

Consolidation and retention of sound place associations and incidental auditory category learning among typical and dyslexic readers.

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INTRODUCTION

- Developmental dyslexia (DD) has been suggested to arise from phonological deficits (**Snowling, 2000**). However broader conceptualizations of dyslexia indicate a procedural learning impairment (**Nicolson & Fawcett, 2011; Ullman, 2004**).
- It has been argued that a procedural learning deficit could influence the resolution of phonological categories through an impaired perceptual learning process (**Gabay & Holt, 2015**). DD readers were impaired in online incidental learning of non-linguistic auditory categories and in categorization of novel exemplars, in the context of a videogame.
- A recent study showed that not only learning (online, within-session) but also between-session consolidation and retention processes can be triggered in a simplified task in which auditory categories are incidentally acquired (**Gabay, Karni & Holt, 2018**).
- The purpose of the present study was therefore to assess different phases of incidental auditory category learning among individuals with DD and neurotypicals, using a simplified task.

RESEARCH QUESTION

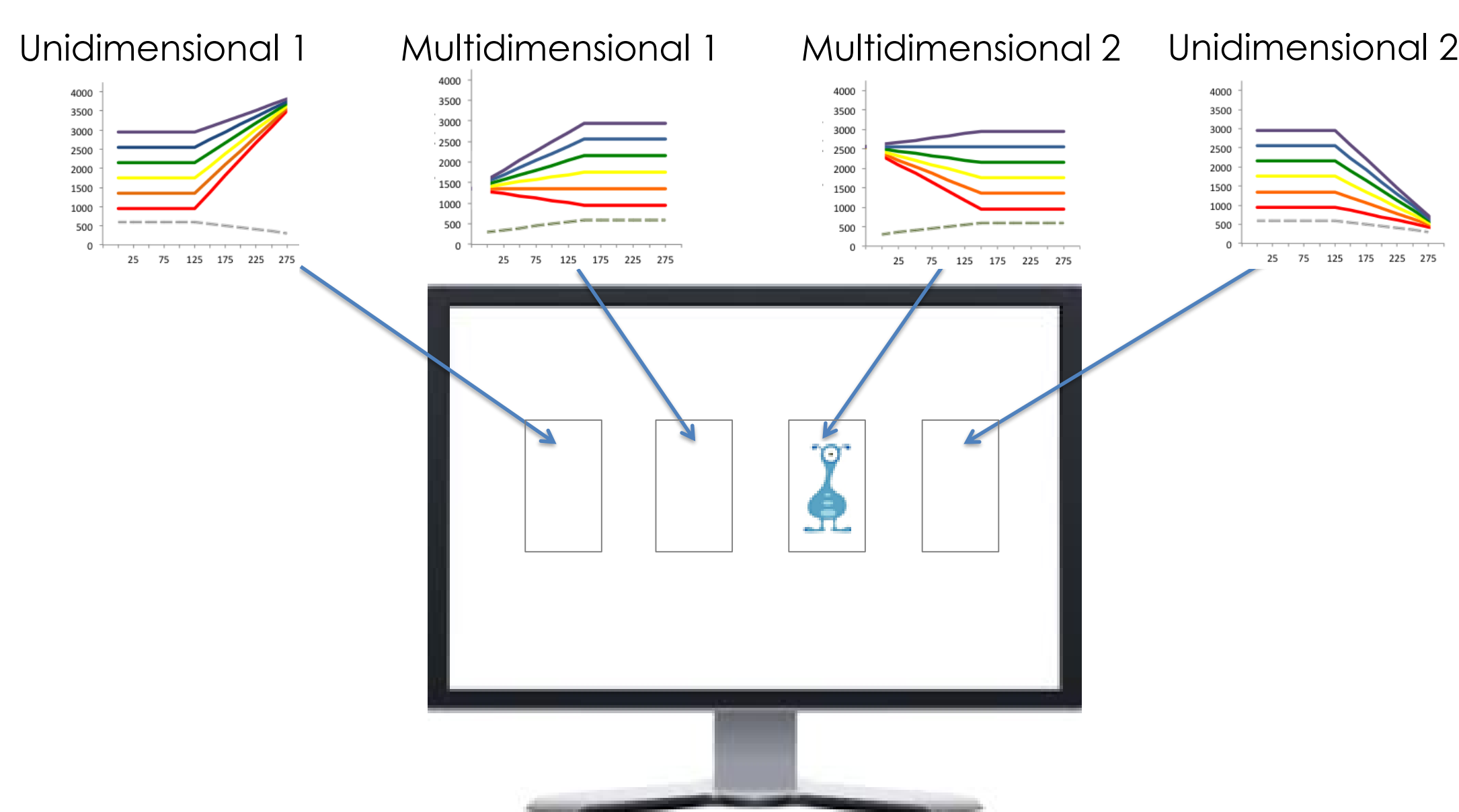
How consolidation and retention processes are affected in developmental dyslexia in a situation affording incidental auditory category learning?

METHOD

Participants. Two groups of adults; individuals with developmental dyslexia, N=21 (M=26.9) and typical readers, N=24 (M=24.8). All were native Hebrew speakers.

Task. The **Systematic Multimodal Associations Reaction Time (SMART) task** (Gabay et al. 2015). sound stimuli preceding the visual cue.

Category sounds. (1) **Two unidimensional categories** (category membership can be determined by a single acoustic property) (2) **two multidimensional categories** (there is no single acoustic property which can determine category membership).



Procedure

Day 1- Acquisition

1	2	3	4	5	6	7	8
train	train	train	train	train	train	random	train

Day 2- Consolidation

9	10	11
train	random	train

Day 7- Retention

12	13	14	Overt generalization task
train	random	train	

Learning measures:

Implicit learning measures -

- Online performance:** RT comparison between blocks 1-6-**RT facilitation**.
- RT cost across sessions:** RT comparison between **fixed** block (last before the random block) to **random** block on each day.
 - If category learning occurs:
 - Decrease in RT across training blocks 1-6
 - RT random block > RT fixed block
 - RT B8 > RT B9
 - RT B11 > RT B12
- offline gains:** RT comparison between the last fixed block in Day 1 (B8) to the first fixed block in Day 2 (B9).
- Retention:** RT comparison between the last fixed block in Day 2 (B11) to the first fixed block in Day 7 (B12).

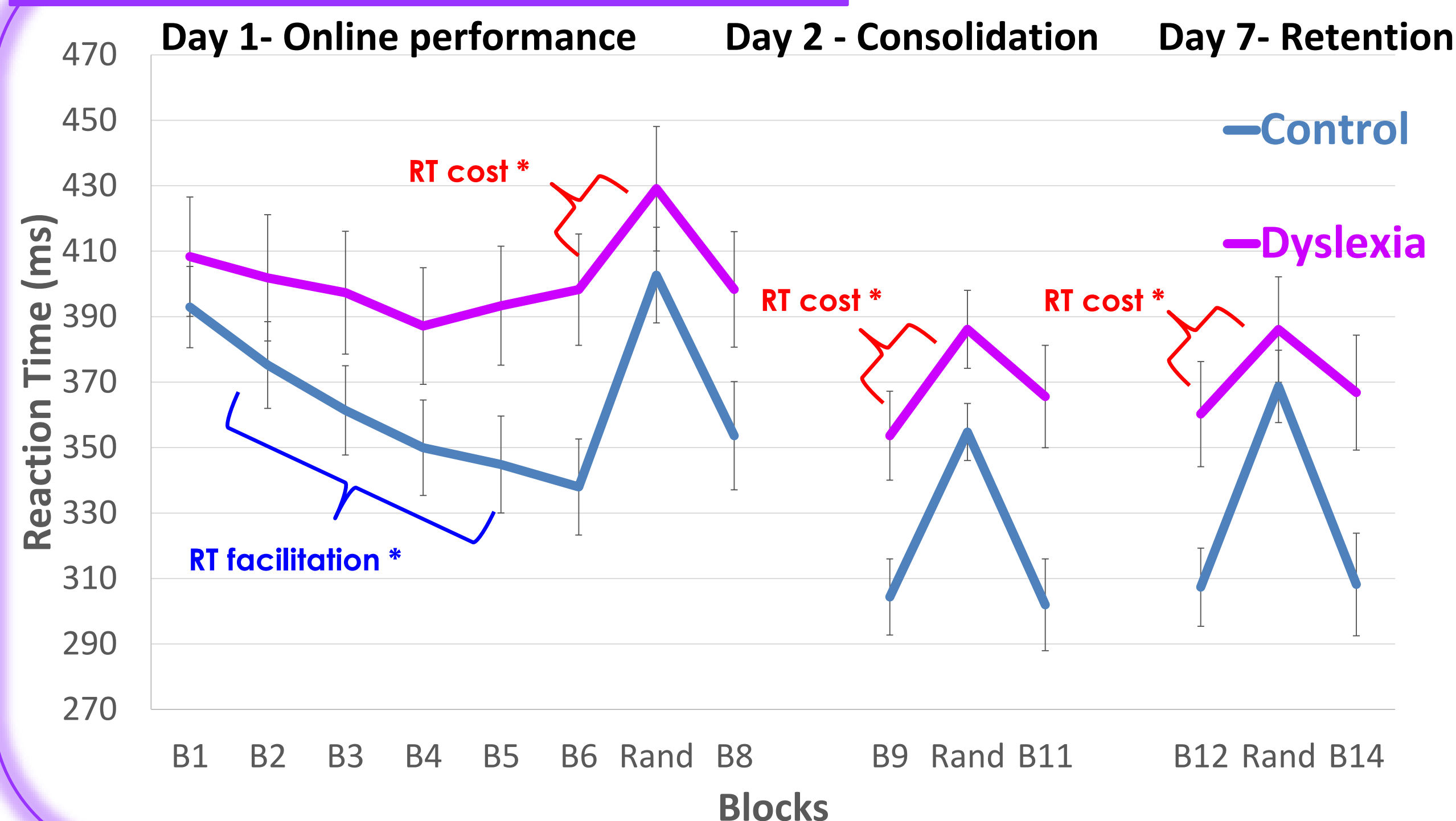
Explicit measure- Overt generalization task accuracy of novel category exemplars

if category learning occurs:

Overt generalization accuracy >0.25 (above chance level)

RESULTS

Implicit measures

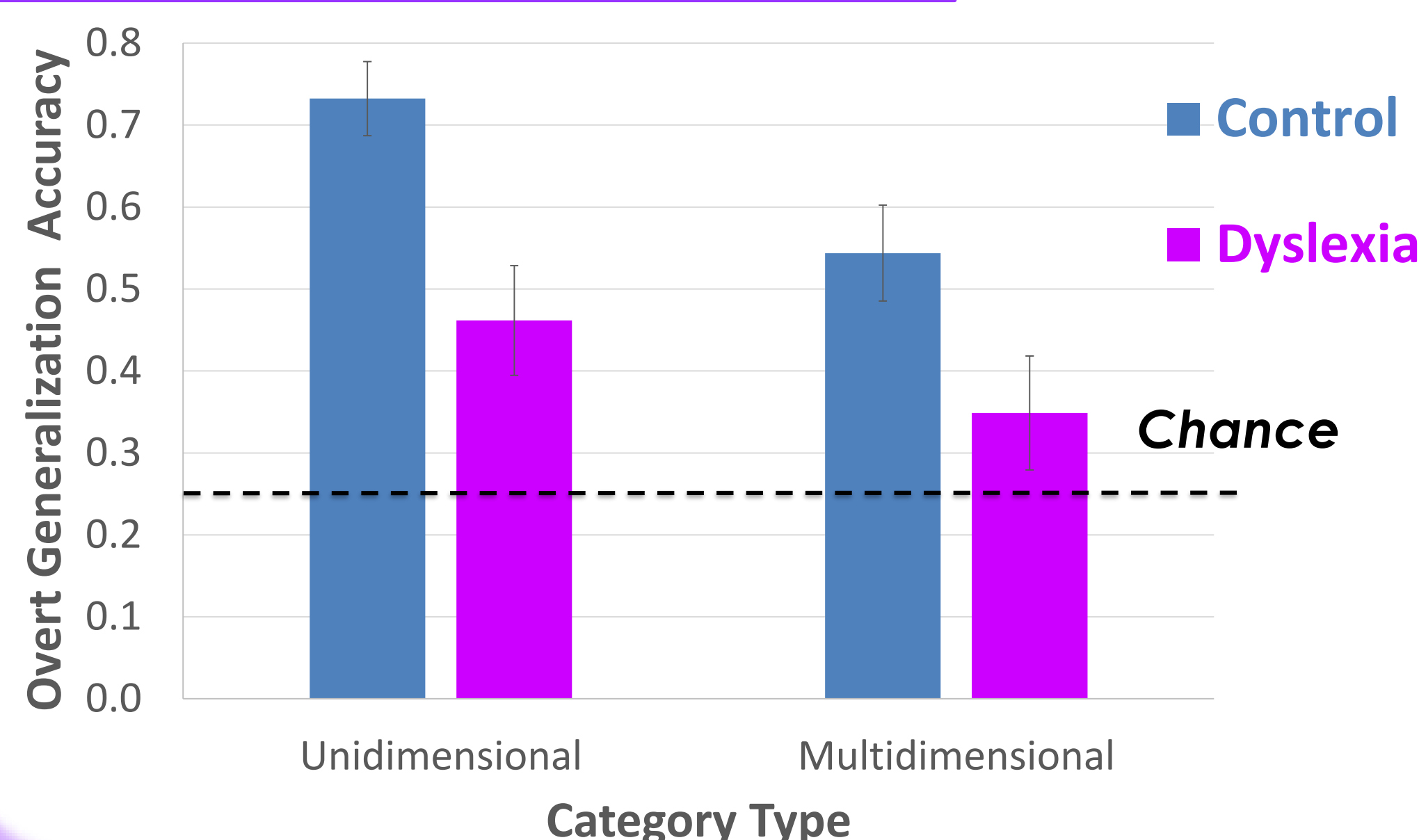


Online performance: A significant **RT facilitation** by group interaction. $F(5,215)=2.582, p<.05$

RT cost across sessions: A Significant **RT cost** by group interaction. $F(1,43)= 5.298, p<.05$

Offline gains and retention: both groups **improve & retain** . no significant **RT improvement** by group interaction $F<1$.

Explicit measures



Both groups - categorization above chance indicative of generalization(all p 's<.05).

A Significant main effect for group $F>1$.

The dyslexia group was significantly poorer compared to controls across all category types $F>1$.

CONCLUSIONS

- Individuals with **DD** showed **reduced sensitivity to visual-motor to sound associations** across acquisition, and were **less capable of generalizing their learning to novel exemplars** compared to neurotypicals.
- But, the learned associations were **robustly consolidated and retained**.
- Thus, **DD** – less sensitivity to incidental multi-modal associations, but what is learned is well retained (**learning less efficient but no memory deficit, per session**).
- This could decrease the resolution of phonological representations and in turn reading performance.

Bibliography

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