STUDYING INDUCTIVE INFERENCE TO UNDERSTAND WORD LEARNING IN CHILDREN WITH DLD

WHAT IS PRESERVED AND WHAT IS NOT?

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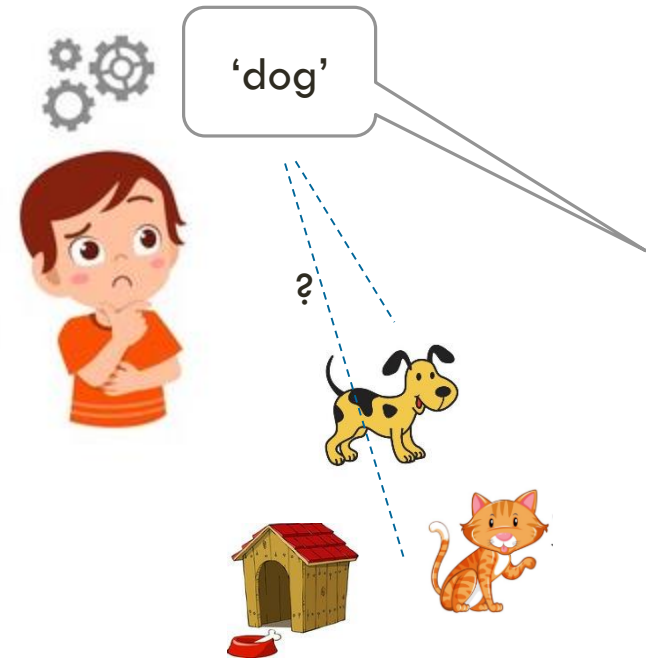
VOCABULARY IN DLD: CHARACTERISTICS

- Children with DLD have lexical deficits in quantity and quality
- They have word-learning difficulties:
  - Difficulty in learning word forms
  - Difficulty in learning form-meaning associations



- As well as deficits in cognitive processes involved in word learning
  - Processing resources
  - Statistical learning

  - but the underlying reasons of their word learning deficits remain misunderstood

Alt & Plante, 2016; Haebig et al., 2017; Kan & Windsor, 2010; McGregor et al., 2013

LEARNING NEW WORDS

- Learning form-meaning associations recruits processes such as attentional and processing resources as well as statistical learning mechanisms

  - Attentional resources in situational learning, i.e. when encountering a form-meaning association
  - Statistical learning mechanisms are recruited thorough the entire process of leaning de form-meaning association, i.e. across situations

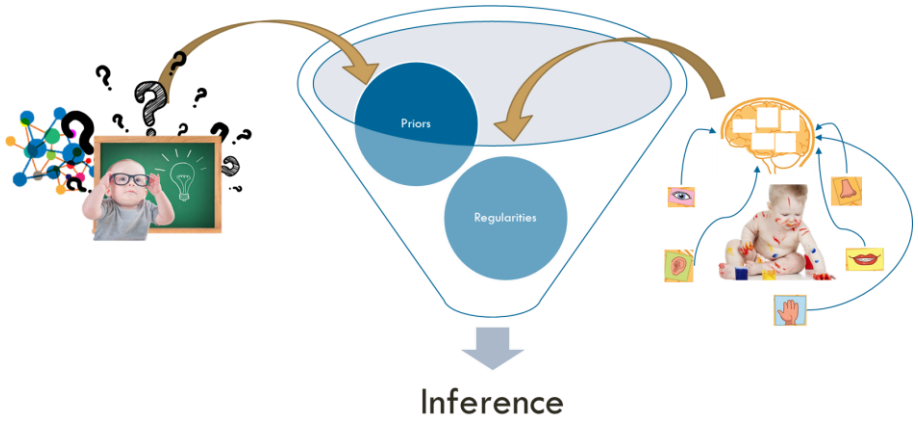
- Prior knowledge can drive attentional resources when learning words

Aslin, 2017; McMurray et al., 2012

A FUNCTIONAL EXPLANATION

- Bayesian theories of cognition explain this phenomenon in functional terms
  - Prior knowledge is fully integrated to these theories
    - Previously acquired categories, knowledge about how the world rules, knowledge about language
  - It suggests the use of statistical learning mechanisms to detect regularities in- and across-situations
  - Prior knowledge is updated following what has been detected in the learning situation = inference

  - Inference might be driven by categories (category-based inference), particularly after the age of 7-8



Perfors et al., 2011; Sloutsky et al., 2015; Xu & Tenenbaum, 2007

WHAT ABOUT INDUCTIVE INFERENCE IN DLD?

Are children with DLD able to draw inductive inference as well as their typically developing peers when learning words ?

- Influence of prior knowledge?

Prior knowledge	→	Relatively Preserved
~~Prior knowledge~~	→	~~Preserved~~

- Are they able to learn categorisation rules based on more than one feature, either perceptual or relational?

DLD < TD children
Impact of complexity

- Study 1: Word extension
- Study 2: Learning and generalising categorisation rules

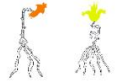
PARTICIPANTS

- Participants
  - Children with severe DLD & TD children
  - Paired on non verbal IQ and chronological age

	DLD		**TD children**	
	Study 1	Study 2	Study 1	Study 2
n	13	26	15	20
age	6;11 to 9;2	7;0 to 12;11	7;4 to 9;2	7;5 to 12;4
NVIQ	96,77 (11,96)	93,30 (10,11)	96,6 (11,27)	98,63 (8,59)
Language Profile	Severe DLD in schools for children with special needs		OK	

STUDY 1 – WORD EXTENSION

- Word extension task (inspired from Xu & Tenenbaum, 2007)
  - 2 conditions: familiar and unfamiliar, counterbalanced order
  - 3 semantic categories per condition, distributed across 3 levels of taxonomy (subordinate, basic, and superordinate)

Semantic category 2			
Superordinate	Vegetables		Pseudo-plants 
Basic	Peppers		Pseudo-plants • long roots 
Subordinate	Green peppers		Pseudo-plants • long roots • blue petals 

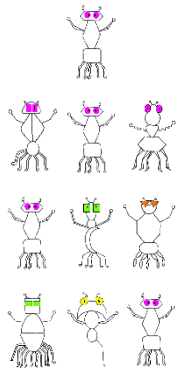
- 4 types of items

One exemplar 

3 subordinate ex. 

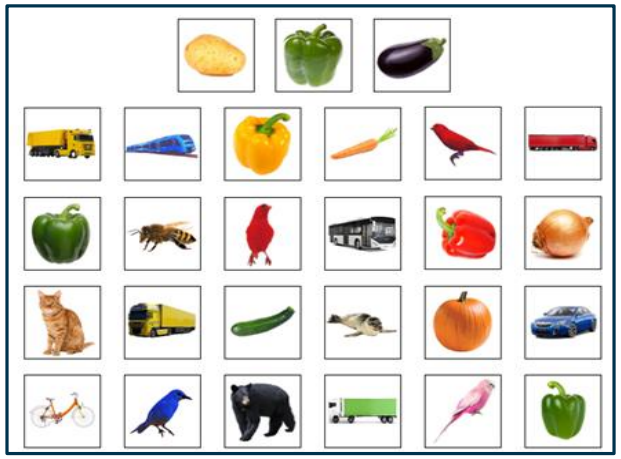
3 basic ex. 

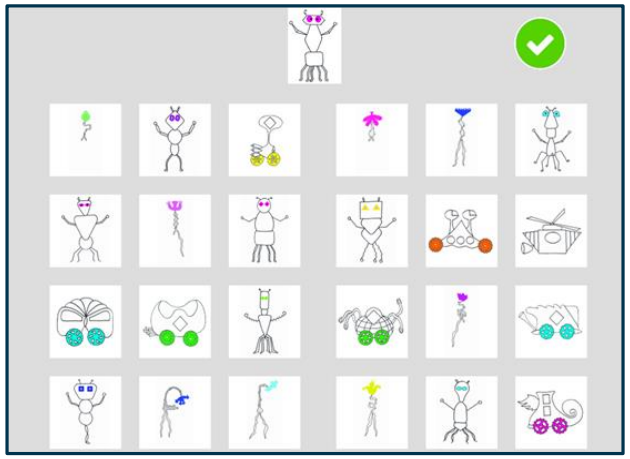
3 superordinate ex. 



STUDY 1 – WORD EXTENSION

- Word extension task





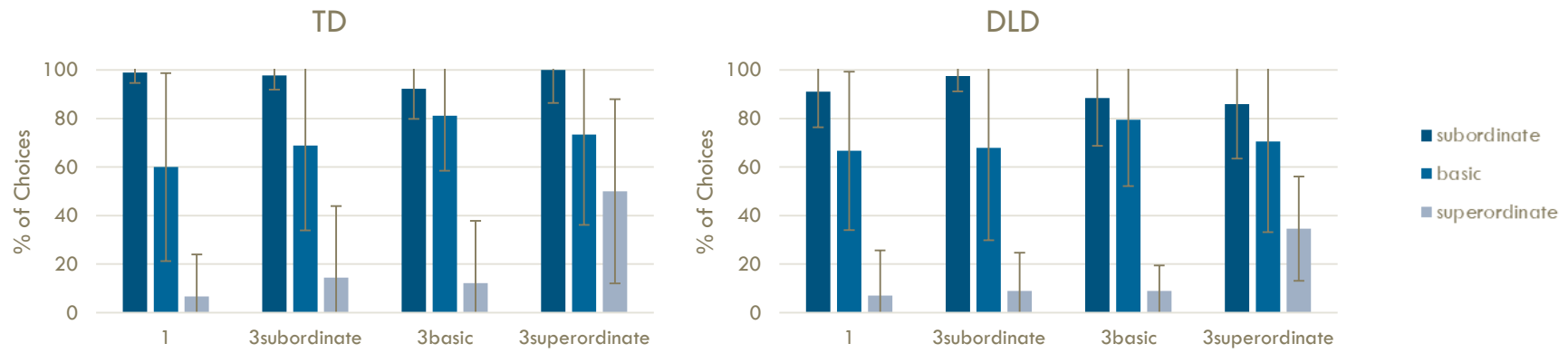
Look, this is ***mopi***. Can you find other ***mopi*** at the bottom ?

STUDY 1 – WORD EXTENSION

- Familiar condition

PRESERVED

➔ When prior knowledge is available, both groups show similar word extension patterns

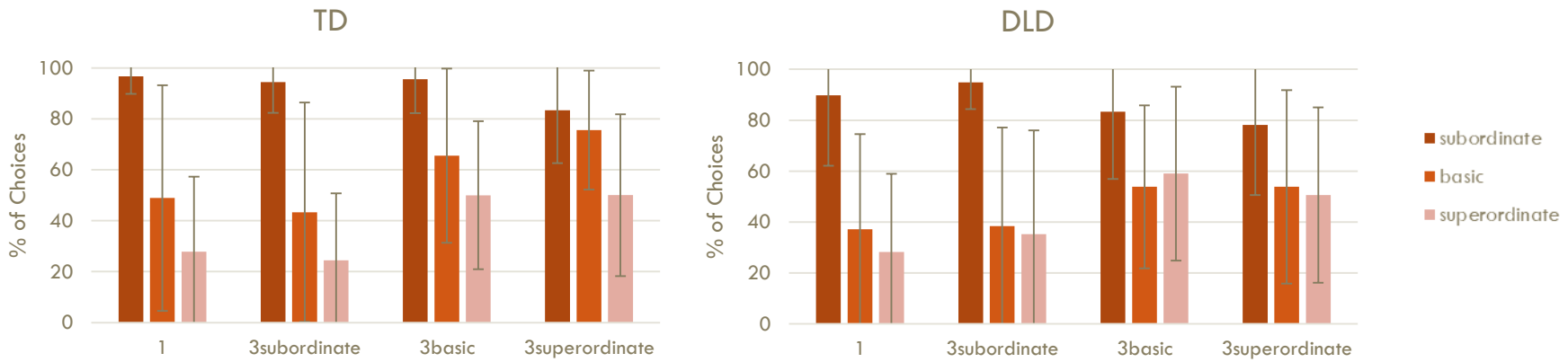


STUDY 1 – WORD EXTENSION

- Unfamiliar condition

~~PRESERVED~~

➔ When prior knowledge is not (or less) available, children with DLD do not seem to organise their knowledge in (sub)categories in a similar way than their peers



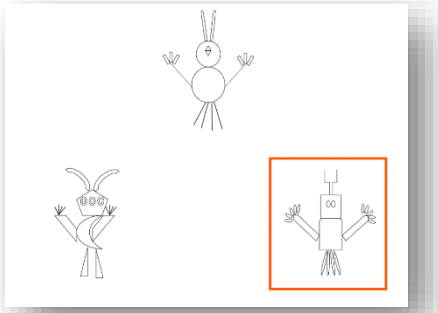
STUDY 2 – LEARNING CATEGORISATION RULES

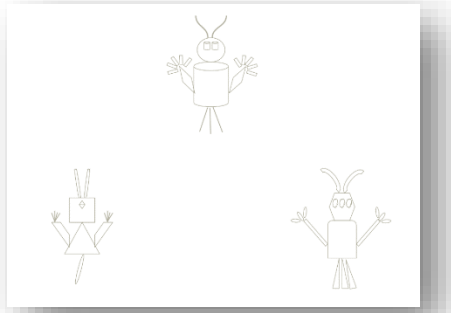
- 2 conditions: perceptually and relationally defined features
  - Number of legs, shape of the eyes
  - Spatial disposition of small and big shapes, relation of symetry
- 4 steps in each condition
  - Check for generalisation
  - Learning of the features is cumulative: the feature 2 is introduced after learning and generalising feature 1

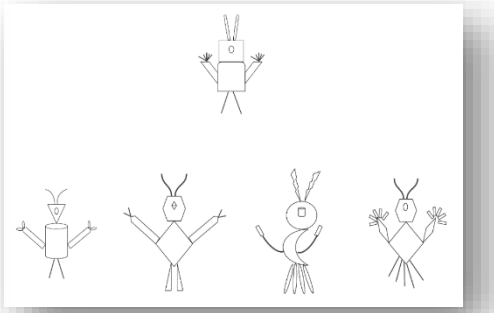
STUDY 2 – LEARNING CATEGORISATION RULES

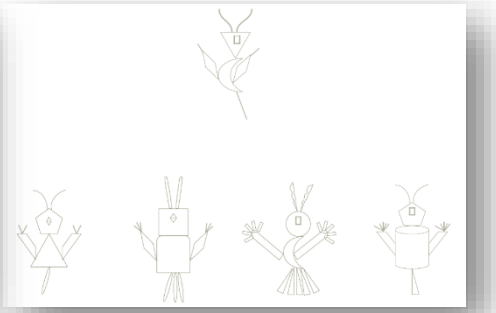
Perceptual

Learning 1 feature → Generalisation 1 feature → Learning 2 features → Generalisation 2 features

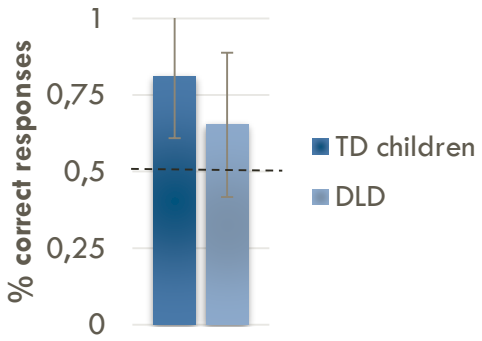




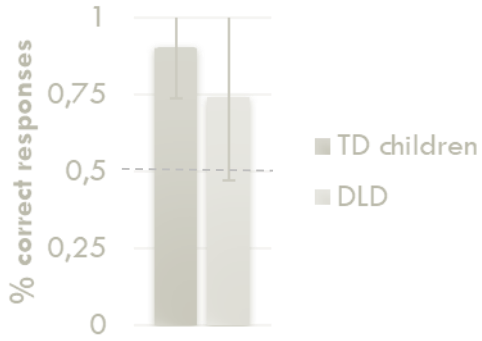




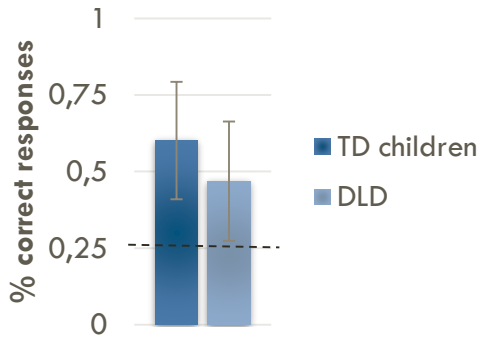
Learning 1



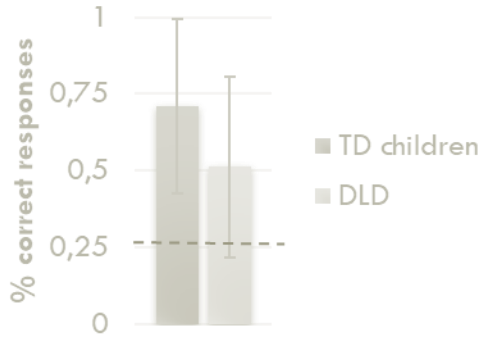
Generalising 1



Learning 2



Generalising 2

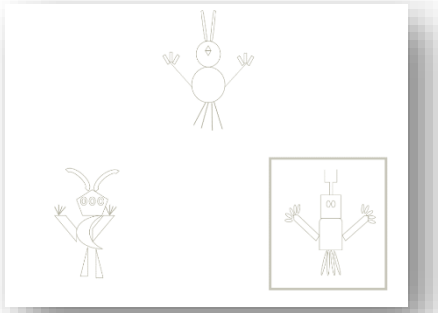


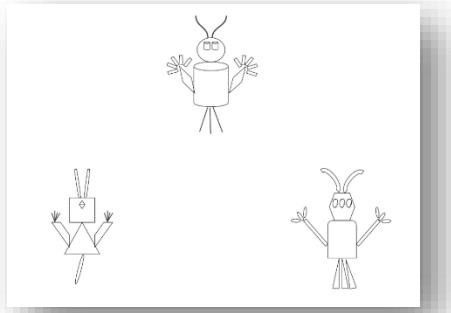
All children are able to learn (>chance level), but children with DLD learned less than TD children

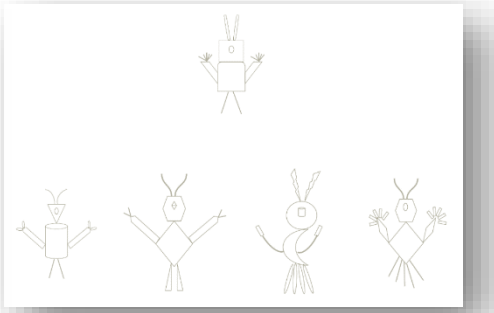
STUDY 2 – LEARNING CATEGORISATION RULES

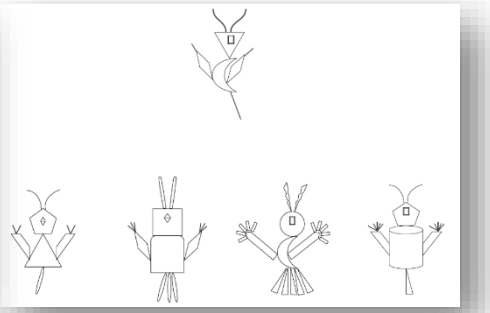
Perceptual

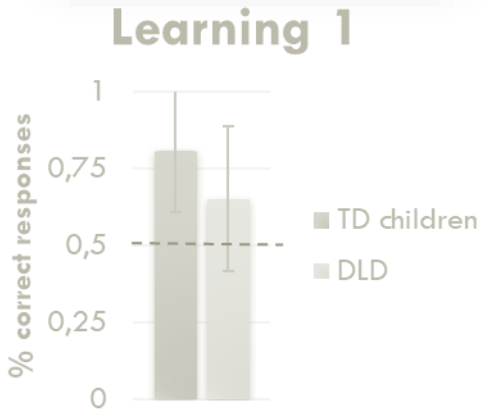
Learning 1 feature → Generalisation 1 feature → Learning 2 features → Generalisation 2 features

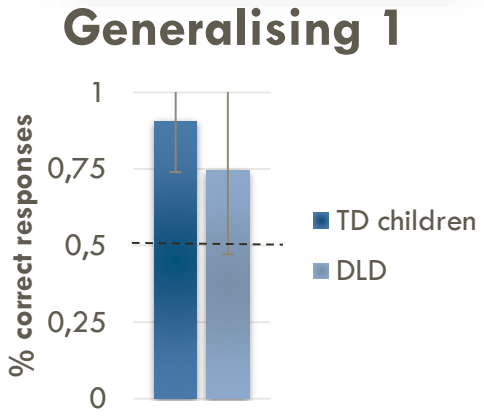


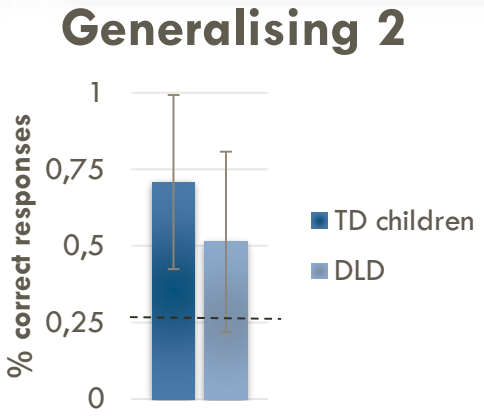










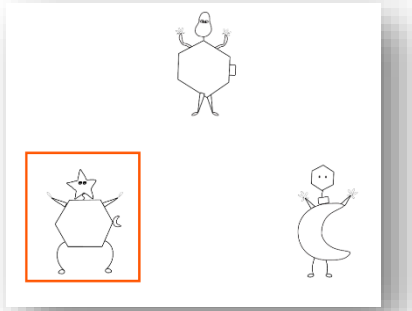


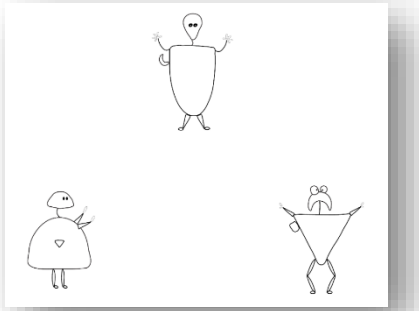
Scores increased between learning and generalisation, especially when dealing with 1 feature ➔ effect of variability

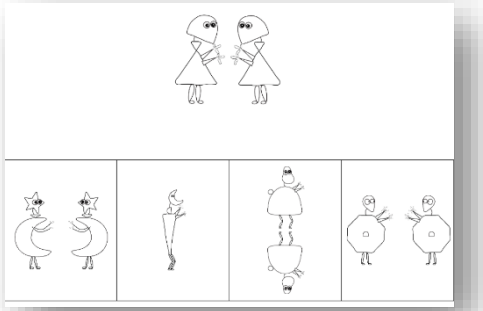
STUDY 2 – LEARNING CATEGORISATION RULES

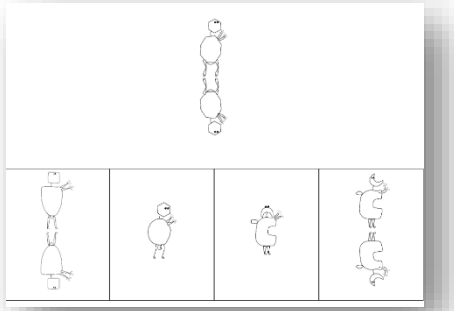
Relational

Learning 1 feature → Generalisation 1 feature → Learning 2 features → Generalisation 2 features

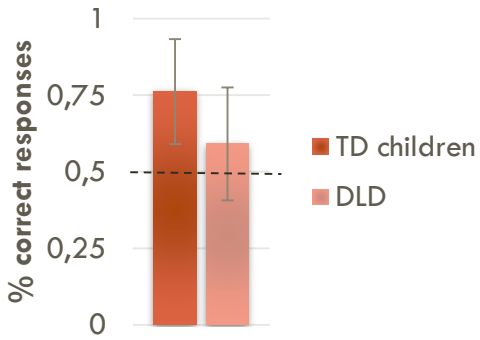




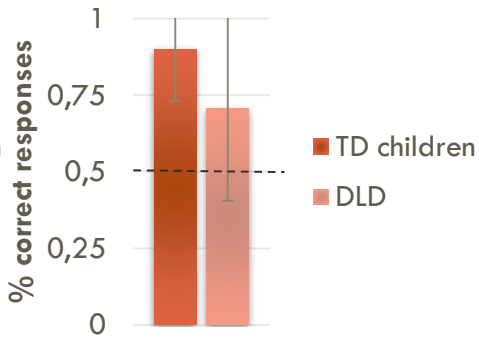




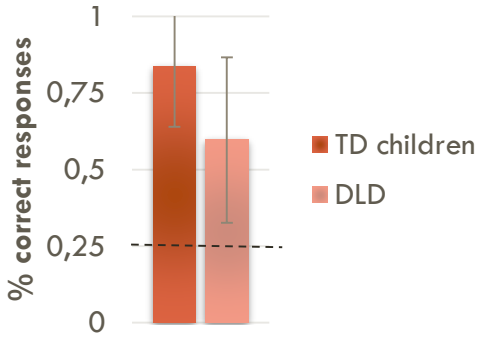
Learning 1



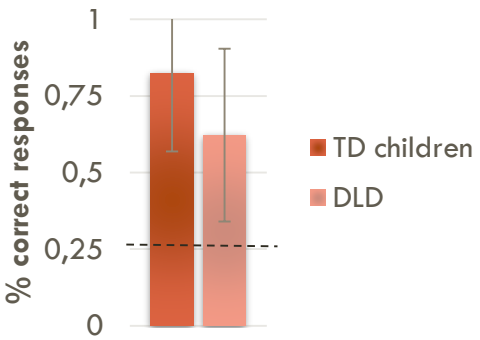
Generalising 1



Learning 2

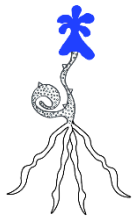


Generalising 2



Conclusions are similar, but learning rates are slightly lower for relational features

TAKE-HOME MESSAGE

Preserved	Not preserved
✓ Prior knowledge → word extension abilities OK 	x ~~Prior knowledge~~ → less able to extend new words and organise it into (sub)categories 
✓ Can learn and generalise categorisation rules	x cannot reach the learning rates of their TD peers when complexity ↑
✓ Performances ↑ when variability ↑	