



# FOCUS ON RESEARCH

## UltraPhonix:

### Ultrasound Visual Biofeedback Treatment for Speech Sound Disorders in Children

#### Researchers

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#### Aim

Communication difficulties impair educational attainment and social/emotional health, and affect over one million children and young adults in the UK. The most common difficulty is a speech sound disorder (SSD), in which children's speech is difficult to understand. Traditional interventions for SSDs require children to listen to their own productions and modify them, using guidance from a Speech and Language Therapist. This is difficult for children with weak auditory skills, and in general teaching children new articulations is problematic because the target articulations are difficult to see or describe. We are interested in a new tool for the treatment of SSDs, namely a modified ultrasound scanner, because it can display tongue images, providing useful visual biofeedback of the tongue's shape and location in real time. The project's aim was to quantify the efficacy of this technique. We targeted high priority children (aged 6-15) with persistent speech sound disorders. Secondary aims were to investigate the nature of the errors in close detail, and to develop ultrasound-based assessment and therapy protocols.

#### Project Outline/Methodology

Over 18 months, we recruited 20 children from NHS Speech and Language Therapists. We developed and applied protocols for ultrasound visual biofeedback therapy that focussed on speech production skills, moving from single sounds and sound combinations to longer words and sentences. Therapy was given in a 10 week block. Progress was primarily monitored through the % correct productions of the sound targeted in therapy, both in words used in therapy, and in untreated words (to test for generalisation, and to eliminate practice effects). Therapy was preceded by 3 weeks of baseline assessments, and incorporated assessments at mid-point, immediately post-therapy, and 3 months later (to test for maintenance). Phonetic research into speech articulation was also undertaken. Of the 20 children recruited, 16 completed therapy, 1 withdrew, and 3 had to be excluded after they scored too highly in the baseline recordings (we would not have been sure if further improvement were due to our therapy).

#### Key Results

For most children (13 of 16) there was both clinically-significant improvement and generalisation to untreated words. A wide variety of speech-targets responded to treatment.

#### Conclusions

Project aims were met and our hypothesis confirmed: ultrasound visual biofeedback is generally effective in treating persistent speech sound disorders, and as a diagnostic tool. Analysis of our recordings reveals new insights into how speech changes during therapy. However, further work is needed before we can predict which children may benefit most.

#### What does this study add to the field?

Since the 1980s there have been around 30 small studies, so this has been a relatively large single-subject design, and the only one to capture high-resolution data on speech production before, during and after therapy. We have addressed a wider range of speech sound disorders than is typical in the literature, adding data on important common processes. The project has directly benefited the world-leading research of the team.

#### Implications for Practice or Policy

Existing specialist Speech and Language Therapy provision could incorporate basic scanners able to add real-time imaging into current diagnostic and therapeutic practice. For enhanced diagnostic power and objective measurement, what would be needed would be more advanced: (a) equipment capable of synchronised audio-visual recordings, (b) simple-to-use analyses, (c) suitable protocols.

#### Where to next?

We will continue to liaise with NHS colleagues to support the use of ultrasound in clinical contexts through training and collaboration, and will consolidate the technique in the SLT training curriculum. Funding has been secured to trial ultrasound with children with cleft lip and palate.

#### Further details from:

<http://www.qmu.ac.uk/casl/ultraphonix/default.htm>  
<https://www.strath.ac.uk/staff/clelandjoannedr/>