • Probes, wordlists and DEAP transcribed by SLT blind to the intervention time point and scored for % segment on target  
• Celeration lines and 2SD band methods to determine progress statistically within speakers |

References