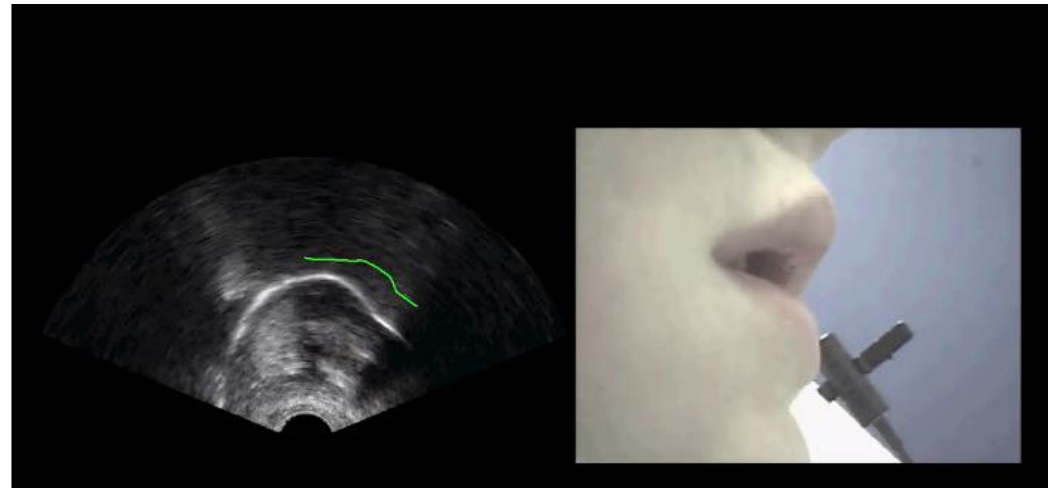


Eleanor Lawson, Joanne Cleland, Jane Stuart-Smith

Speech STAR - An online ultrasound tongue imaging based curated corpus of disordered and non-disordered speech





SEEING SPEECH www.seeingspeech.ac.uk

- Phonetics teaching resource using ultrasound tongue imaging (UTI), Magnetic Resonance Imaging (MRI) and animation of vocal tract during speech.
- Modelled and “naïve” speech (www.dynamicdialects.ac.uk)
- Funded by Carngie Trust and Arts and Humanities Research Council
- Launched March 2015



SEEING SPEECH www.seeingspeech.ac.uk

- 2019 Seeing Speech user survey - 26% of respondents were either Speech and Language Therapists (SLTs), SLT teachers, researchers, or students.
- Seeing Speech was being used for CPD; revision, in preparation for sessions with patients; in clinic and to recommend to clients/carers.
- Viewing speech articulations helped with diagnosis; feedback to clients/carers; provided visual support for children to better explain tongue placement, and improved understanding of non-English speech sounds.



STAR

Speech Therapy Animation and imaging Resource

Clinically-focussed. Building on the online www.seeingspeech.ac.uk and www.dynamicdialects.ac.uk resources.

Project team – PI Eleanor Lawson; Co-I Joanne Cleland (University of Strathclyde); Co-I Jane Stuart-Smith; Brian Aitken (web developer) (University of Glasgow); Gregory Leplatre (animator).

Aim – to provide Anglophone SLTs, paediatric clients and their parents/carers with vocal-tract imaging and animation video to improve speech and language therapy training and therapy outcomes.

Funders - Economic and Social Research Council, Secondary Data Analysis initiative, and Royal Society of Edinburgh, (July 2021-June 2023).



STAR

Speech Therapy Animation and imaging Resource

- **2 websites (1) SLT Training and CPD (2) In-clinic.**
- Introductory multimedia content, (i) 3-D head, (ii) 2-D vocal-tract speech animations (iii) UTI recording session, (iv) UTI and MRI imaging comparison.
- Clickable extIPA chart with (1) UTI and lip video; (2) midsagittal MRI; (3) MRI-based animation.
- Filterable database of non-disordered adult speech from different accents of English, and non-disordered Scottish child speech.
- Filterable databases of disordered Scottish child speech (i) speech errors, (ii) longer UTI utterance examples of different speech disorders.
- Speech animations to aid practise at home, e.g. discrimination tasks



STAR

UTI and MRI source datasets

Funding council	Collection date	Project title	Data formats	Speech type	Speaker age	No. of speakers
AHRC (AH/L0103 80/1)	Jan 2014- March 2015	Dynamic Dialects: integrating articulatory video to reveal the complexity of speech.	UTI, lip video, MRI, audio	modelled and normative	Adult (18-65yo)	54
ESRC (RES ES- N008189-1)	Sept. 2016- Dec. 2019	Changes in shape, space and time: the impact of position on the spatiotemporal and configurational articulatory properties of liquid consonants.	UTI, lip video	normative	Adult (18-50)	32
EPSRC (EP/102769 6/1)	Feb. 2011- July 2014	Ultrax: Real-time tongue tracking for speech therapy using ultrasound.	UTI, lip video	normative and disordered	Child (5-13)	68
CSO (ETM 402)	Jan. 2015- Nov. 2016	Ultraphonix: Ultrasound Visual Biofeedback Treatment for Speech Sound Disorders in Children.	UTI	disordered	Child (6-13)	20
Action Medical Research (GN2544)	April 2017- July 2018	Visualising Speech: Using ultrasound visual biofeedback to diagnose and treat speech disorders in children with cleft lip and palate.	UTI	disordered	Child (3-15)	39
EPSRC (EP/P02338 X/1)	Aug. 2017- Nov 2020	Ultrax2020: Ultrasound Technology for Optimising the Treatment of Speech Disorders.	UTI	disordered	Child (5-16)	50



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Derived speech-imaging datasets

Name	Description	Speech type and speakers	Data format
<u>extIPA</u> chart	36 modelled disordered speech sounds of the extended IPA chart	Modelled adult disordered speech, adult female speaker	MP4 video of: (i) UTI, (ii) MRI, (iii) animation derived from MRI data.
Paediatric disordered speech-imaging database	c1,000 videos of paediatric disordered speech samples, to be used for reference, training	Disordered child speech, multiple speakers	MP4 video of processed UTI and lip camera recordings
Normative speech-imaging database	c1,000 videos of non-disordered speech samples from both adults and children, to be used for reference and training, or as targets in therapy	Normative adult and child speech, multiple speakers	MP4 video of processed UTI and lip camera recordings.
Animated introductory videos	circa 6 unique illustrative and explanatory videos showing half-head vocal tract models	Normative vocal tract movement from an adult female speaker	MP4 video of animation derived from MRI and UTI.
Clinical interactive homework database	Unspecified number of videos for paediatric speech therapy practise. Content to be determined in partnership with the SLT community.	Normative vocal tract movement from an adult female speaker	MP4 video of animation derived from MRI.

Training site



STAR Speech and Language Therapy

Introduction

About the project

Speech articulation

ExtIPA charts

IPA charts

Child speech error database

Non-disordered speech database

Speech disorder database

Central Scottish Phonetic Features

Star in-clinic

Key speech sound animations

Introduction

Welcome to our interactive website for Speech and Language Therapy teaching! We offer a visual approach to learning about speech articulation and speech disorders. STAR provides teachers and students of Speech and Language Therapy with ultrasound tongue imaging (UTI) and lip video of speech, magnetic resonance imaging (MRI) video of speech, 2D midsagittal head animations based on MRI and UTI data and 3D-vocal tract animations.

The website resources:

- An introduction to UTI, MRI vocal tract imaging techniques and information about the production of the articulatory animations.
- Animated vocal-tract video.
- A clickable 2008 extended [International Phonetic Association chart](#) that links to UTI, MRI and animated speech articulator video.
- A database of UTI recordings of paediatric speech errors.
- A database of UTI recordings of normative paediatric and adult speech (single words).
- A database of MRI recording of normative adult speech (single words).

Creation of this resource

STAR is the product of a collaboration between researchers at three Scottish Universities: the [University of Glasgow](#), [Queen Margaret University Edinburgh](#), the [University of Strathclyde](#), and is funded by the



We are very grateful to Sharynne McLeod, Sadanand Singh and Plural Publishing for allowing us to share the title of their book, [Seeing Speech](#), which we recommend, along with their book [Speech Sounds](#), as a very useful tool for the student of phonetics.

How to refer to this resource:

In-clinic site



STAR Speech Therapy Animation and Imaging Resource

Welcome!

Welcome to our interactive website for Speech and Language Therapy! We offer a visual approach to learning about speech and speech disorders. On this site you will find different ways to look at the parts of the mouth that you use when you speak - especially the ones inside your head that you can't see. Ultrasound Tongue Imaging (UTI) and Magnetic Resonance Imaging (MRI) allow you to look inside speakers' heads to see how they move their tongues, and other speech organs, to make speech sounds. You will also be able to look at accurate, moving animations of the vocal tract to help you understand the differences between speech sounds.

Resources

- An introduction to vocal tract imaging techniques and information about how the animations are made.
- Animated videos of the moving speech organs.
- A database of UTI recordings of children's speech errors.
- A database of UTI recordings of non-disordered child and adult speech (single words).
- A database of MRI recording of non-disordered adult speech (single words).
- Animated exercises to help you understand the differences between sounds.



★ Clinic resources



★ Speech sound animations

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Ext-IPA chart: MRI & animation



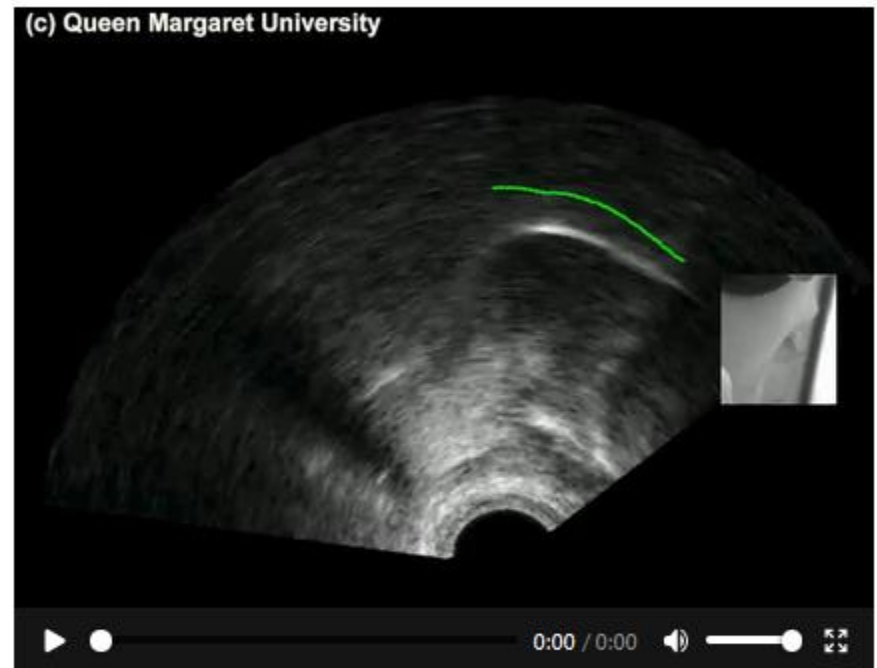
Speech disorder database (UTI and lip video)

Viewing multiple videos



15M (Male, 6;1)

Phonological delay: My granny Maggie got a golden gown



19M (Male, 10;0)

Phonological delay: Sean the sheep was on the ship

Playback speed:



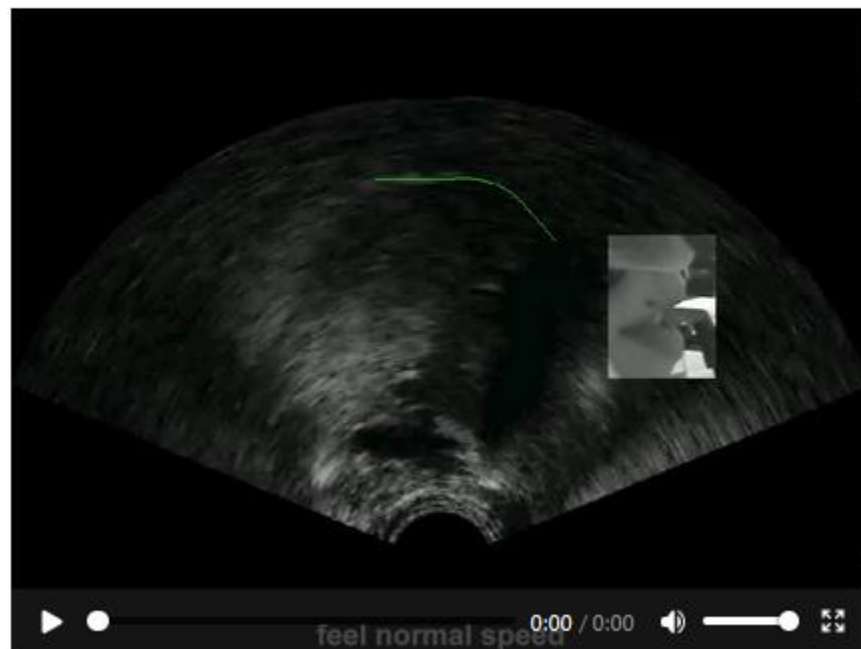
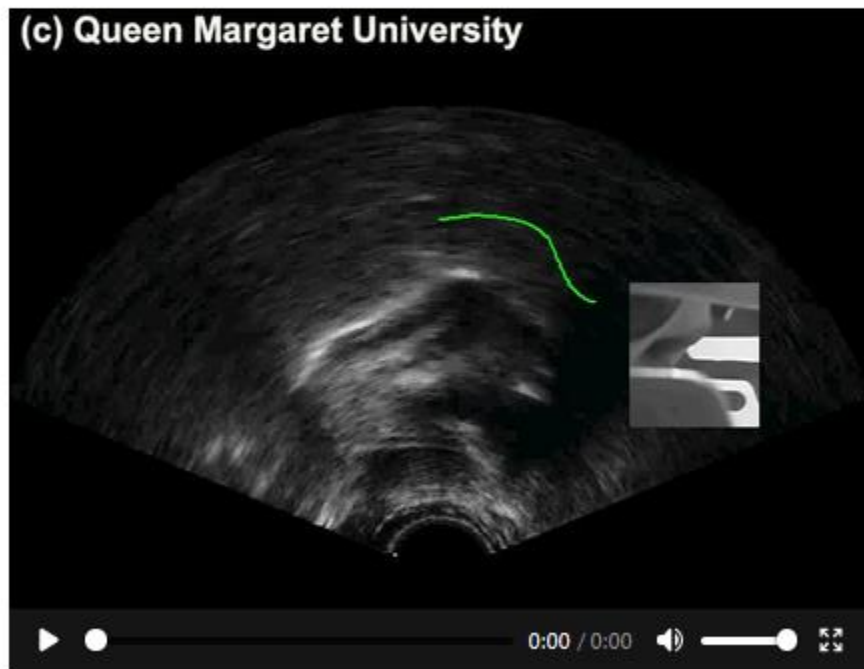
Non-disordered adult and child speech database (UTI and lip video)

Viewing multiple videos



Accent: **Scottish: Central**, Speaker: **29TD1F**, Sex: **Female**, Age: **7;3**, Word: **ara iri oro**, Sound: **r**, Articulation: **alveolar**, Position: **intervocalic**

Accent: **Canadian: Ontario**, Speaker: **SS speaker 11**, Sex: **Female**, Age: **20**, Word: **feel**, Sound: **l**, Articulation: **alveolar**, Position: **coda**



Playback speed: **Normal** Slow