Neural correlates of learning novel word forms in children with Developmental Language Disorder

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INTRODUCTION
We have argued that children with DLD have particular trouble with tasks involving implicit learning of sequence structure. We hypothesised that dysfunction in frontostriatal areas underlies these difficulties. In adults: learning to articulate novel word forms is associated with decreasing activity in left inferior frontal gyrus and the striatum. Here, we explore the neural basis for learning new word forms in typically developing children and children with DLD.

WHAT IS DLD?
Developmental Language Disorder is characterised by unexplained difficulties in learning one’s native language. It was previously known as SLI (Specific Language Impairment). DLD is seen in ~7% of children. It is common but hidden.

Our criteria for DLD was:

i. a history of speech and language difficulties
ii. A score of -1SD on two or more language measures (receptive and expressive tests of grammar, vocabulary, and narrative)
iii. Nonverbal IQ > 70

METHODS
Native English speaking 10-15 year olds.

After quality control for motion: DLD: 42 (11F), Typically developing (TD): 58 (33F)

Scan: Prisma 3T; ABCD sequence, 60 axial slices, 2.4mm3 voxels, TR=0.8s, TE=30ms, 600 volumes

In the scanner participants repeated 32 pseudowords; 16 were produced 4 times (R1-4) and 16 were produced only once (NR). Words were presented with a visual referent.

Retention of verbal-visual associations & repetition were assessed after the scan.

RESULTS & DISCUSSION
Analyses on post-scan behavioural data show children with DLD repeat nonwords less accurately than their TD peers. When tested on the recognition of associations between form and referent, TD children benefitted more from repetition of a pseudoword than those with DLD.

In typically developing children, learning novel word forms was associated with decreasing activity in L IFG and STG. The cortical pattern resembled learning-related changes for novel word forms observed in adults. In contrast, no learning-related changes were seen in the dorsal striatum.

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Experimental design