**Sugden, Eleanor and Lloyd, Susan and Cleland, Joanne and Isles, Jenny (2018) Ultrasound visual biofeedback in intervention for speech sound disorders : a systematic review of the evidence. In: International Clinical Phonetics & Linguistics Association Conference, 2018-10-23 - 2018-10-25. ,**

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# Ultrasound Visual Biofeedback in Intervention for Speech Sound Disorders: A Systematic Review of the Evidence

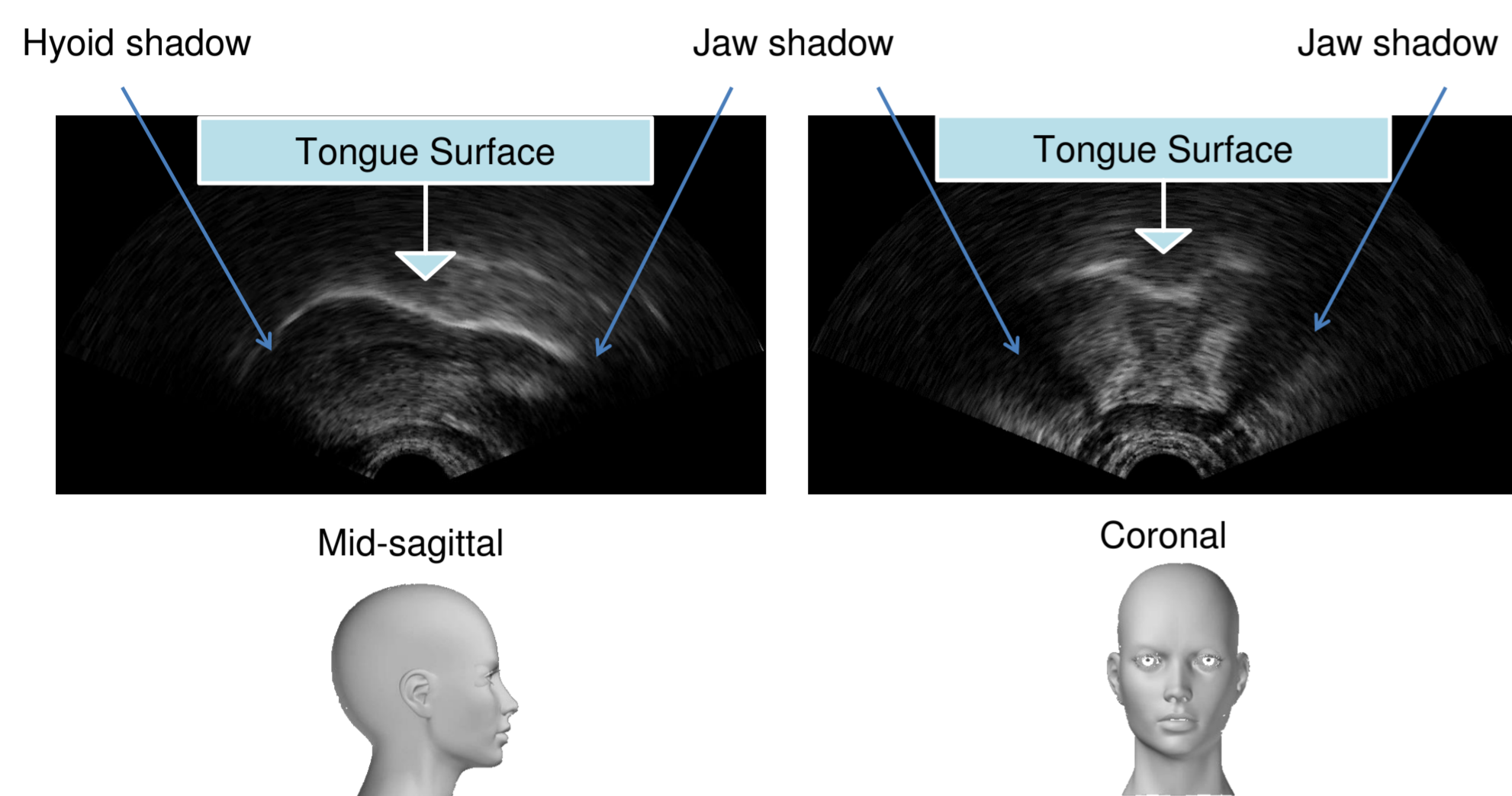*Eleanor Sugden, Susan Lloyd, Joanne Cleland & Jenny Isles*

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Speech sound disorders (SSDs) are the most common childhood communication disorder, with prevalence rates of between 2.3% and 24.6%[1].

Treatment typically relies on providing predominately auditory information[2], but this can be difficult for children as the articulators are largely invisible during speech. Visual biofeedback may hold the answers.

## Ultrasound Visual Biofeedback

Hyoid shadow      Jaw shadow         Jaw shadow

Tongue Surface        Tongue Surface

Mid-sagittal          Coronal

The image can be used in intervention to provide cues and feedback on the movement/position of the tongue.

Decreases in costs and increases in portability have led to a growing clinical and research interest in U-VBF.

Interpretation of the research is challenging due to diversity in study design, populations, clinical methods, and outcomes. A systematic review is therefore needed.
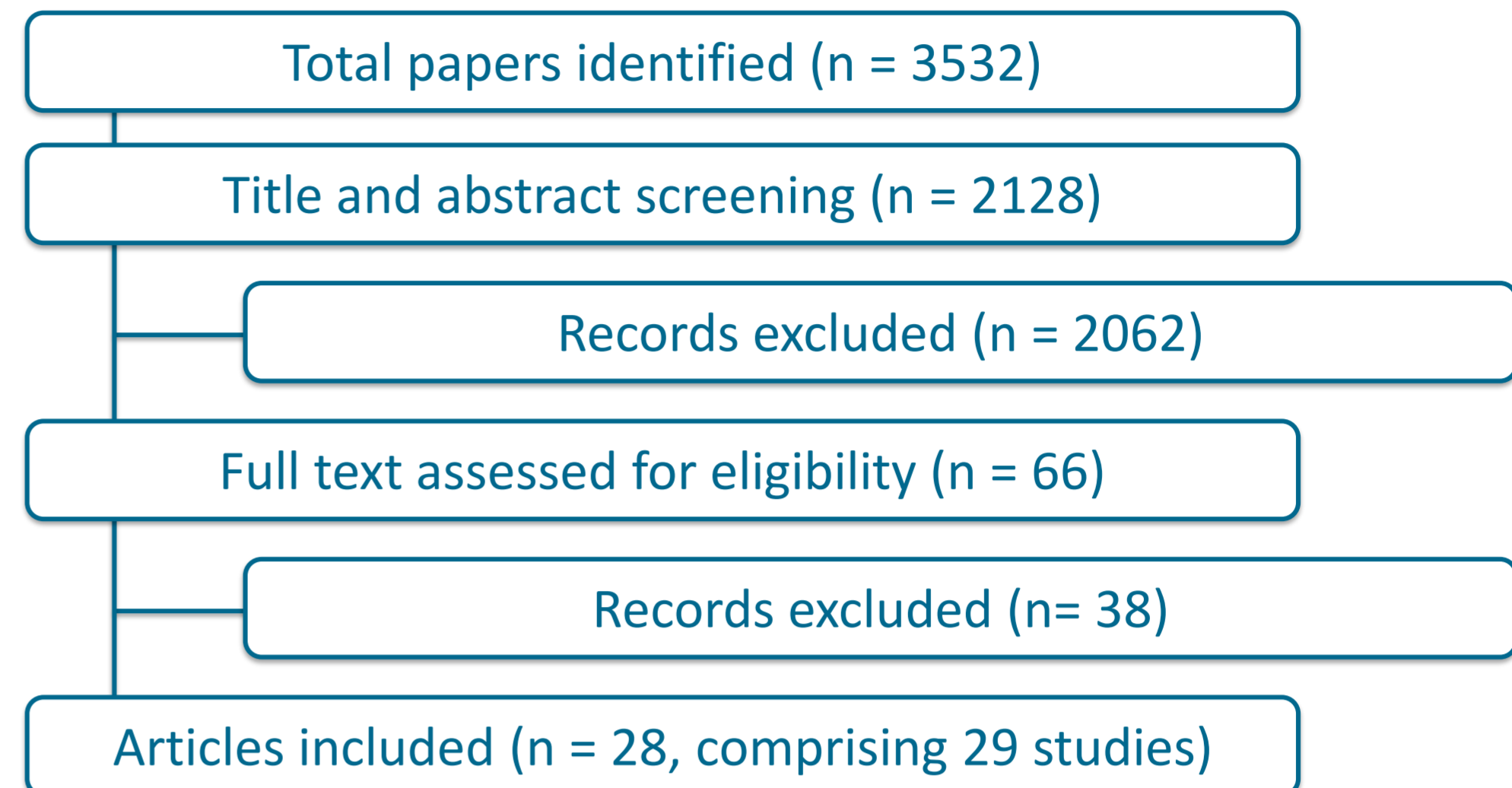
## Search Strategy & Identification

| Databases searched | Search terms |
|---|---|
| Medline | intervention OR therapy OR treat* |
| Cumulative Index to Nursing and Allied Health Literature (CINAHL) | |
| PROQUEST | ultrasound OR biofeedback |
| Scopus | |
| Linguistic and Language Behaviour Abstracts | speech OR articulat* OR phon* OR apraxi* OR dyspraxia* |
| SpeechBITE | |
| ASHA's online journal search site | |
| The Cochrane Library | |

### Inclusion criteria

1. Peer-reviewed articles published in or before 2017
2. Available in English
3. Reporting on an investigation of the use of U-VBF in intervention
4. Intervention delivered to children or adults identified as having a developmental (i.e., non-acquired) SSD

## Results

Total papers identified (n = 3532)

Title and abstract screening (n = 2128)

Records excluded (n = 2062)

Full text assessed for eligibility (n = 66)

Records excluded (n= 38)

Articles included (n = 28, comprising 29 studies)

| Study design | n (%) |
|---|---|
| Randomised controlled trial | 1 (3.4%) |
| Quasi-experimental group design | 1 (3.4%) |
| Single-case experimental design | 13 (44.8%) |
| Case series | 8 (27.6%) |
| Case study | 6 (20.7%) |

**118** Participants (103 unique)

**11** Average age (4 – 27)

**38%** Studies with concomitant disorders

A range of SSDs have been treated[3], including: Residual speech sound errors, CAS, dysarthria, persistent SSD, those related to hearing impairment and repaired cleft.

Targets:

/ɹ/ 23/29 studies

Sibilants 9/29 studies

Vowels 4/29 studies

Velars 3/29 studies

**65.5%** of studies reported positive results
**34.5%** of studies reported mixed results

## Discussion

- U-VBF can be an effective intervention for a range of SSDs, particularly in the early/acquisition stages of motor learning[4]
- Low generalisation to non-treated words/contexts[5]
- Predominately low-n SCED or case study design, representing lower levels of evidence
- Need for large-scale studies in everyday practice

### References

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2. Baker, E., Williams, A. L., McLeod, S., & McCauley, R. (2018). Elements of phonological interventions for children with speech sound disorders: The development of a taxonomy. *American Journal of Speech-Language Pathology*, 27(3), 906-935.
3. Cleland, J., Wrench, A., Lloyd, S., & Sugden, E. (2018). *ULTRAX2020: Ultrasound Technology for Optimising the Treatment of Speech Disorders: Clinicians' Resource Manual.* Glasgow: University of Strathclyde.
4. Maas, E., Robin, D. A., Austermann Hula, S. N., Freedman, S. E., Wulf, G., Ballard, K. J., & Schmidt, R. A. (2008). Principles of motor learning in treatment of motor speech disorders. *American Journal of Speech-Language Pathology*, 17(3), 277-298.
5. Preston, J. L., Maas, E., Whittle, J., Leece, M. C., & McCabe, P. (2016). Limited acquisition and generalisation of rhotics with ultrasound visual feedback in childhood apraxia. *Clinical Linguistics & Phonetics*, 30(3-5), 363-381.