Auditory Resolution Deficits in Children with Reading Difficulties

Presented by:
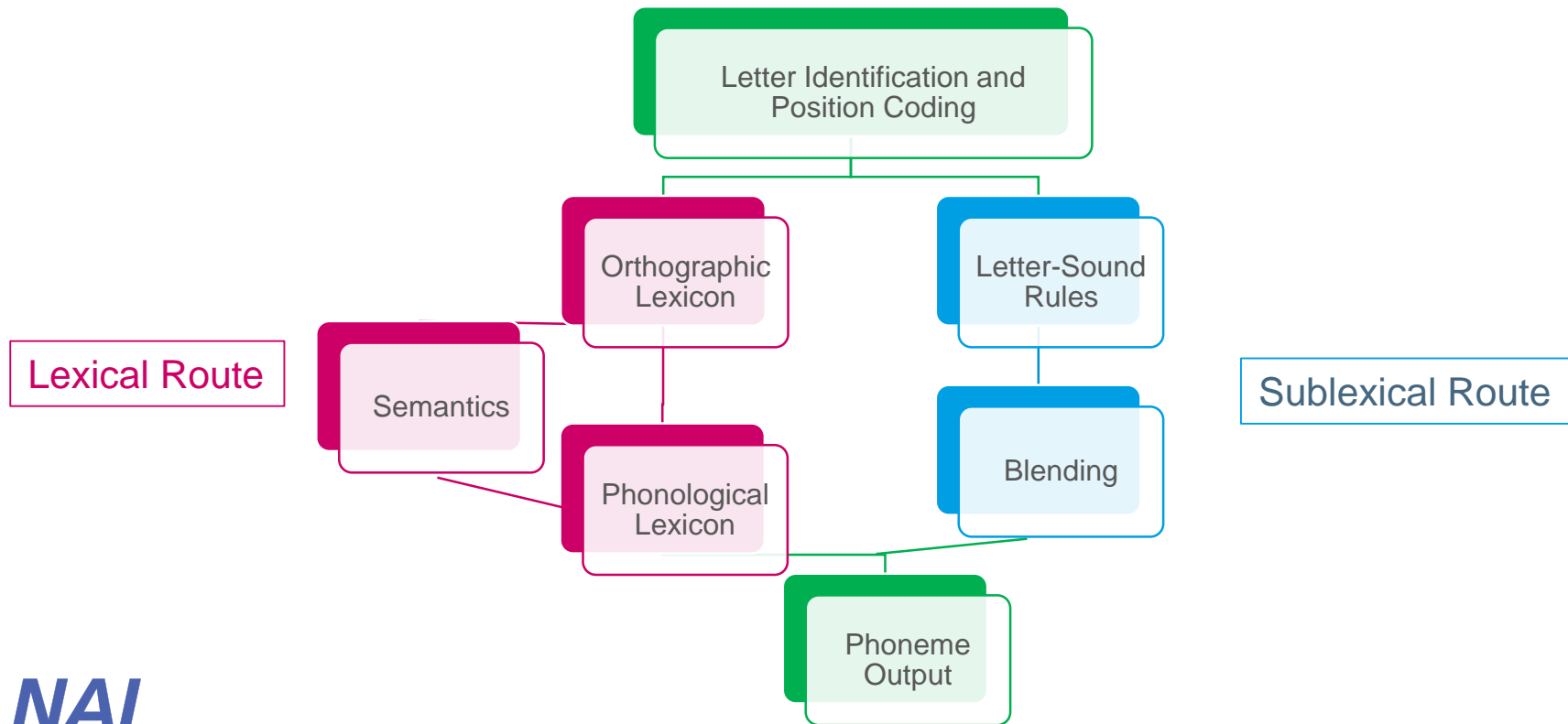
Dr Kiri Mealings

National Acoustic Laboratories
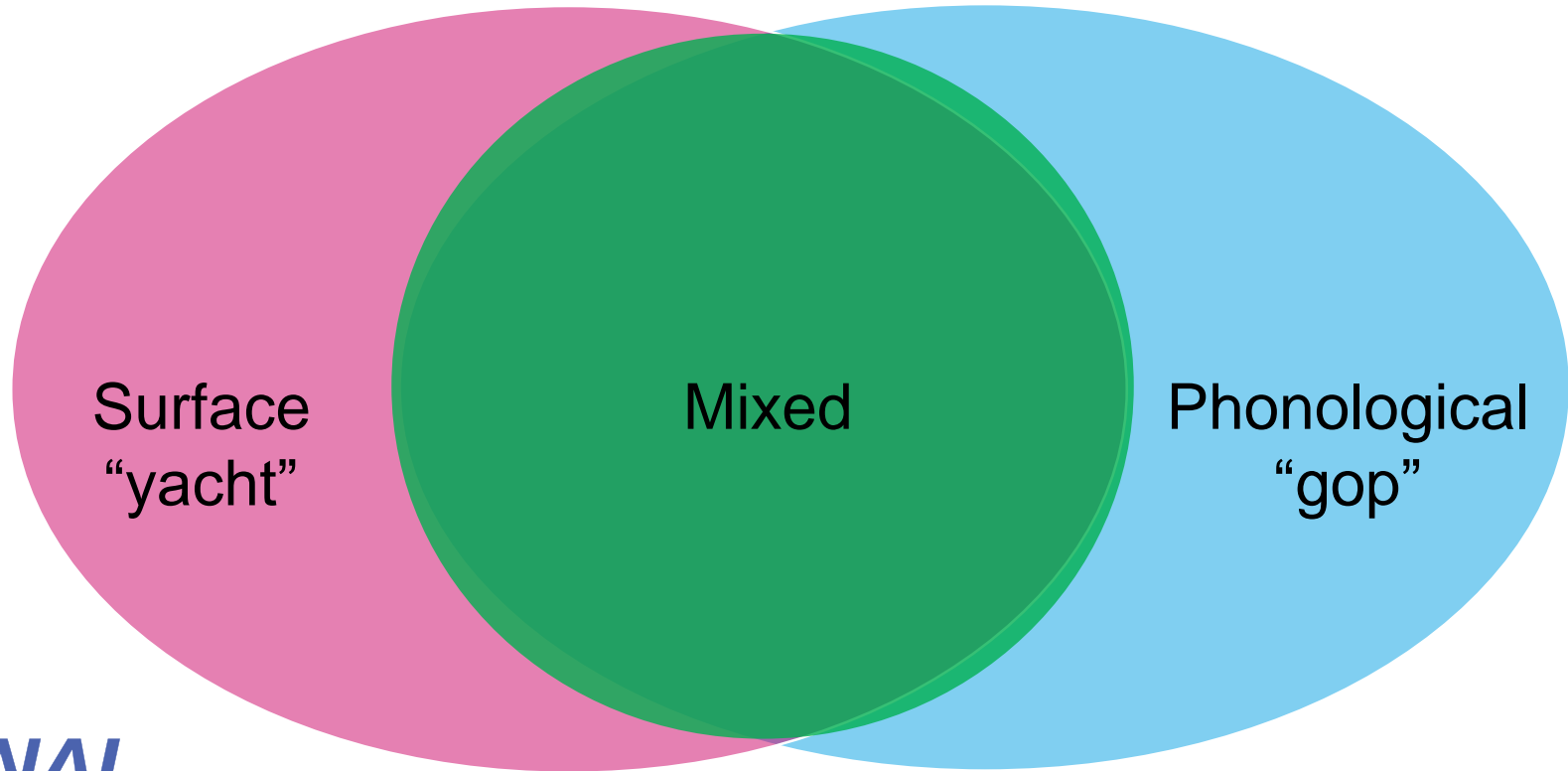
kiri.mealings@nal.gov.au

Dual Route Model of Reading e.g. Coltheart et al. (2001)

Letter Identification and Position Coding

Orthographic Lexicon

Letter-Sound Rules

Lexical Route

Semantics

Sublexical Route

Phonological Lexicon

Blending

Phoneme Output

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Broad Categories of Dyslexia

Broad Categories of Dyslexia

Our hypothesized subgroup

Auditory deficit

Surface "yacht"

Mixed

Phonological "gop"
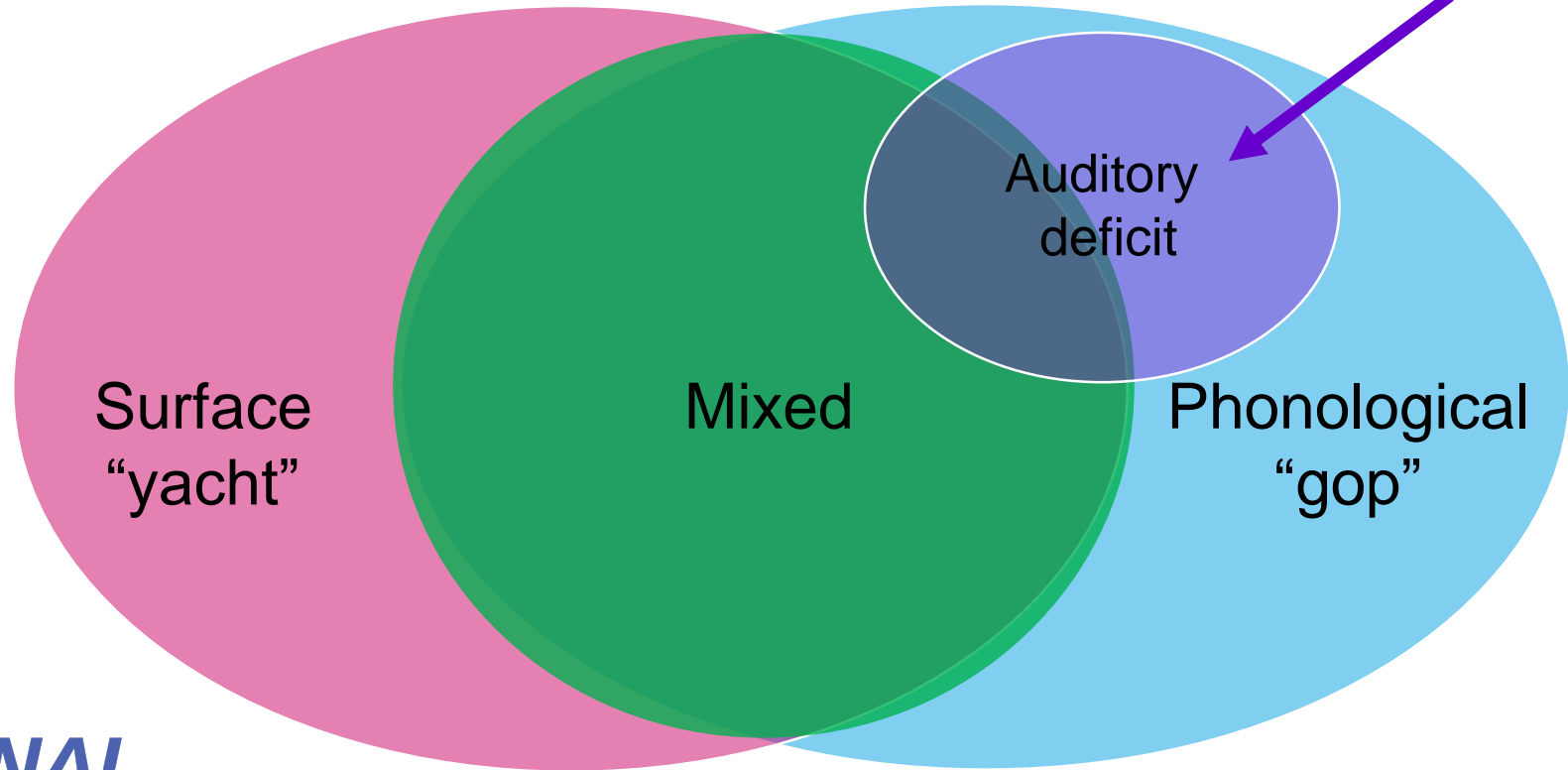
Two main types of auditory deficits for dyslexia

Trouble processing **phonemes**

Rate-processing constraint hypothesis
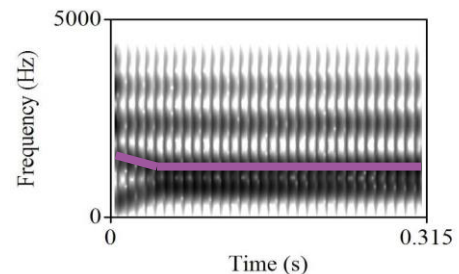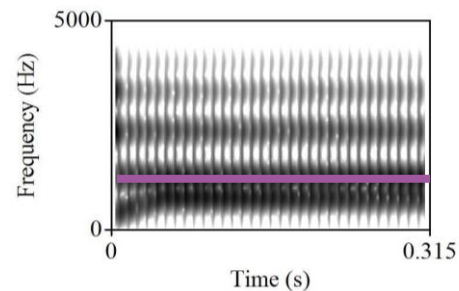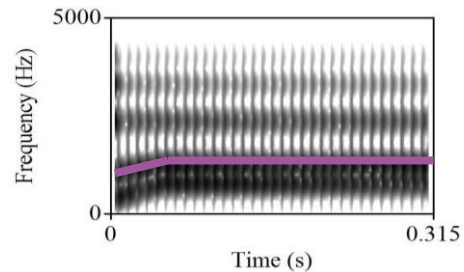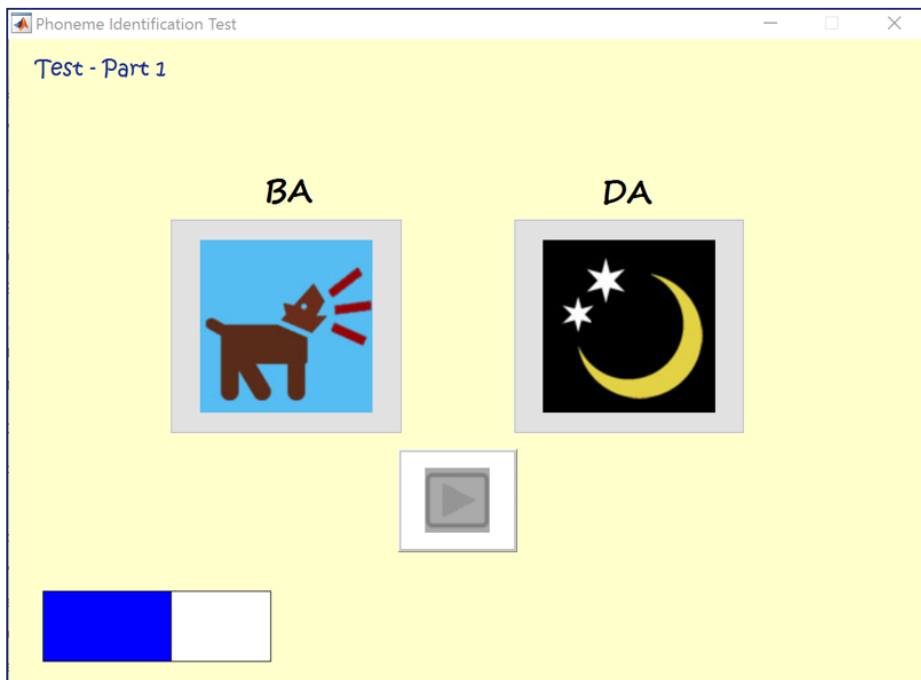(Tallal, 1980)

Trouble processing **syllables**

Temporal sampling framework hypothesis
(Goswami, 2011)

Phoneme Identification Test
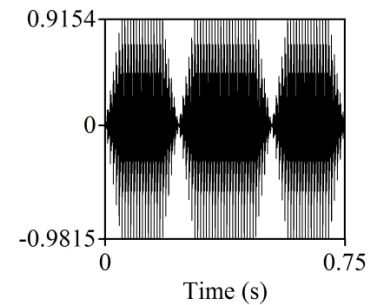(PIT)

Assesses categorical perception

Parsing Syllable Envelopes Test
(ParSE)

Assesses syllable boundary detection

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PIT – Fast-rate processing of formant frequency changes

Conditions: Quiet; 0 dB SNR Broadband Noise

100% /ba/ (0% /da/)

50% /ba/ (50% /da/)

100% /da/ (0% /ba/)

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ParSE – Temporal sampling of slower syllabic amplitude modulations

0% modulation

50% modulation

100% modulation
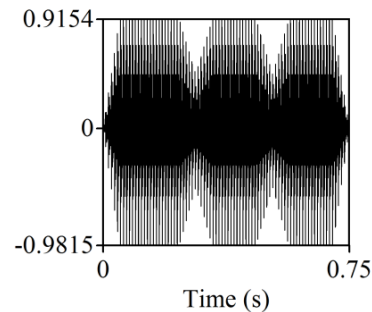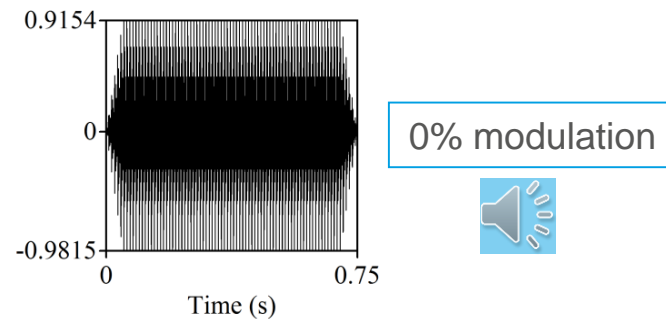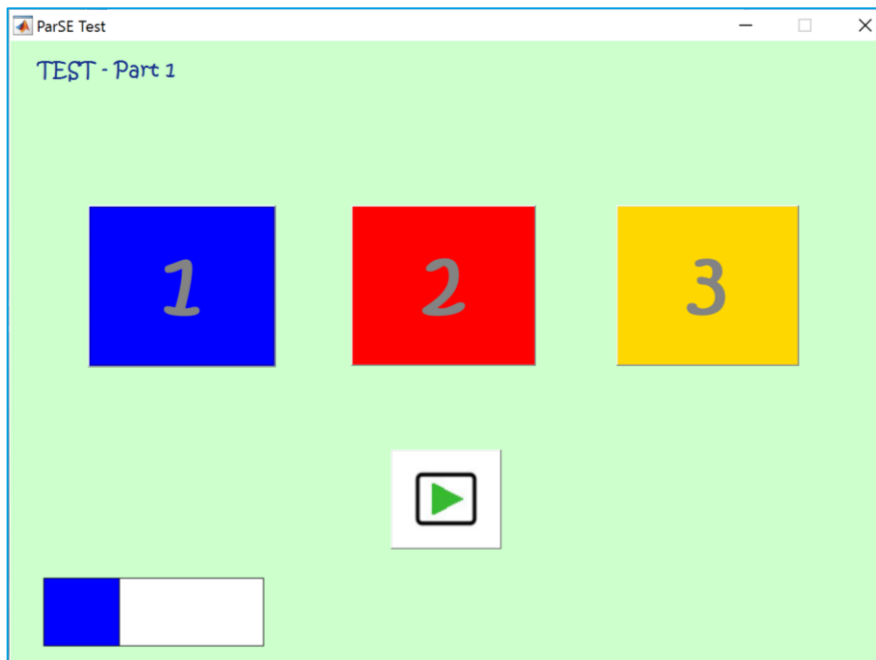
Hypotheses

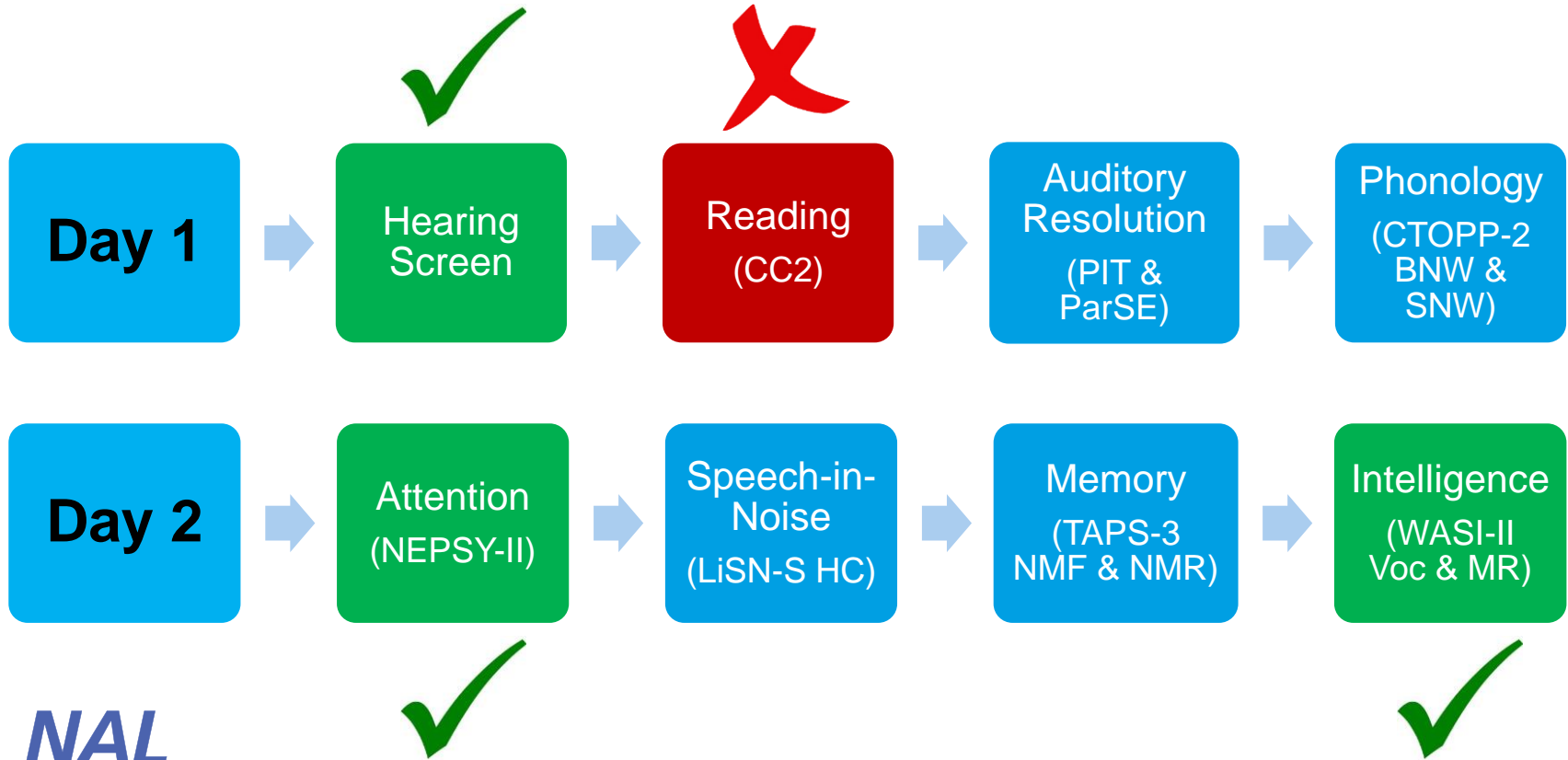- A proportion of children with **phonological** or **mixed** reading difficulties will <u>**fail**</u> PIT and/or ParSE

- Children with **surface** reading difficulties will <u>**pass**</u> PIT and ParSE

- Children's performance on the PIT and ParSE would be:

  - Positively correlated with **non-word** reading (and stronger for PITN)

  - But <u>**not**</u> correlated **irregular word** reading

Participants

- 16 children: males = 10; females = 6

- Age range = 8 yrs 2 mths – 11 yrs 4 mths; Mean age = 9 yrs 7 mths

- All monolingual English speakers

Test Procedure

Day 1 → Hearing Screen ✔ → Reading (CC2) ✘ → Auditory Resolution (PIT & ParSE) → Phonology (CTOPP-2 BNW & SNW)

Day 2 → Attention (NEPSY-II) ✔ → Speech-in-Noise (LiSN-S HC) → Memory (TAPS-3 NMF & NMR) → Intelligence (WASI-II Voc & MR) ✔

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Results

CC2

```
                              Phonological
                                 dyslexia
                                  n = 4

Child with
reported        ───────────    Mixed dyslexia
reading
difficulties                       n = 7

                              Surface dyslexia
                                  n = 5
```

Results

CC2

PIT & ParSE

Child with reported reading difficulties

Phonological dyslexia

n = 4

Fail: Auditory deficit

n = 4

PITQ&N: n = 2
PITN: n = 1
ParSE: n = 1

✔

Pass: Non-auditory deficit

n = 0

Mixed dyslexia

n = 7

Surface dyslexia

n = 5

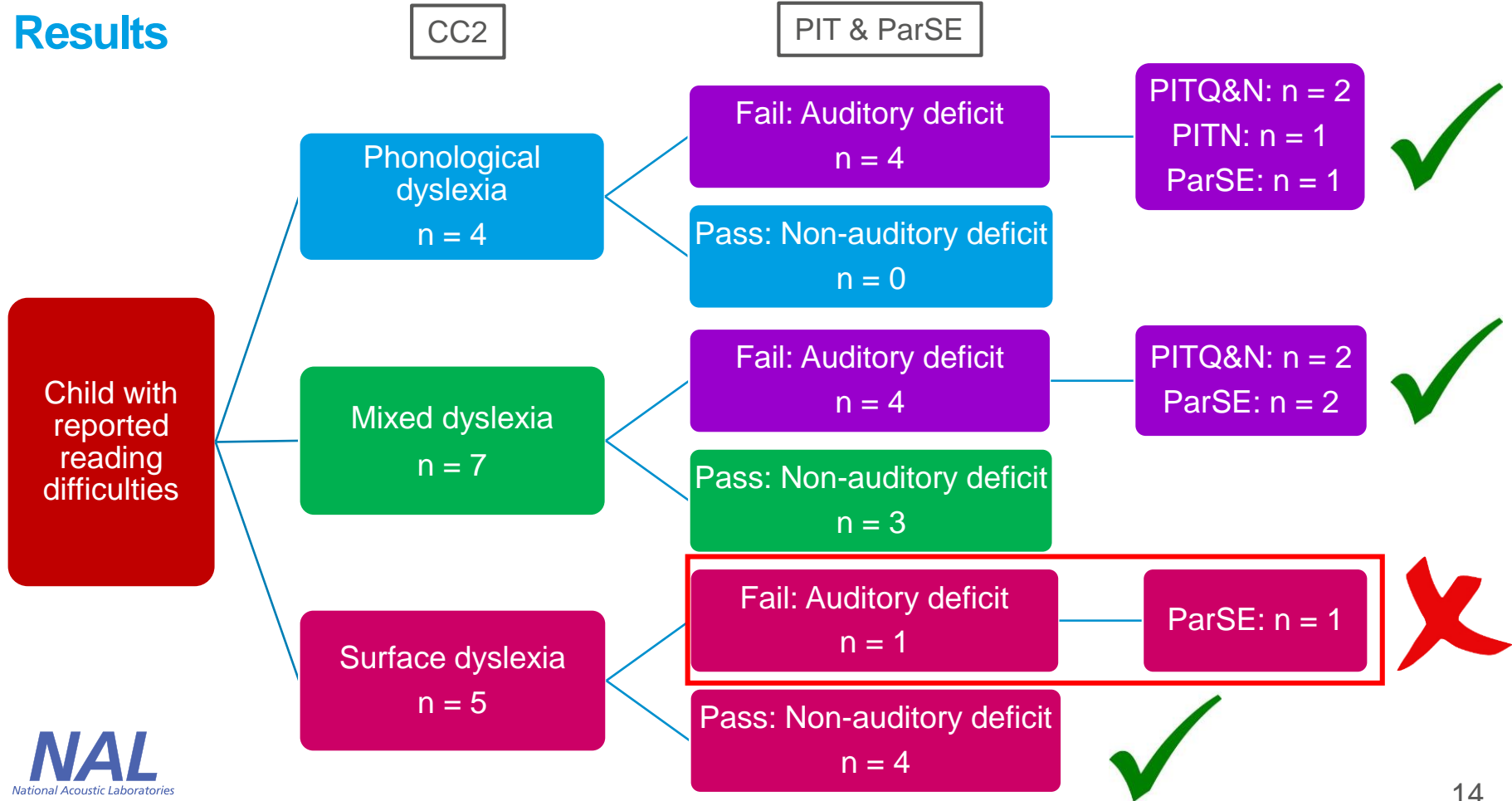# Results

Results

Significant Correlations

Variables	n	r	r^2	p	Correlation Strength
Non-words vs. PITN	16	0.58	0.34	0.019	Strong
Non-words vs. Blending	16	0.72	0.52	0.002	Strong
Non-words vs. Segmenting	16	0.61	0.37	0.013	Strong
PITQ vs. PITN	16	0.74	0.54	0.001	Strong
Blending vs. Segmenting	16	0.74	0.55	0.001	Strong
Attention Switching vs. NMF	16	0.57	0.33	0.020	Strong
NMF vs. NMR	16	0.61	0.37	0.012	Strong

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Non-Word vs. PIT Correlations

r = 0.36, r² = 0.36, p = 0.17

r = 0.58, r² = 0.34, p = 0.02
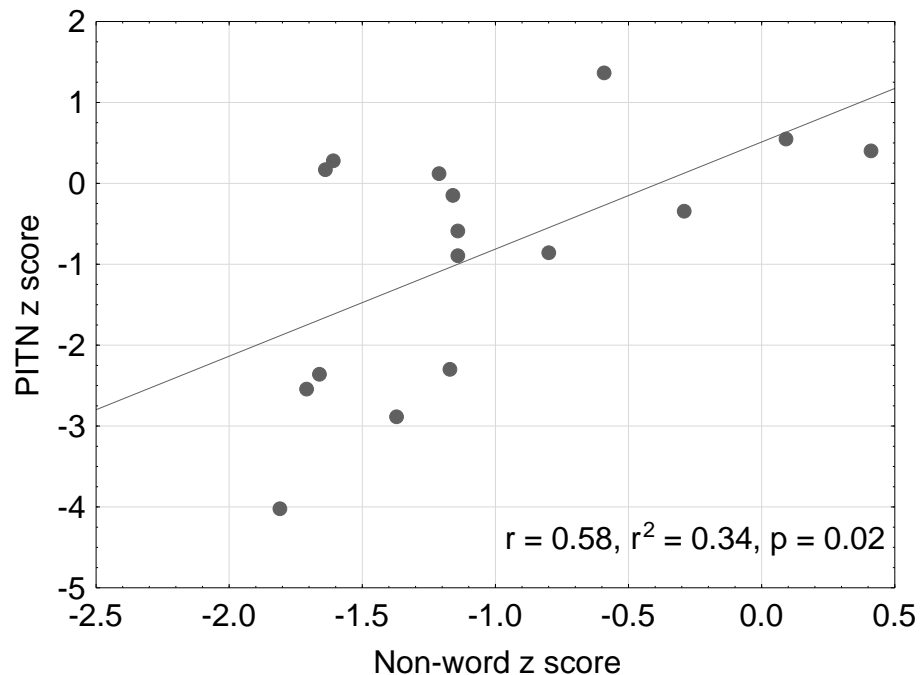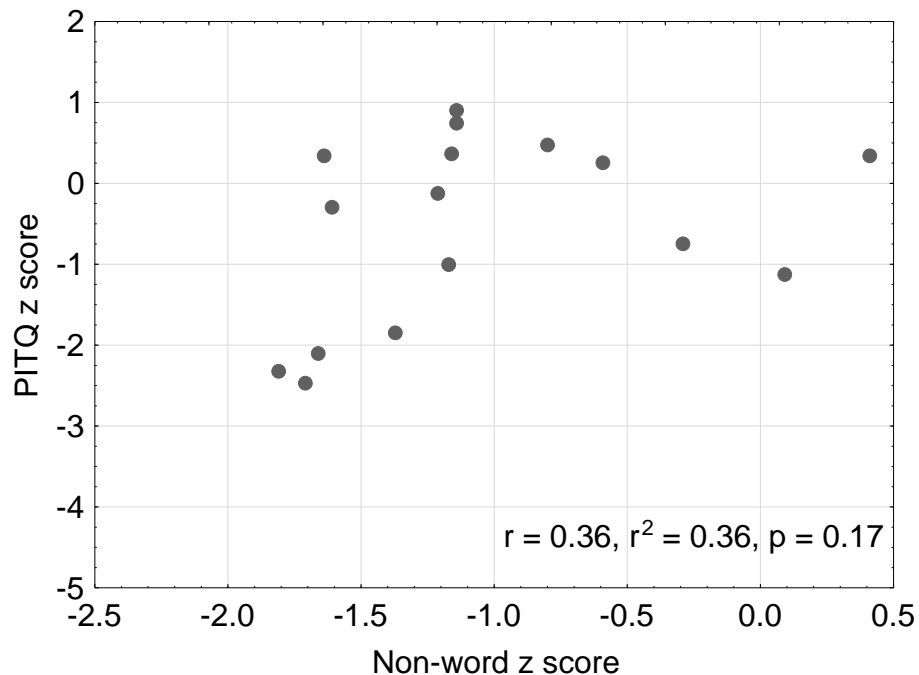
Non-Word vs. ParSE Correlation
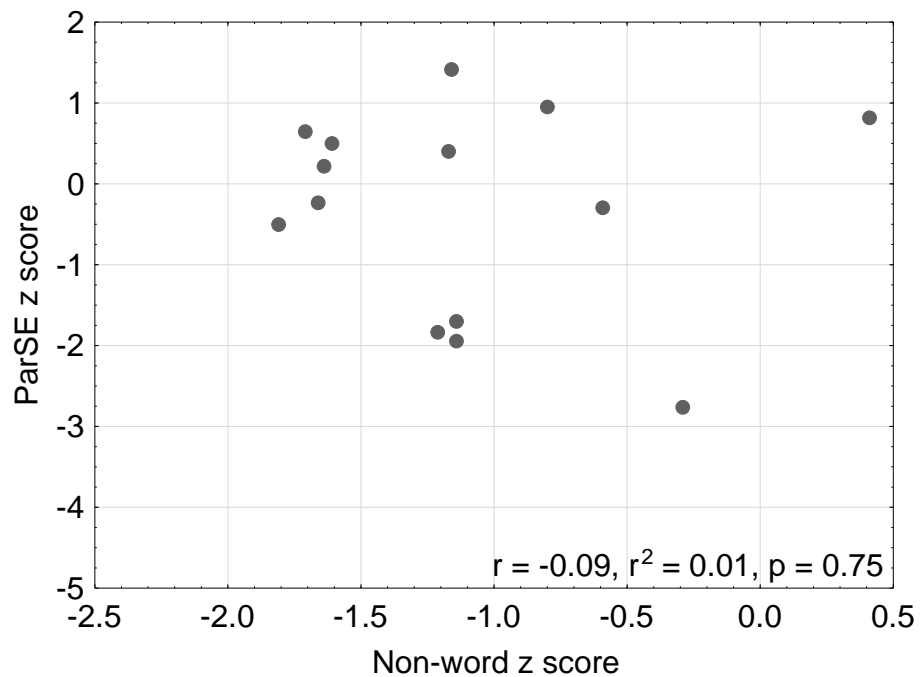
Irregular Word vs. PIT Correlations

r = -0.15, r² = 0.02, p = 0.58

r = -0.16, r² = 0.03, p = 0.55
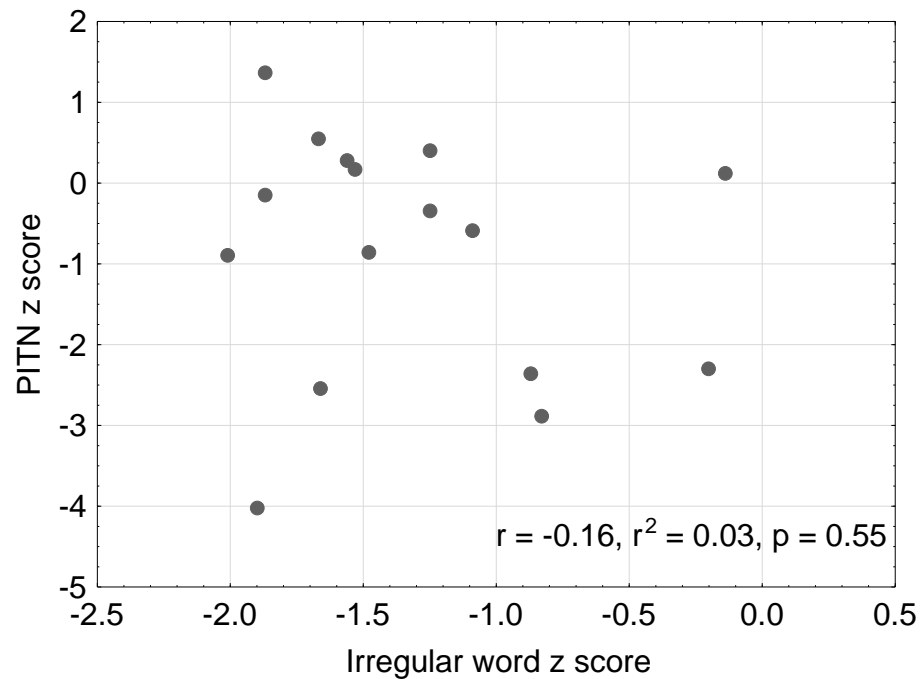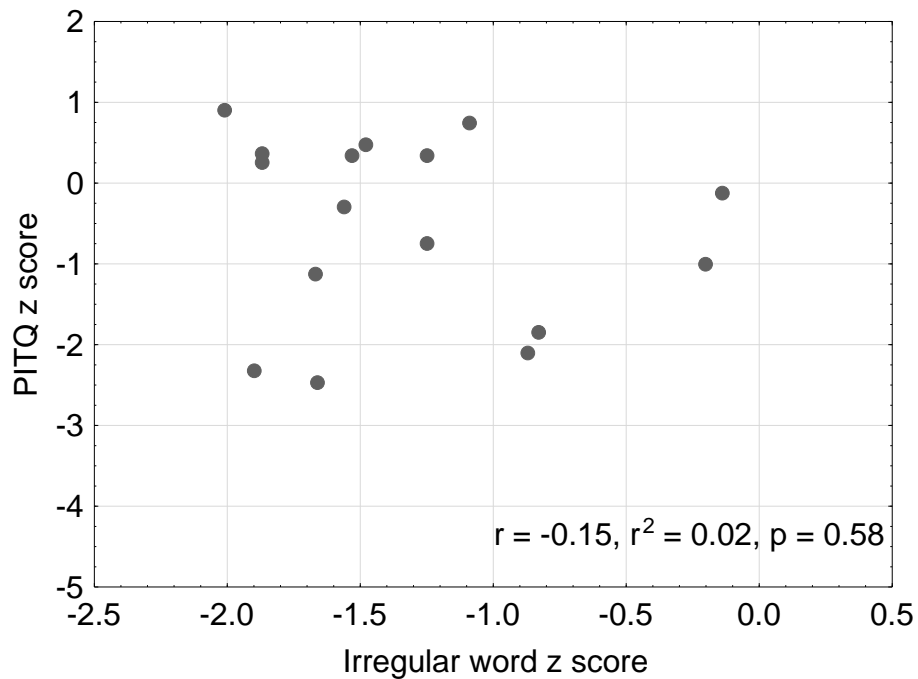
Irregular Word vs. ParSE Correlation
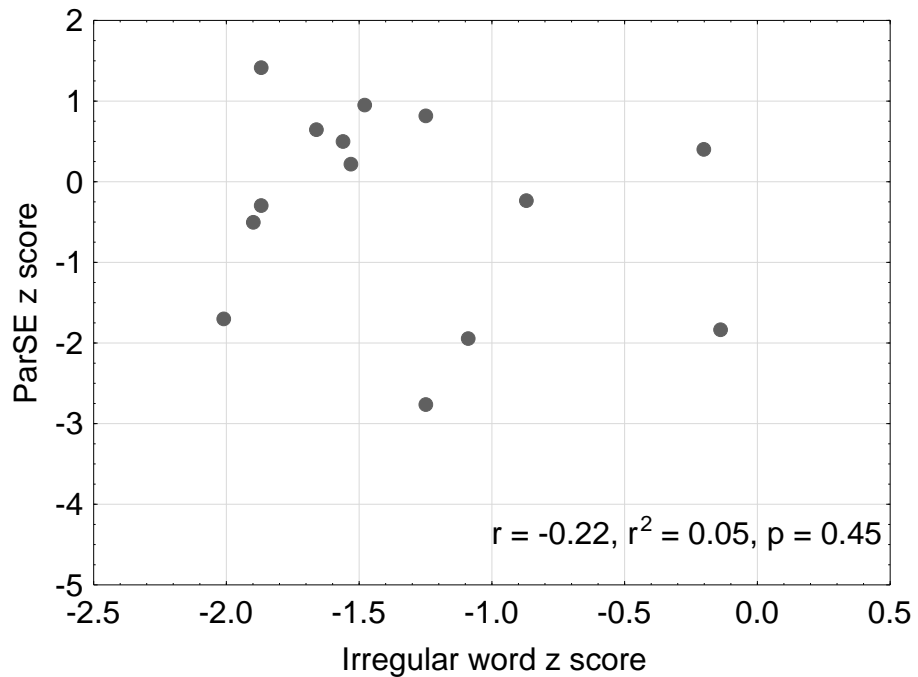
Conclusions

- A proportion of children with **phonological** or **mixed** reading difficulties <u>**failed**</u> PIT *or* ParSE
  - But not both
    - Different mechanisms at work for rate-processing & temporal sampling
    - These hypotheses may describe different reading difficulties
- 4 out of 5 children with **surface** reading difficulties <u>**did not**</u> have an auditory resolution deficit
- Non-word reading correlated to PITN only
  - Need to do a larger study, subgroup children, and then correlate

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Thanks for listening! Any questions?

Presented by:
Dr Kiri Mealings
National Acoustic Laboratories

kiri.mealings@nal.gov.au
https://capd.nal.gov.au