Performance of Maltese children on a language specific nonword repetition task (NWRT)

Nadine Tabone

Kristina Agius

Background

- Extensive research on the use of non-word repetition tasks in the assessment of children with
  - Speech and language impairment (e.g. Ibertsson, Willstedt-Svensson, Radeborg, & Sahlen, 2008)
  - literacy difficulties (e.g. Bishop, McDonald, Bird, & Hayiou-Thomas, 2009).
  - Speech motor control (e.g. Reuterskiöld & Grigos, 2015; Krishnan , Alcock, Carey, Bergström, Karmiloff-Smith, Dick, 2017)

- The administration of a NWRT requires the child to repeat nonsense words that are presented auditorily (Jones, Tamburelli, Watson, Gobet, & Pine 2010).

- In Malta children are exposed to both Maltese and English to varying degrees.
- Most are primarily exposed to Maltese and later to English.
- Specific features in the non-word can assist with differential diagnosis of some communication disorders. Through:
  - Syllable length
  - Consonant clusters/sequences vs single consonants

Literature

- Past bilingual studies on NWRT → Different findings:
  - Spanish-English sequential bilingual children: performance is significantly influenced by language (e.g. Windsor, Kohnert, Lobitz, & Pham, 2010; Summers, Bohman, Gillam, Pena, & Bedore, 2010).
  - French-English simultaneous bilingual children: Thordardottir and Brandeker (2013) found that nonword repetition was less affected by previous exposure (when compared with a measure of vocabulary in the study).
- Oromotor praxis uniquely predicted nonword repetition ability in school-age children, (in addition to digit span, memory for non-verbal sequences, articulatory rate (measured by oral diadochokinesis) as well as reading fluency (Krishnan et. al., 2017).
- Indications that increases in phonological short-term memory demands affect articulator movement (Reuterskiöld & Grigos, 2015).

Aim

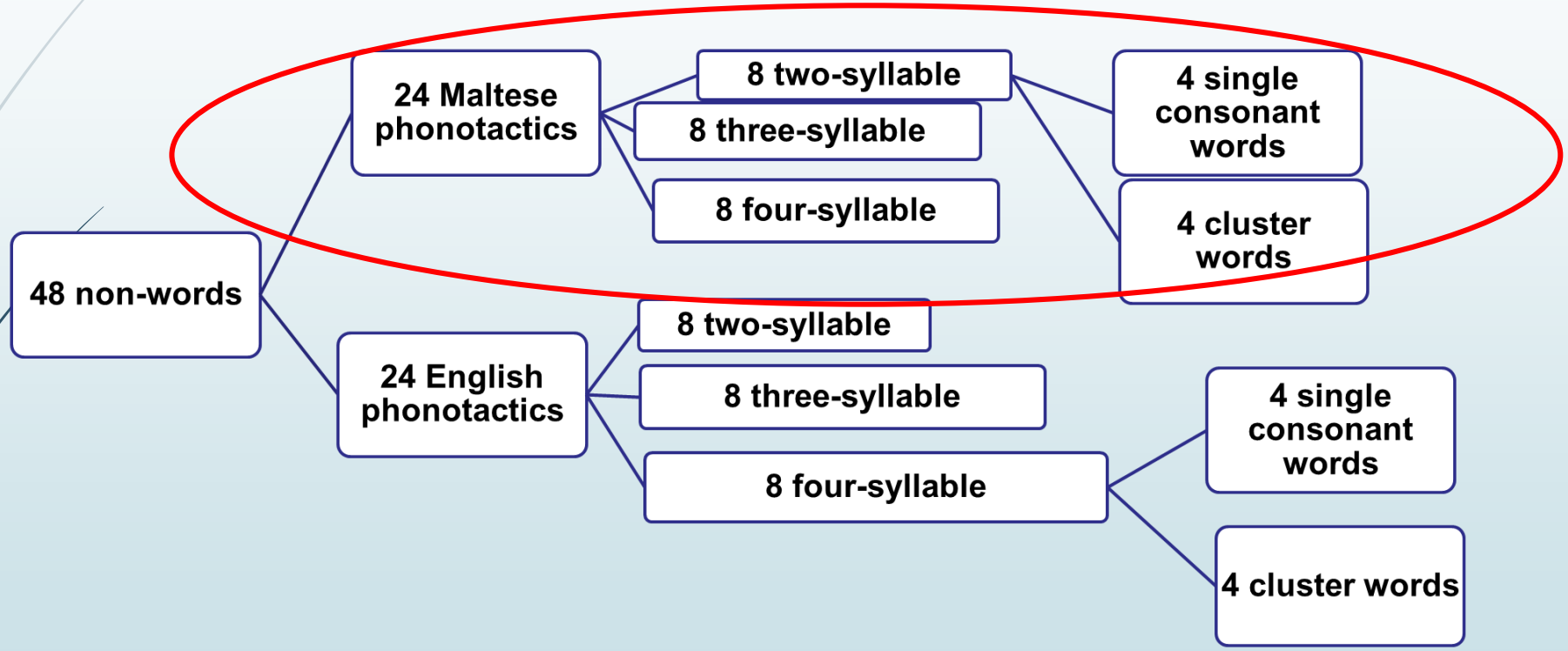
To obtain data related to the construction of a language specific non-word repetition task in Maltese children.

To compare the performance of typically developing (TD) children with that of children diagnosed with a neurodevelopmental disorder (clinical group).

Subjects

- 100 TD children
- Clinical sample of 30
- Aged between 7;0 and 9;11 years
- Recruited randomly through the Malta National Statistics Office

Structure of the NWRT list



Method

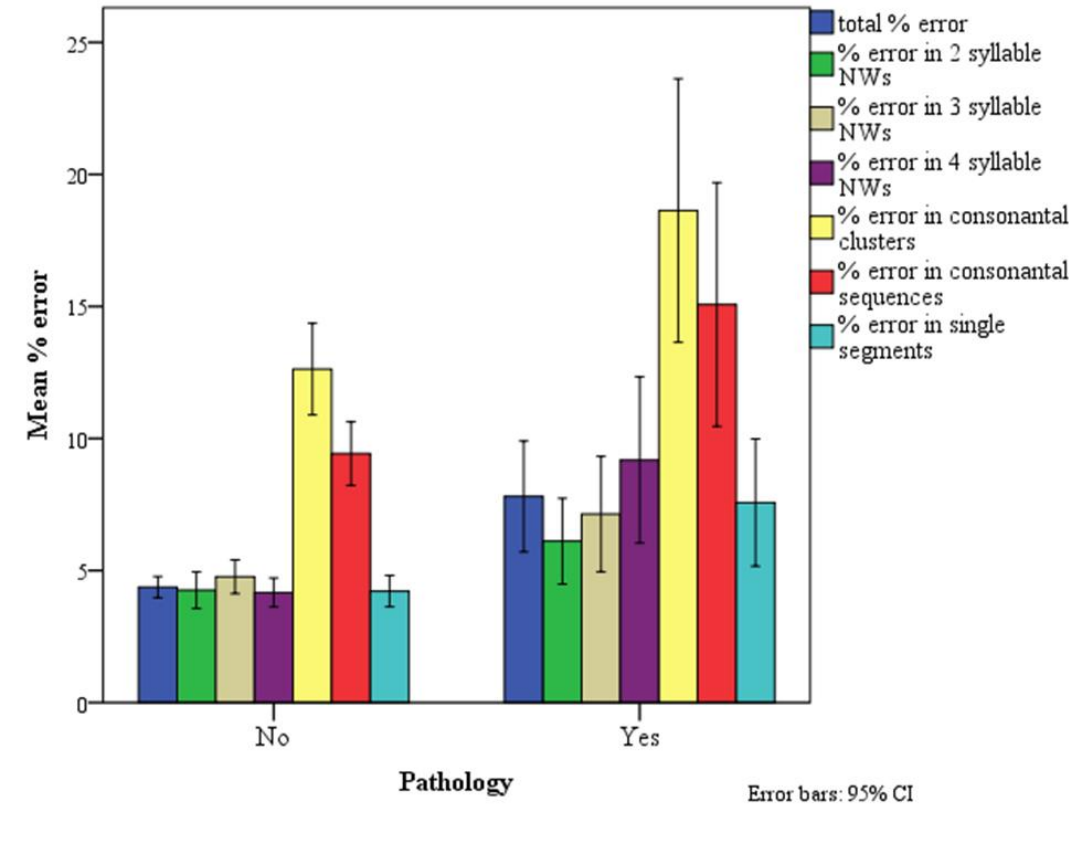
- All children were presented with the nonwords.
- Words were presented auditorily through headphones.
- The children were asked to repeat what was heard.

- The children's responses were audio recorded and transcribed.

- Responses were analysed in terms of the percentage amount of errors produced within each:
  - Syllable length
  - Absence/presence of consonantal clusters/sequences

- Deeper analysis:
  - Percentage of structure preserving and structure changing responses
  - Percentage of occurrence for emerged error patterns in each group (TD and clinical).

Results



- The TD participants faired across syllable length of the non-words.
- The clinical group , displayed more errors with increasing syllable length.
- Both groups made most errors in the consonant clusters, followed by the consonant sequences.

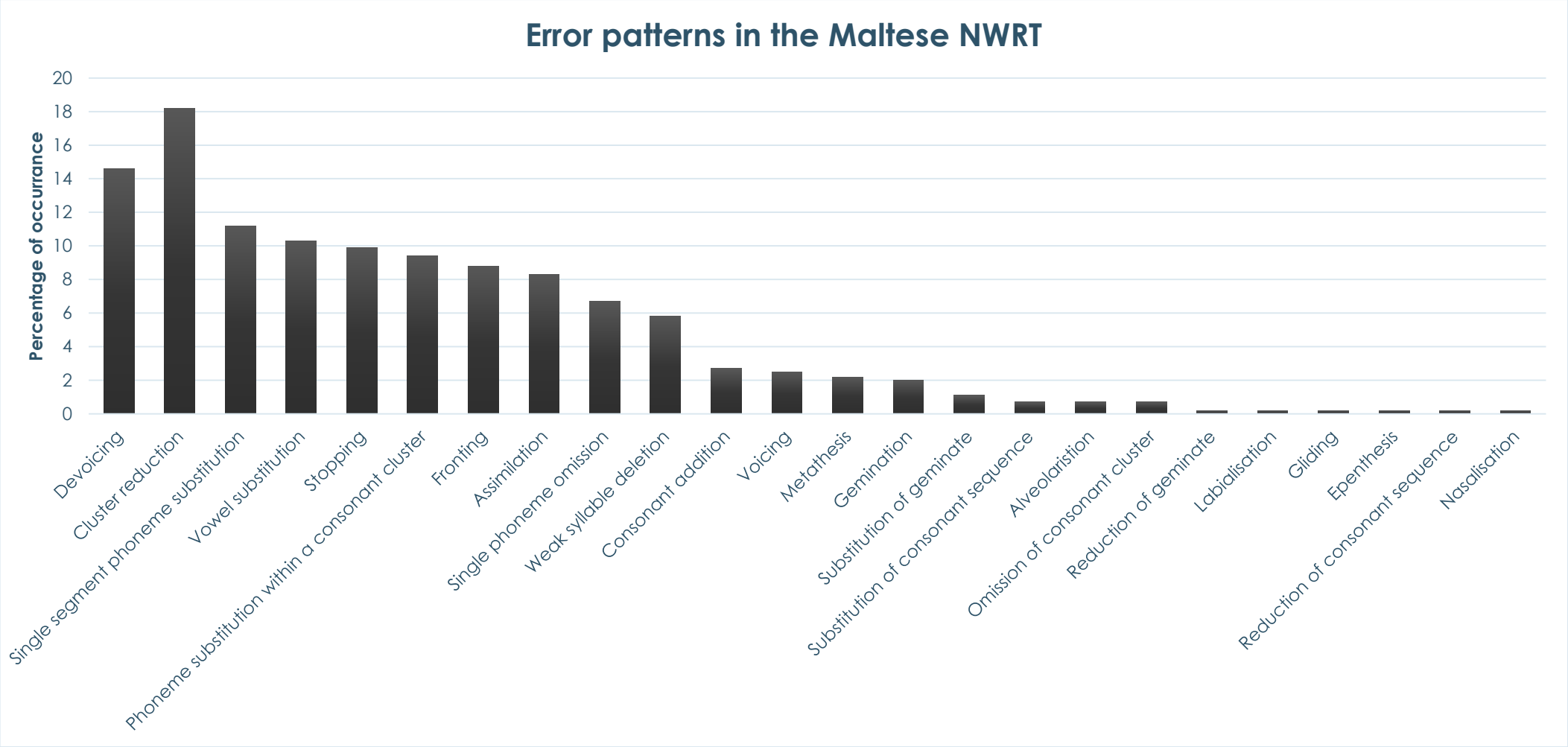
Typically Developing group

- Errors were mainly structure preserving (68.8% of the errors).
- More errors occurred at the syllable initial position (68.3%).
- The vast majority of errors were at a phoneme level (94.5%), with only a few (5.5%) occurring at the syllable level

Clinical group

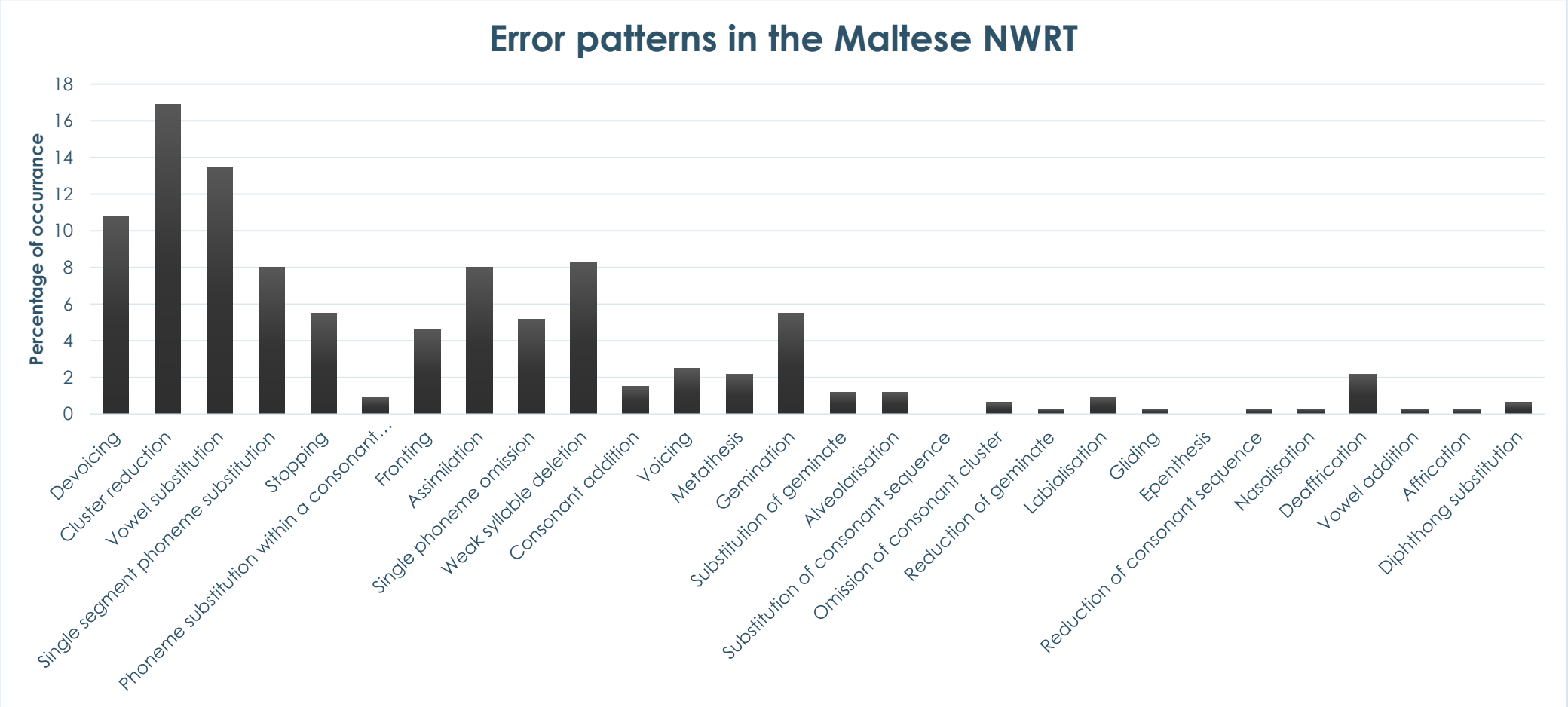
- The error patterns followed a similar distribution to the TD group
- Most processes being structure preserving (63.6% of the errors), and in the syllable initial position (65%). The majority were also at a phoneme level (90.7%), compared with processes occurring at the syllable level (9.3%), although a slightly higher amount of processes occurring at the syllable level was evident in the clinical group

Typically developing children

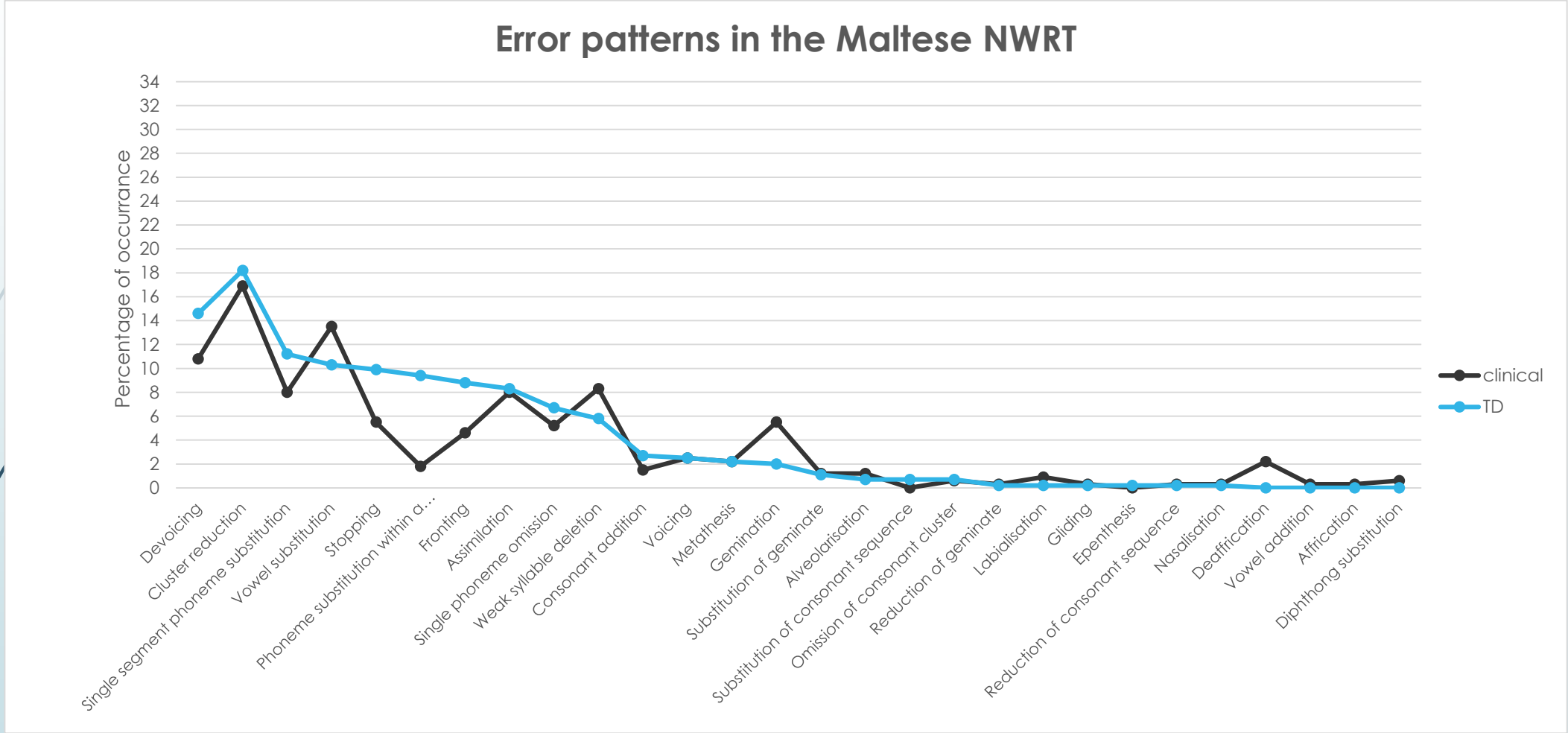


- The highest amounts of error patterns were of devoicing (systemic) and cluster reduction (structural). Much of the devoicing process is attributable to a high number of devoicing in the geminate /v:/ present in the non-word /rɛv:ɔfija/ to /rɛf:ɔfija/, while a large number of the cluster reduction process occurred syllable finally in the non-word /lɪ'ranʃ/ to /lɪ'ratʃ/.

Clinical group



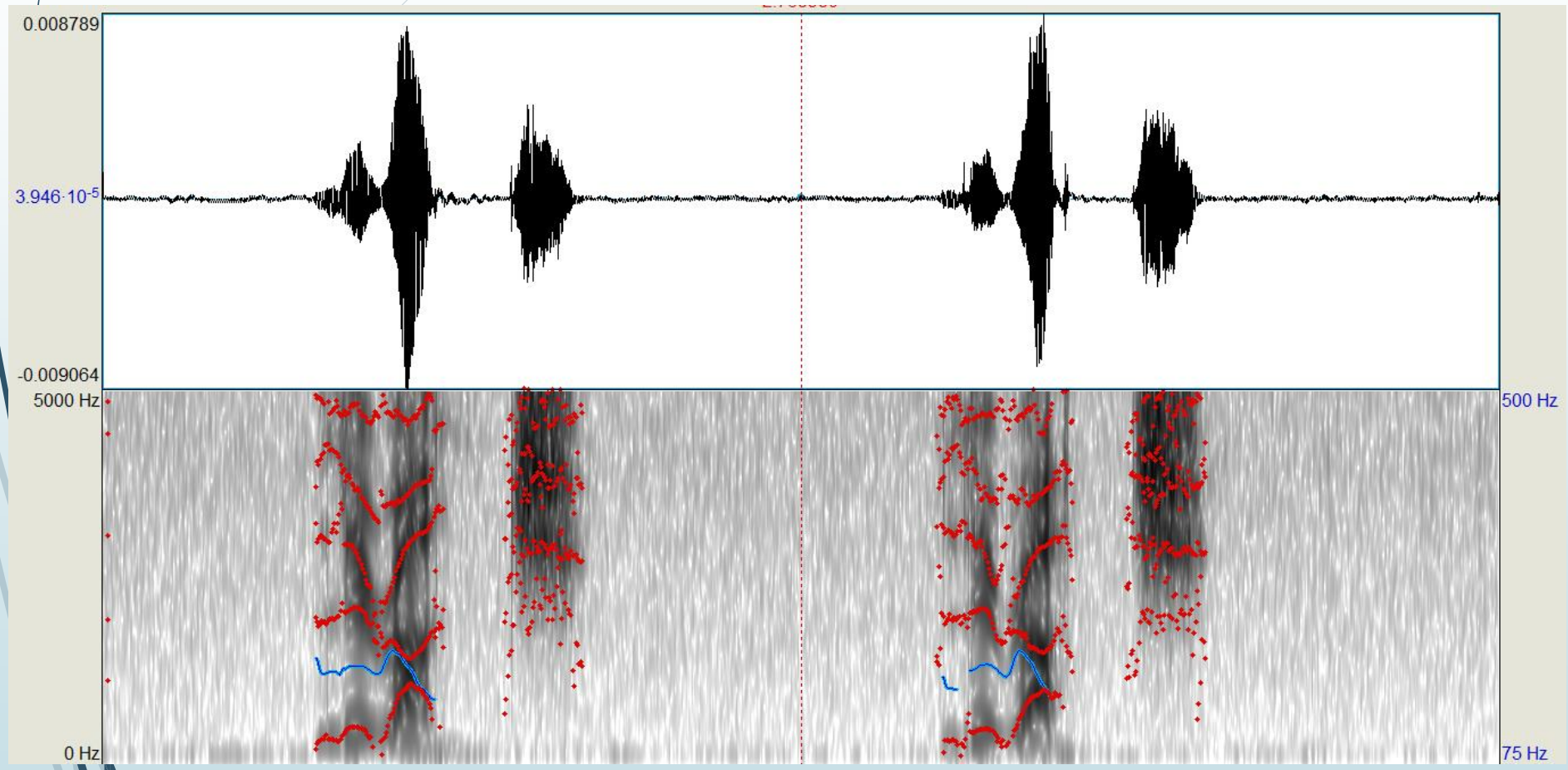
Comparison of TD and clinical groups



Acoustic analysis

- The target nonwords that were subjected to a high amount of the same error (by both TD and clinical groups) were compared with the 'mispronounced' nonword through a visual analysis of the acoustic energy (i.e. their spectrograms).

Denasalisation within the syllable final consonant cluster



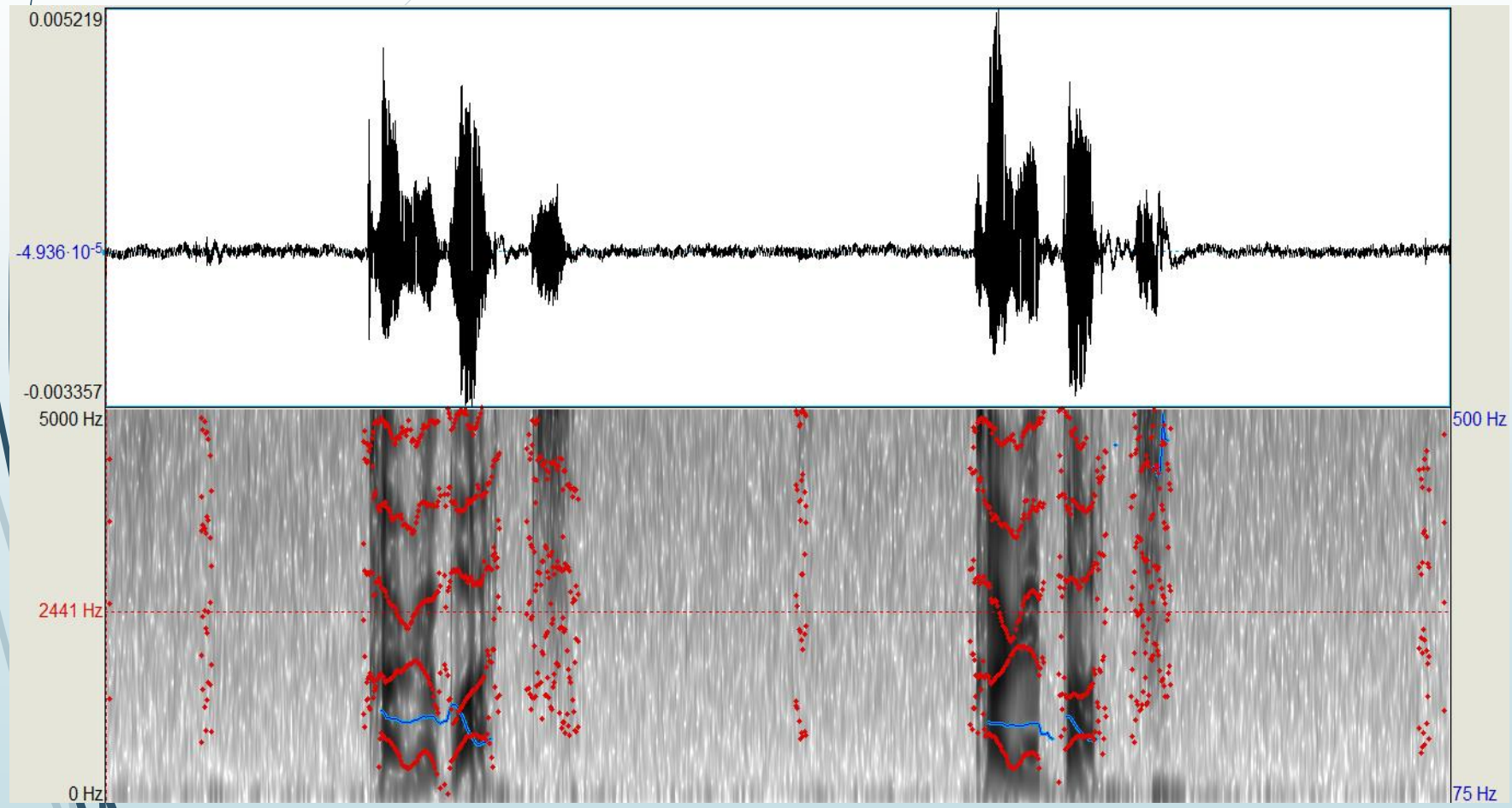
l ɪ'r a n t ʃ

l ɪ'r a t ʃ

Difference emerged between the two nonwords demonstrating the low amount of acoustic energy emerging from the nasal sounds.

This 'anticipatory denasalisation', where the end parts of the nasal sound are denasalised in expectation of the oral voiceless obstruent, has been documented (e.g. Ohala, n.d.; Ohala & Ohala, 1993).

Stopping of syllable initial approximants

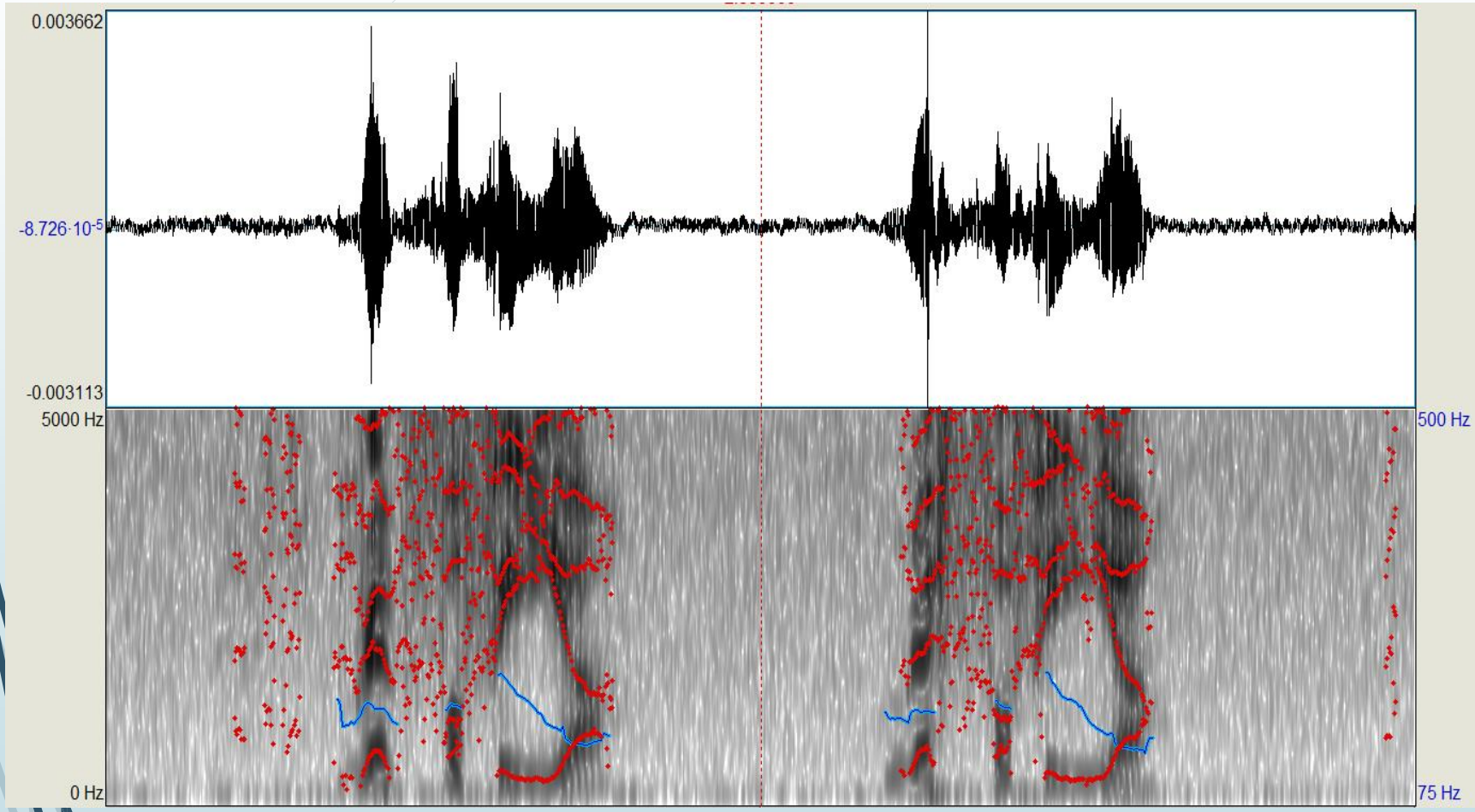


karɛwa t: **karɛ ba t:**

Evident in the TD sample. There are similarities in the sounds [w] and [b]: both are voiced and produced at the same place of articulation but vary in manner.

The spectrogram demonstrates less acoustic energy in the production of [w] and [b] when compared with the preceding and following vowels.

Devoicing of geminate



r ɛ v: ɔ f i j a

r ɛ f: ɔ f i j a

The spectrogram illustrates the frequent occurrence in devoicing of the geminate [v:] of the target nonword and child production.

The difference between the voiced and voiceless fricatives [v] and [f] should be evident through a visible voice bar (dark band in the low frequencies – about 400Hz) for [v] on a spectrogram (Hayward, 2013).

This difference is not evident in the spectrogram of the two nonwords as read by the same reader of the NWRTs in the assessment battery, suggesting the possible reason for the frequent substitution.

Suggested future research

- To gather data on disordered speech in Maltese bilingual children of varying ages.
  - Speech sample
  - Comparing speech patterns using both English and Maltese assessments
  - Comparing with the literature
  - Carer questionnaire

- Current investigation going on: American English spoken by children with ASD from Maltese-speaking families (vocabulary study).
  - Need to investigate prosody and consonant / vowel productions in this group (data available).