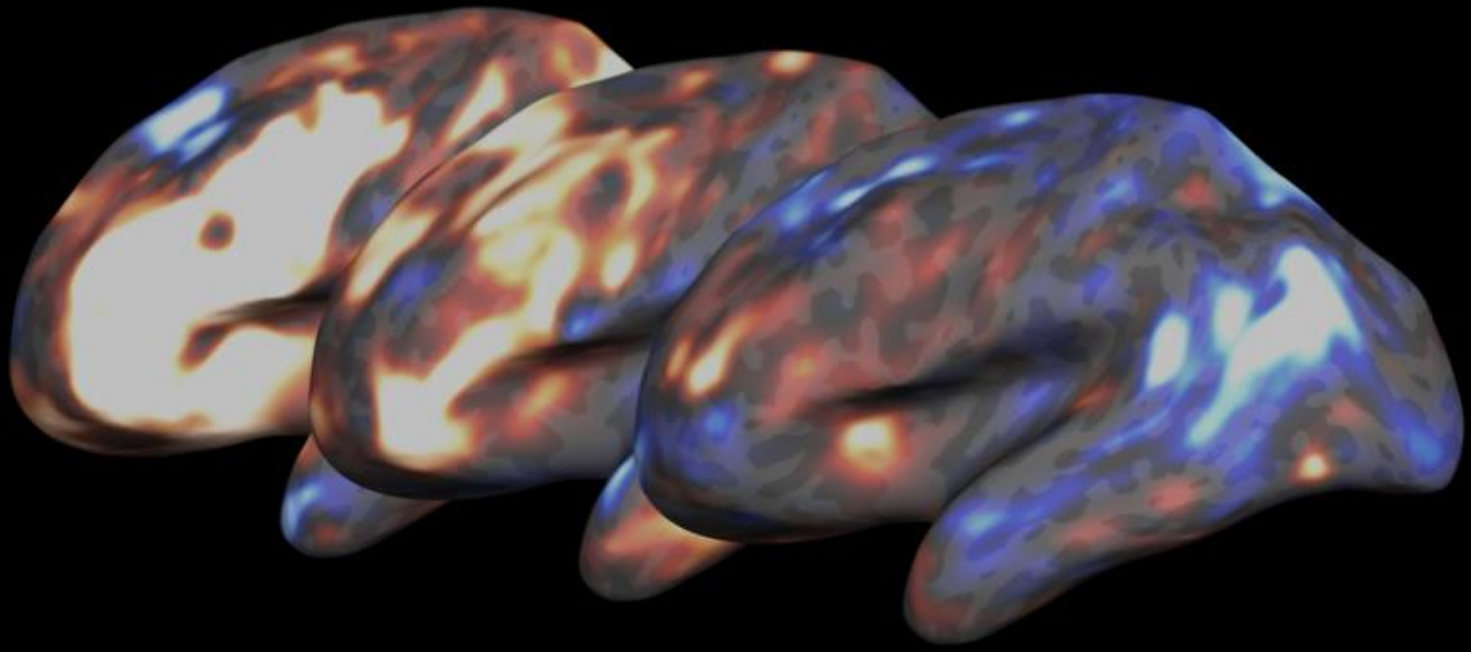
@SALONIKRISHNAN

NEUROBIOLOGICAL BASIS OF **LANGUAGE DISORDERS**: A FOCUS ON **LEARNING**



N-CoDe Lab
Neuroscience of Communication Development

ROYAL HOLLOWAY UNIVERSITY OF LONDON

DEVELOPMENTAL LANGUAGE DISORDERS

THE NEED TO EXAMINE LEARNING IN DLD

THE BOLD STUDY

WHAT'S NEXT AT ROYAL HOLLOWAY

GUESS HOW OLD THE CHILD IS..

One day the boy in his orange shirt was feeding his fish called Larry
And his mum walked in
She took some money out of her purse and said to him
'You can go buy another fish if you want to keep Larry company'
So the boy
Who we're going to call Bob
Walked out of the house with the money and towards the pet shop

Fish in a tank and he's feeding him
His mom is giving him some money
out of her purse
He's going to the shop maybe
He's walking down the street

DLD -DIFFICULTIES TALKING AND LISTENING

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7%

2 in every classroom

Hidden

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7%

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Negative Consequences

DEVELOPMENTAL LANGUAGE DISORDERS

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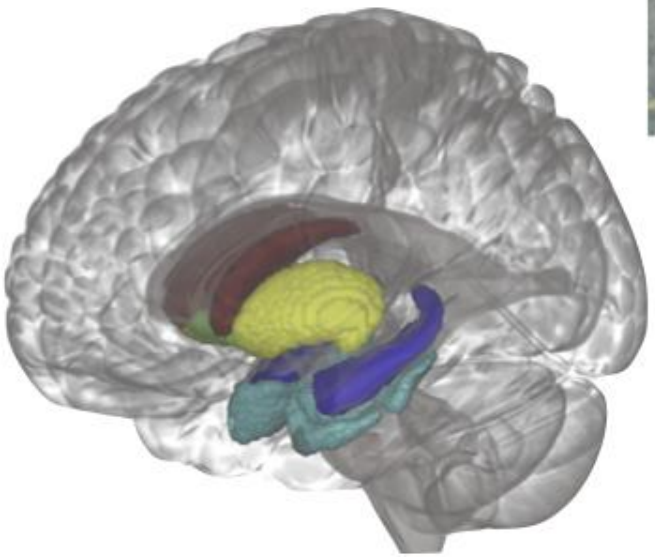
- For the longest time, the debate centred around broader impairments vs. domain-specific deficits, such as syntactic competence or phonology

- Learning view: Language deficits not by-products, but reflect immaturity/impairment of mechanisms to extract structure

- Is learning unitary? No

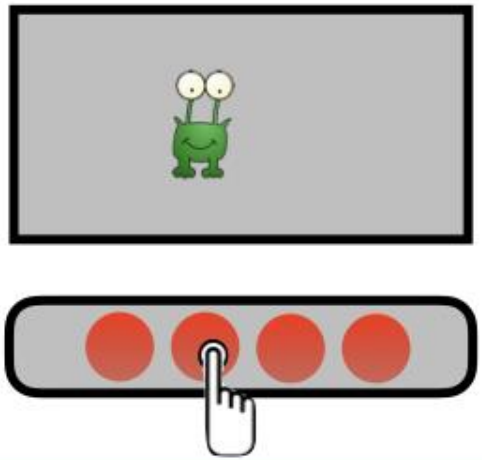
PROCEDURAL VS DECLARATIVE LEARNING



PROCEDURAL LEARNING IN DLD

- Abnormalities of **brain structures underlying the procedural system** in those who have grammatical or lexical retrieval difficulties
- Differences in **linguistic and non-linguistic tasks** that depend on the procedural system
- The declarative system can and will **compensate** for procedural deficits

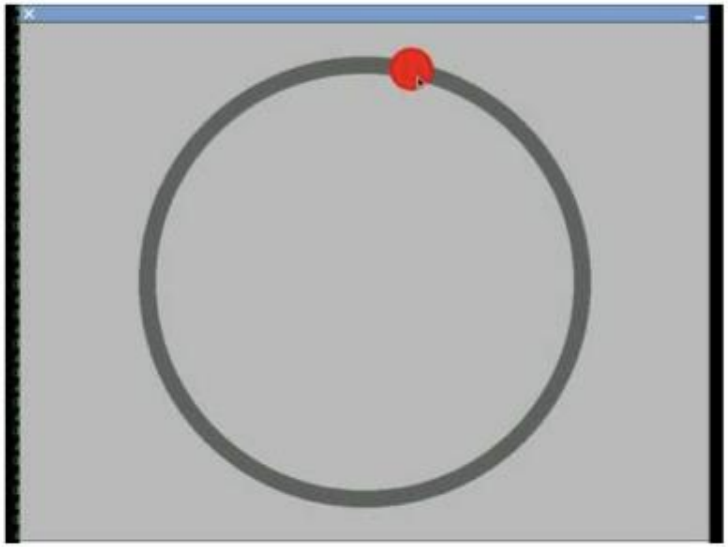
MOTOR SEQUENCE LEARNING



ARTIFICIAL GRAMMAR LEARNING

VOT **WADIM** JIC
VOT **KICEY** JIC
DAK **WADIM** TOOD
DAK **KICEY** TOOD
PEL **WADIM** RUD
PEL **KICEY** RUD

PURSUIT ROTOR



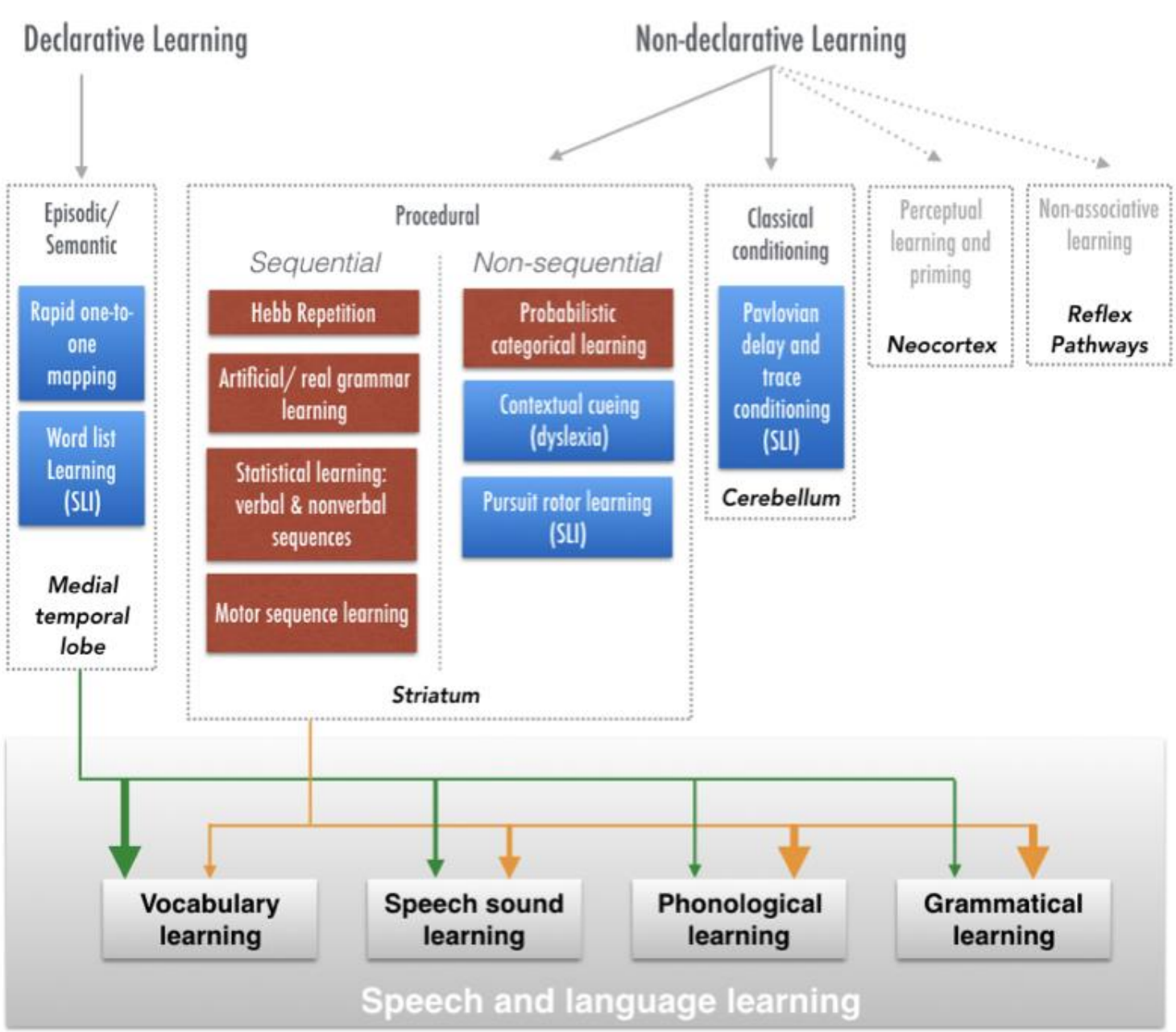
EYE BLINK CONDITIONING

CS Tone + US Puff => UR Eye blink

.
.
.

CS Tone => CR Eye blink

PAIRED ASSOCIATE LEARNING



KRISHNAN, WATKINS, & BISHOP, 2016
TRENDS IN COGNITIVE SCIENCES

DO WE KNOW ANYTHING ABOUT CORTICO-STRIATAL REGIONS IN DLD?

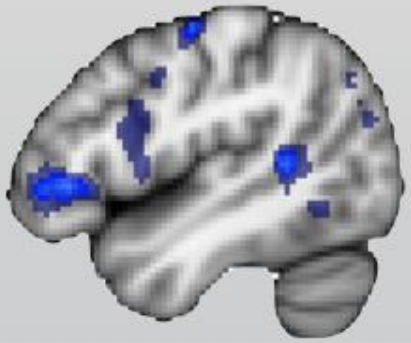
- Reductions in caudate nucleus volume (Jernigan et al., 1991, Herbert et al., 2003, Badcock et al., 2012)
  - Lee et al., 2013: increase
  - Soriano-Mas et al., 2008: age-related change
- Differences in gray matter in L IFG (but again, different directions)

Structure

WATKINS ET AL., 2002

BADCOCK ET AL., 2012

Function



BADCOCK ET AL., 2012

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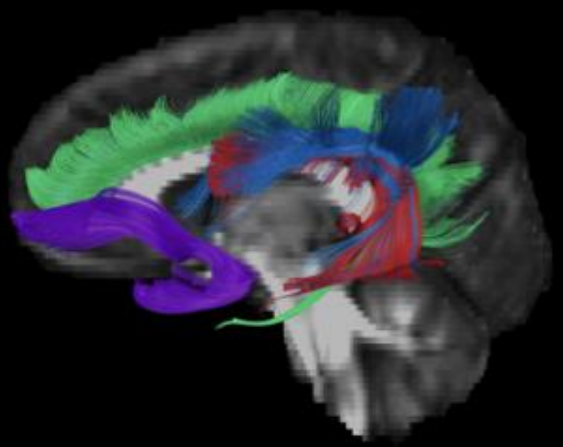
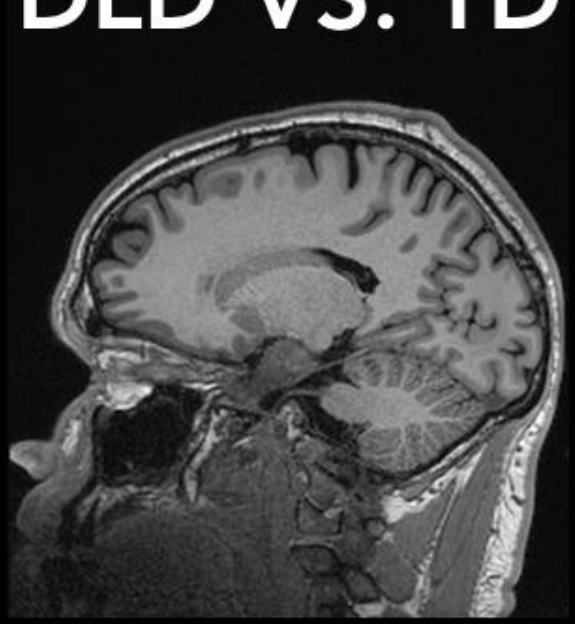
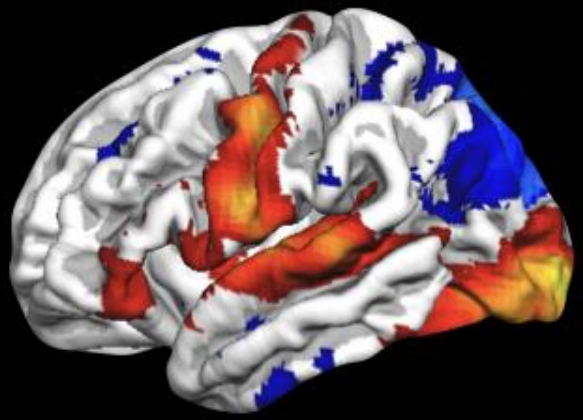
BRAIN ORGANISATION IN LANGUAGE DEVELOPMENT

	Planned	Complete
DLD	80	45 + 11 HSL
TD	80	55

EXPLORE DIFFERENCES IN BRAIN STRUCTURE AND FUNCTION IN DLD VS. TD







EMERGING FINDINGS SUGGEST DIFFERENCES IN LANGUAGE-RELEVANT AND STRIATAL SYSTEMS

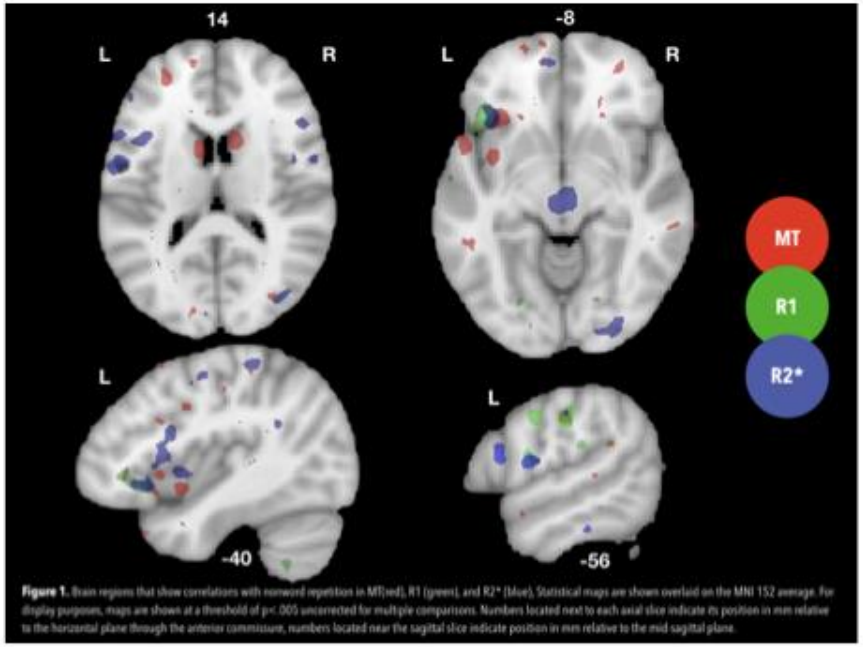
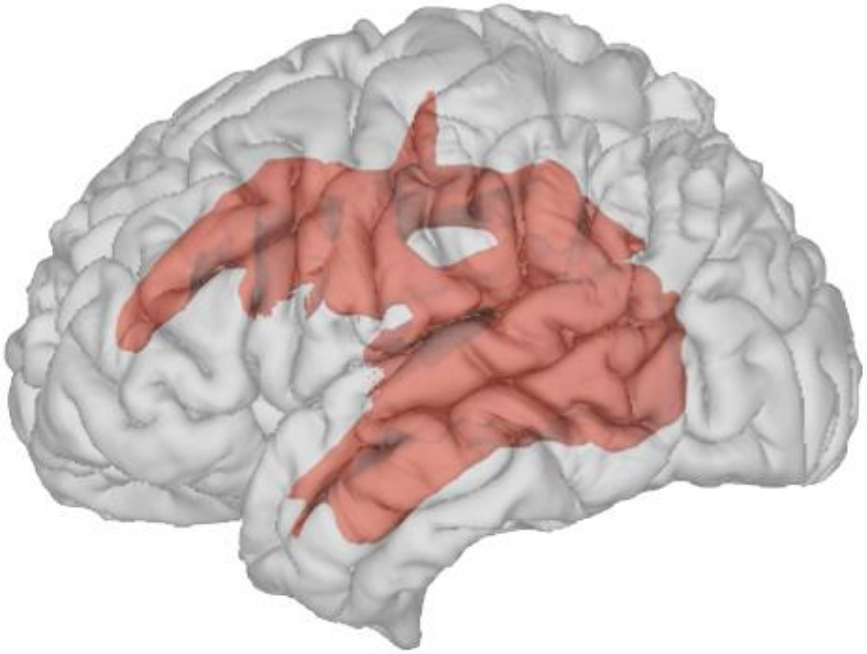
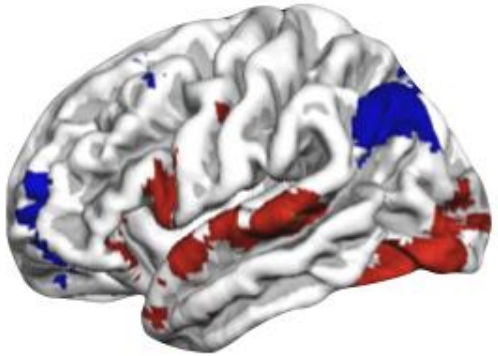
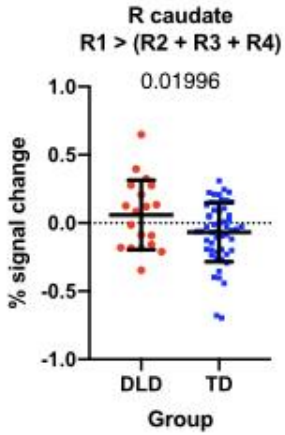
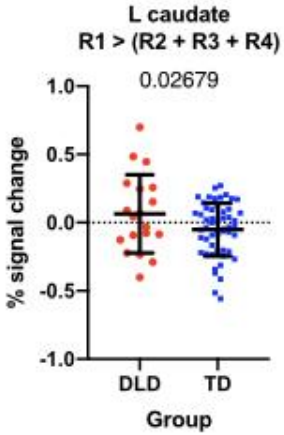


Figure 1. Brain regions that show correlations with nonword repetition in MT(red), R1 (green), and R2* (blue). Statistical maps are shown overlaid on the MNI 152 average. For display purposes, maps are shown at a threshold of p< .005 uncorrected for multiple comparisons. Numbers located next to each axial slice indicate its position in mm relative to the horizontal plane through the anterior commissure, numbers located near the sagittal slice indicate position in mm relative to the mid sagittal plane.



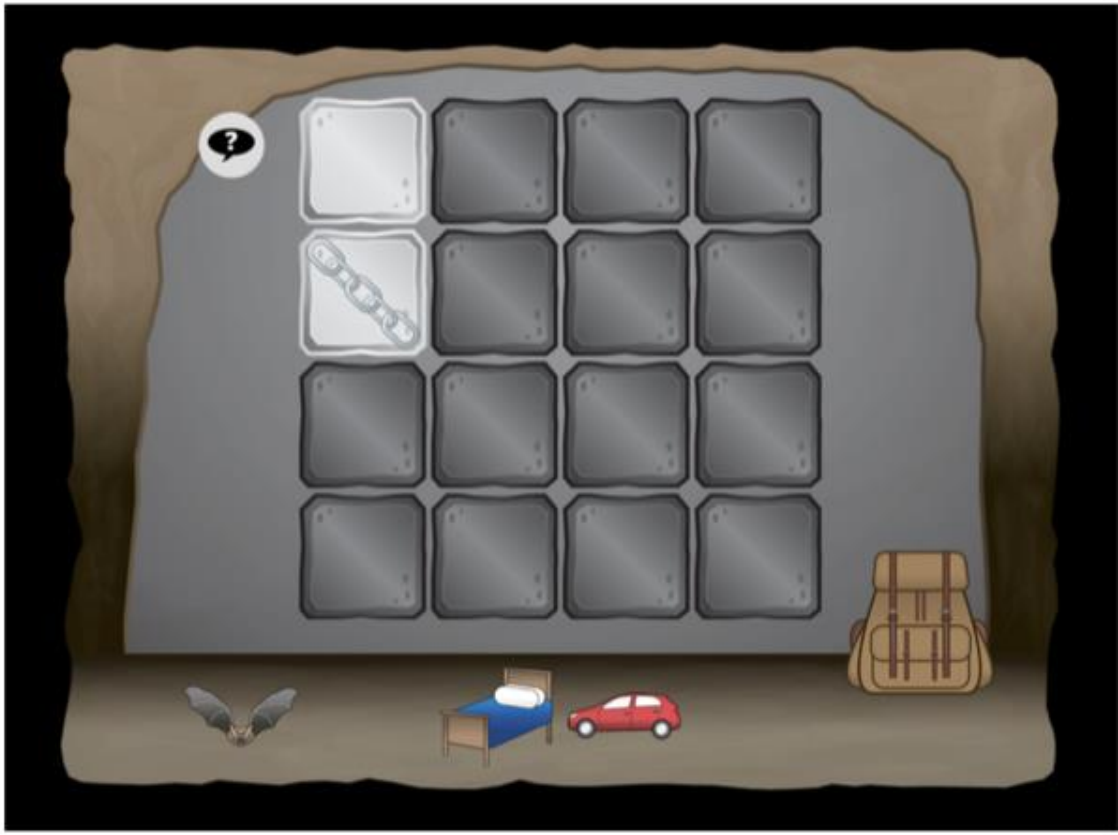






LEARNING TASKS

Vocabulary



Syntax

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£20


£20

Do children engage reward-regions of the brain when learning new language?

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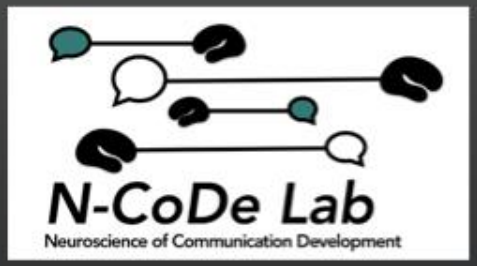
Does this differ in dyslexia & DLD?

Do children engage reward-regions of the brain when learning new language?

Does this differ in dyslexia & DLD?

What optimises reward responses?



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