Using verbal fluency tasks to investigate the lexicon in Greek–speaking children with literacy and language disorders

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Introduction

- In verbal fluency tasks, children produce as many words belonging to a given **semantic category** (e.g. animals), or as many words beginning with a given **phonological category** (e.g. the letter "F") usually within one minute;
- Words are often produced in **clusters of semantically–related words** in the case of the semantic condition (e.g. "cat–dog" is a cluster of 'pets') and **phonologically–related words** in the case of the phonological condition (e.g. "*fl*ag–*fl*ower"). Once a semantic or phonological subcategory is exhausted, people **switch to another subcategory** (e.g. from 'pets' to 'fish', or from "*fl*ag–*fl*ower" to "*fr*ee–*fr*iend");
- Response output rate tends to decline over the one–minute test period, especially after the initial 15–sec have elapsed;
- Six measures can therefore be considered in verbal fluency tasks: (i) **verbal fluency** (i.e. the number of correct words retrieved); (ii) **total responses produced in the first 15–sec of test period**; (iii) **total responses produced in the subsequent 45–sec of test period**; (iv) **number of switches**; (v) **number of clusters**; and (vi) **size of clusters**.

Objectives of the study

- Dyslexia and Developmental Language Disorder (DLD) are two neuro–developmental disorders affecting the development of literacy and oral language skills, respectively. Children with the two conditions have been reported to show poorer verbal fluency performance and difficulties with executive function (EF) skills;
- With respect to semantic fluency, the objective of the study was to investigate whether poorer semantic fluency performance could be attributed to children's **impaired lexical–semantic representations** or to a **general slowing of retrieval processes**;
- With respect to phonological fluency, it was investigated whether poorer phonological fluency performance could be attributed to children's **impaired phonological representations**, or alternatively, to **impaired explicit access but intact implicit access to phonological representations**;
- Whether poorer phonological fluency can be attributed to **phonological deficiencies** or to **broader difficulties with EF skills** was tested using a design fluency task measuring visuo–spatial EF skills without hinging upon phonological representations and processing skills.

Methods

Participants.
- Sixty–six Greek–speaking children with dyslexia and/or DLD (hereafter DDLD group) aged 8–12 years; and
- 83 children with typical development (TD) aged 6–12 years.

Fluency tasks.
- Semantic fluency: 'animals', 'foods', 'objects';
- Phonological fluency: 'Chi', 'Sigma', 'Alpha'; and
- Design fluency: "*Make as many different designs by connecting two to five dots in one minute*".

Results
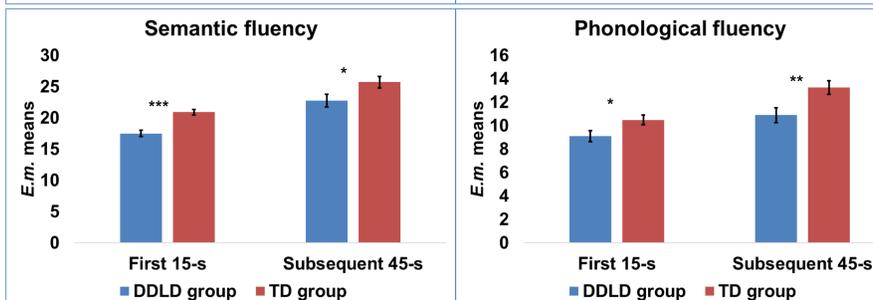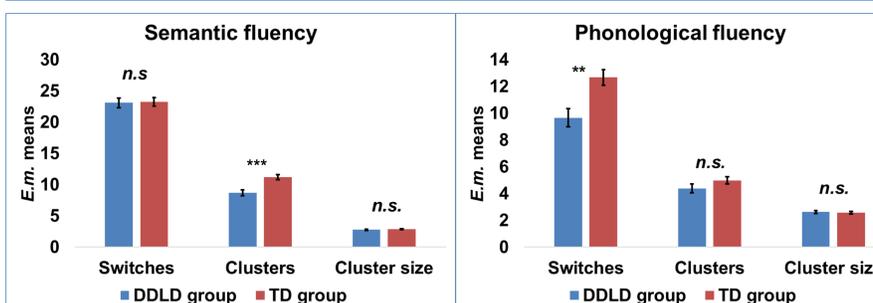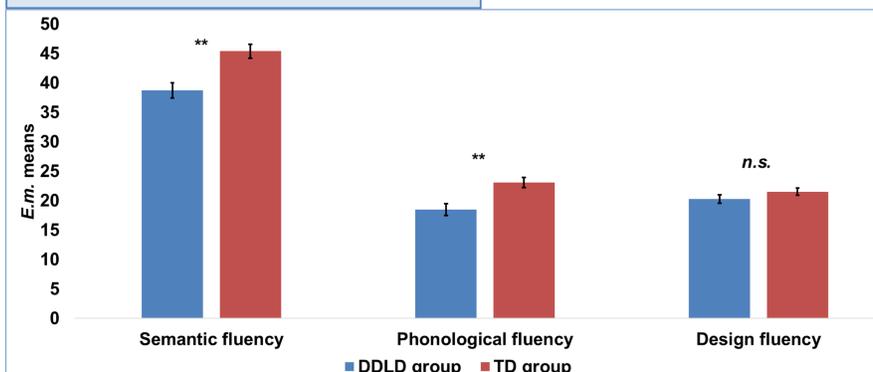
Note: Estimated marginal (*e.m.*) means controlled for age in months; bars display standard errors; ***$p < .001$; **$p < .01$; *$p < .05$; *n.s.*=non–significant; η_p^2=partial eta squared.

Discussion

- The DDLD group showed poorer semantic and phonological fluency performance compared to the TD group; however, the two groups did not differ on design fluency performance;
- In the semantic condition, the DDLD group produced significantly fewer clusters than the TD group; the two groups did not differ, however, on the number of switches and cluster size;
- In the phonological condition, the DDLD group switched significantly fewer times between subcategories than the TD group; however, the two groups did not differ on the number of clusters and cluster size;
- The DDLD group produced significantly fewer responses throughout the one–minute test period in both verbal fluency conditions compared to the TD group. Importantly, a large effect size ($\eta_p^2 = .13$) was found between the two groups in the semantic condition in the first 15–sec of test period.

Conclusions

- Poorer semantic fluency in children with DDLD is attributed to a general slowing of retrieval processes while lexical–semantic representations are intact as proposed by the *Retrieval Slowing Model* (Lenio et al., 2016);
- Poorer phonological fluency in children with DDLD is attributed to impaired explicit access to phonological representations while implicit access to phonological representations is intact as proposed by the *Deficient Phonological Access Hypothesis* (Ramus & Szenkovits, 2008);
- Given that switching draws upon EF skills (Troyer, 2000), broader difficulties with EF skills cannot be excluded as a factor accounting for poorer phonological fluency performance in the DDLD group, even though the two groups showed a similar design fluency performance.

References
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