Why is nonword repetition deficient in specific language impairment (SLI)?

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wellcome trust

Work conducted in collaboration with:

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Specific language impairment (SLI)

- Language does not follow normal developmental course
- Normal development in other areas
- Not due to hearing loss, physical abnormality, acquired brain damage

Nonword Repetition

Child listens to spoken nonwords and repeats, e.g.

2 syllables: hampent

3 syllables: dopelate

4 syllables: confrantually

5 syllables: pristoractional

Items from Children's Nonword Repetition Test (CNRep)
– *Gathercole & Baddeley, 1990*

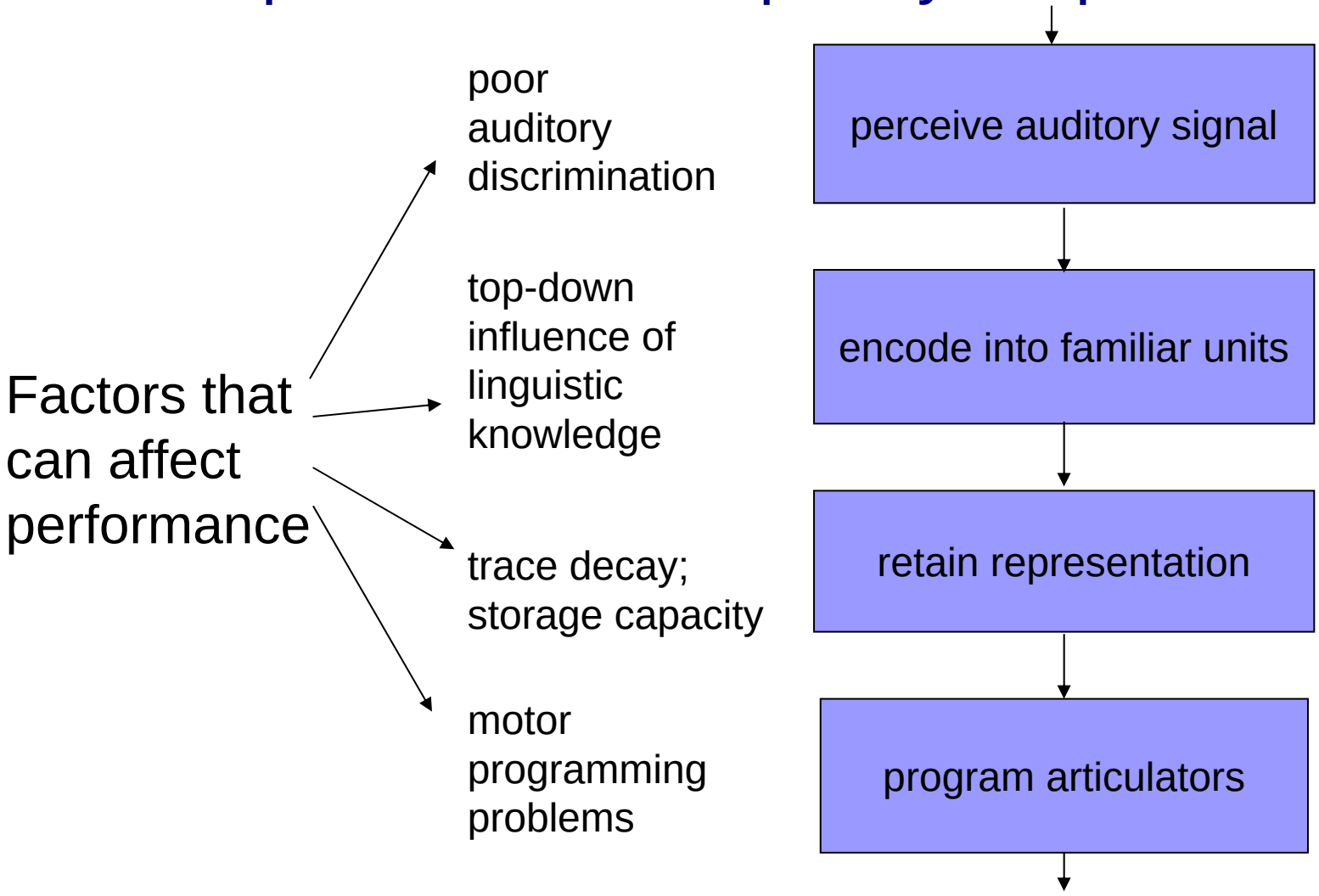
Nonword repetition in SLI

- Initial study by Gathercole and Baddeley (1990) showed marked deficits in SLI, for long (3+ syllables) but not short nonwords

- Many replications – see meta-analysis by Graf Estes et al (2007)

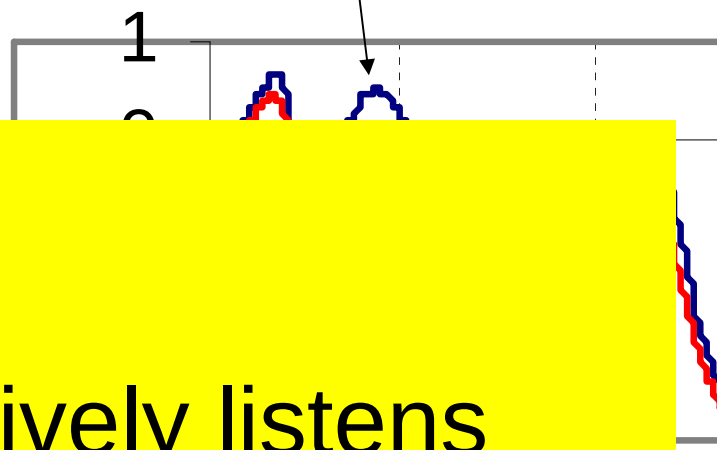
- Nonword repetition also poor in ‘resolved’ cases of SLI, and relatives of affected individuals

Nonword repetition – a deceptively simple task



Mismatch responses

- Enhanced negativity of electrophysiological respor
devian
(red) o
of repe
(blue)
- Graph
respor
over 80+ trials at frontocentral site (FZ)



No task!
Participant passively listens while viewing silent DVD

postulated to indicate phonemic categorisation

ERP task to index phonological short-term memory

standard: ba-bi-bu-be

deviant da-bi-bu-be

ba-di-bu-be

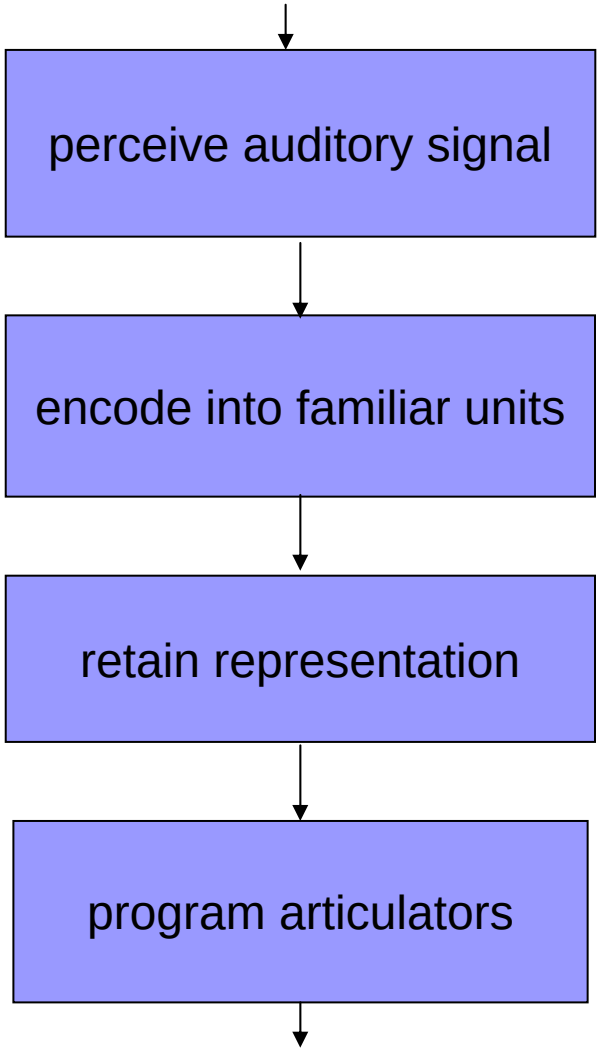
ba-bi-du-be

ba-bi-bu-de

N.B. task minimizes effects of vocabulary knowledge/ serial ordering

Barry, J. G., Hardiman, M. J., & Bishop, D. V. M. (2009). Mismatch response to polysyllabic nonwords: A neurophysiological signature of language learning capacity. PLOS One, 4, e6270.

Predictions re mismatch responses



Reduced MMN for all syllables

Reduced LDN for all syllables

Reduced mismatch for later syllables

No impairment

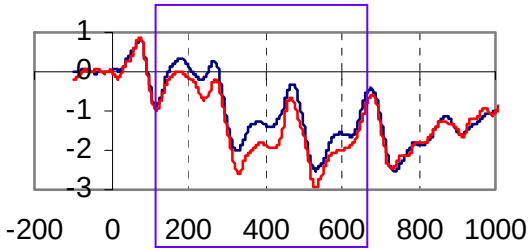
Participants

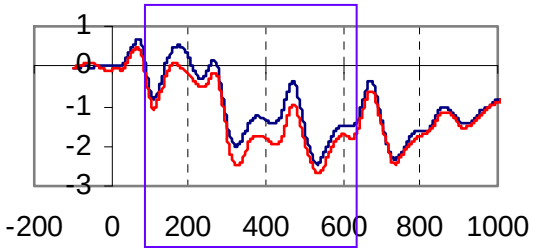
	Good Repeaters N = 44	Poor Repeaters N = 15	p-value
Male:female	7:37	4:11	0.356
Age	43.4 (5.3)	44.2 (6.5)	0.634
Age left ft education	19.6 (2.7)	16.8 (2.1)	0.001
WASI Non-verbal IQ	112.5 (12.6)	112.7 (12.9)	0.951
Digit repetition raw	10.6 (2.1)	9.23 (1.9)	0.035
Word reading scaled	93.9 (12.1)	83.9 (15.0)	0.012
Non-word reading scaled	100.4 (12.7)	86.3 (14.2)	0.001
TROG-2 scaled	101.7 (7.0)	97.5 (9.7)	0.072
Nonword repetition, raw*	41.0 (2.8)	33.3 (3.6)	

** Groups selected on this variable: no overlap in scores*

Poor nonword rep. **Good nonword rep.**

blue lines are grand averages for standards (ba-bi-bu-be) red lines show deviants





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da-bi-bu-be

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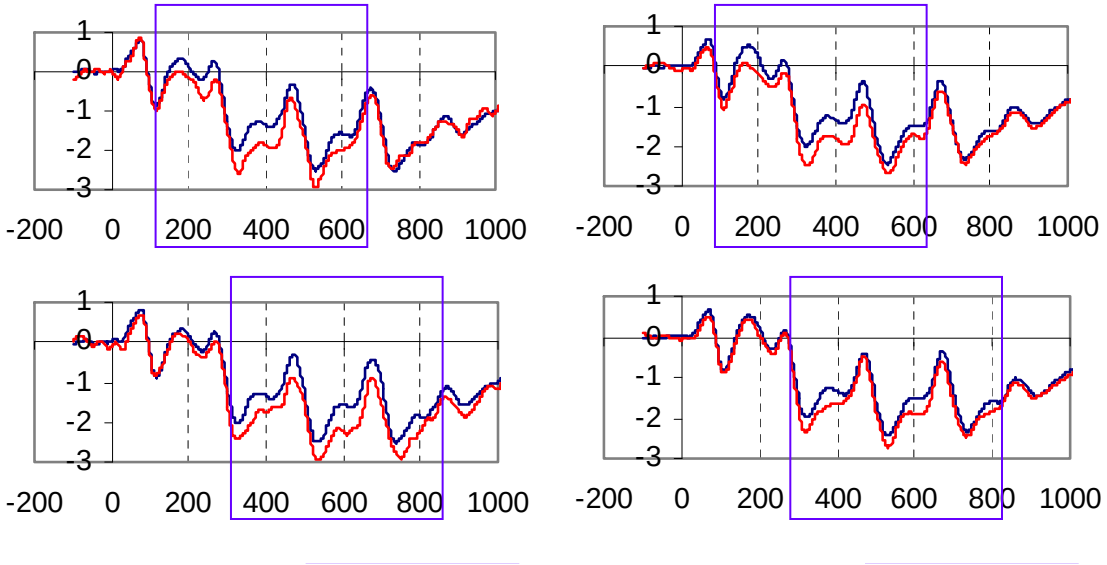

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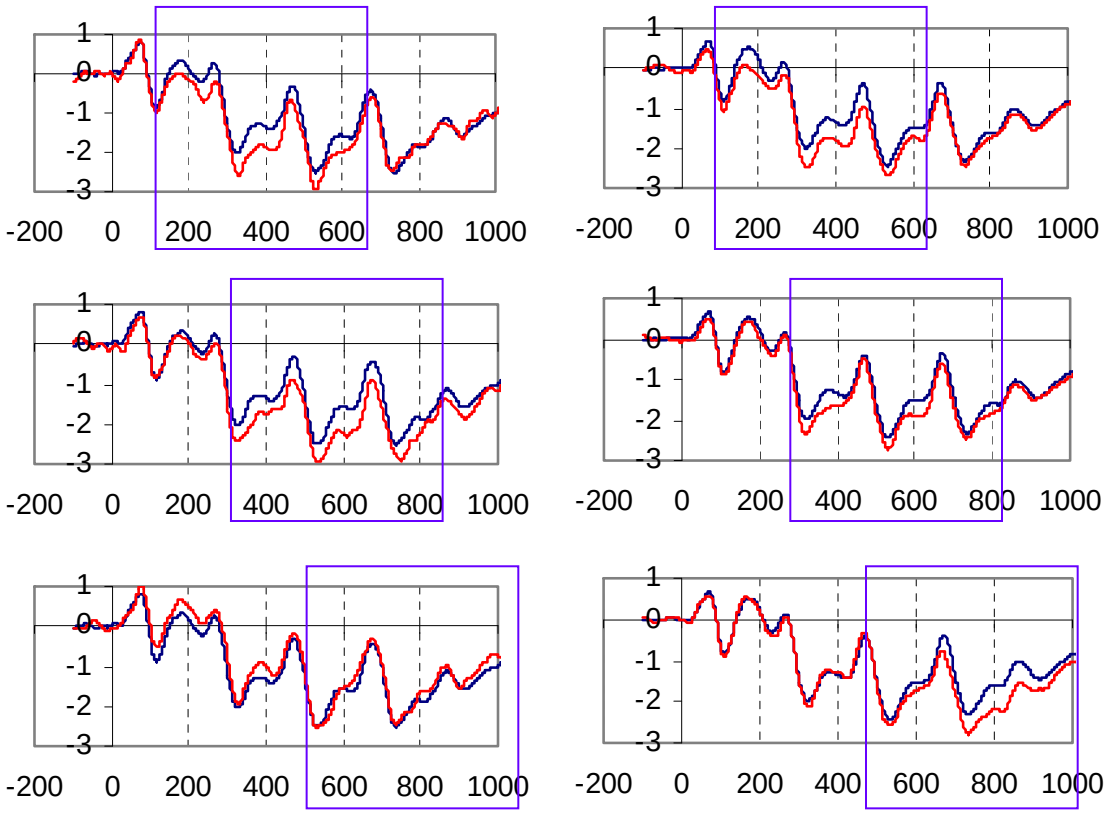

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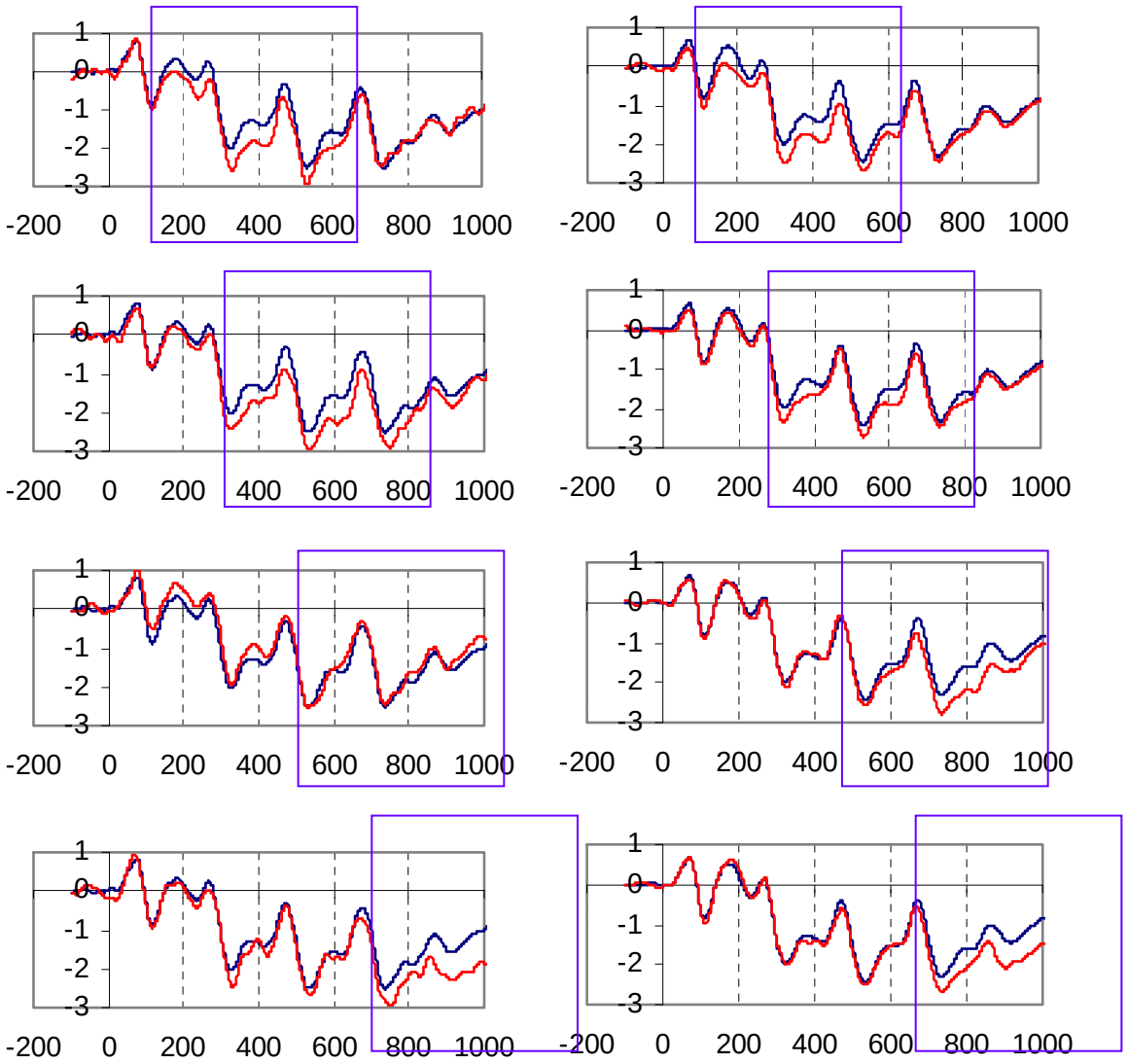

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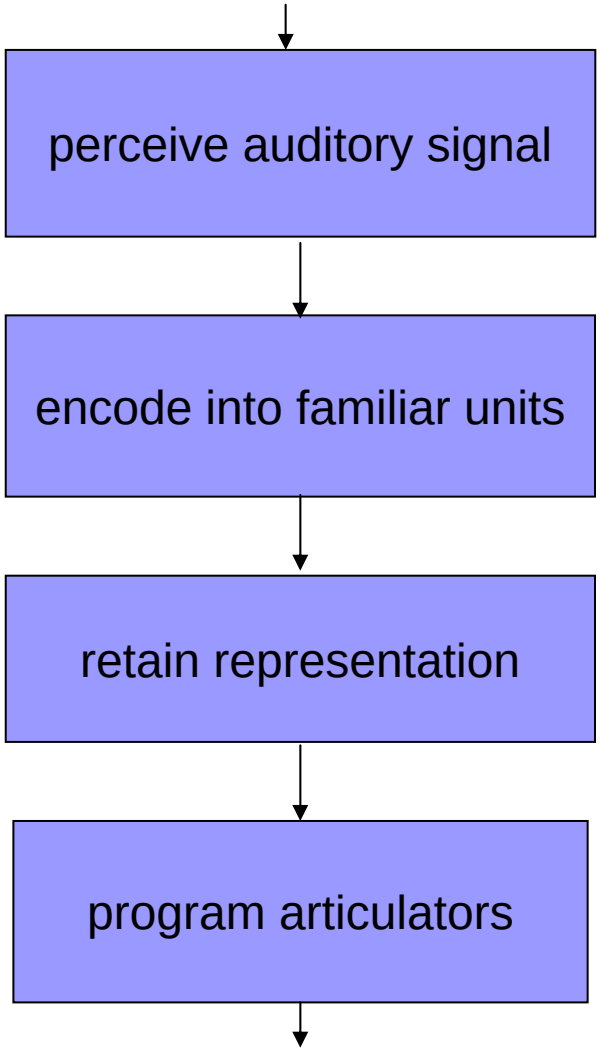

Reduced MMN for all syllables ✗

Reduced LDN for all syllables ✗

Reduced mismatch for later syllables ✗

No impairment ✗

Archibald & Gathercole, 2007

SLI deficit in recall of nonwords is worse than for recall of same phonological sequences as list:

fiemoychee vs. fie ... moy ... chee

Adult ERP study: summary

- Those with poor nonword repetition fail to show LDN at 3rd syllable position
- Suggests cumulative effect from processing of prior signals
- Not seen for 4th syllable: is this because there is time to complete processing without another stimulus occurring?

Adult ERP study: conclusions

- Pattern of results not consistent with limited memory storage or rapid decay of representations

- Rather, the problem appears to be one of encoding phonological information when successive syllables occur at a rapid rate

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