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To cite this version:
Stéphanie Bellocchi, Stéphanie Ducrot, Jessica Tallet, Marianne Jover. Effect of comorbid reading disorder on oculomotor behavior in children with DCD. 13th International Conference on Developmental Coordination Disorder, Jun 2019, Jyväskylä, Finland. hal-02479443

HAL Id: hal-02479443
https://hal.archives-ouvertes.fr/hal-02479443
Submitted on 14 Feb 2020

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Effect of comorbid reading disorder on oculomotor behavior in children with DCD

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Introduction

Studies have suggested a dysfunction in oculomotor skills in children with DCD (Robert et al., 2014; Sumner et al., 2016). The nature of these dysfunctions is still not clear, as DCD often appears together with other neurodevelopmental disorder (Bellocchi et al., 2015).

The Developmental Eye Movement (DEM) test (Garzia et al., 1990) has been shown to be useful in exploring the oculomotor behavior of dyslexic children (DD; Moiroud et al., 2018). This standardized test comprises horizontal and vertical digit reading tasks and provides reading time and errors norms as well as oculomotor type of response.

Pre-test: “See these numbers? Please say these numbers out loud for me”. Vertical Test (Test A and B): “Please carefully read the numbers down the two columns like this as quickly as you can. Do not use your finger. Use only your eyes”. Horizontal Test (Test C): “Please carefully read the numbers across the rows like this as quickly as you can”.

Do DD and DCD children share the same oculomotor dysfunctions? What is the effect of DD comorbidity on DCD’s oculomotor skills?

Aims of the study

- to explore oculomotor behavior in DCD children as assessed with DEM test
- to compare DCD children to DD children and to children with DCD+DD

Method

Participants

138 French children (8-12 years old) (DYSTAC-MAP cohort).
22 DCD 47 DD 27 DCD+DD 42 TD (typically developing children)

All the children received a comprehensive cognitive assessment to evaluate criteria for inclusion in each group:

- intellectual functioning (WISC-5)
- reading skills (Alouette-R)
- phonological processing (ODESYS)
- motor development (MABC-2)

Materials

DEM test (Garzia et al., 1990): vertical time (VT), horizontal time (HT), RATIO HT/VT, number of errors (z scores) and oculomotor type.

Analysis

Z scores and oculomotor types (type 1 to 4)
Non parametric statistics:

Conclusions

- Children with DCD frequently presented atypical scores at the DEM test, as attested by the number of reading errors and oculomotor type of response (Robert et al., 2014; Sumner et al., 2016).
- Reading disorder was clearly linked to lower performances at the DEM test: both children with DD and children with DCD+DD had higher vertical and horizontal reading time, more errors and more atypical motor responses (Moiroud et al., 2018).
- Research focusing on oculomotor skills in DCD should contain a reading test to exclude the effect of comorbidity DD on visual behavior.
- Performance of children with DCD+DD were highly heterogeneous and more research is needed to understand the profile of these children.
- Eye tracking techniques should help to explore the nature of oculomotor disorder in DCD children, distinguish DD and DCD+DD behavior, and apprehend DCD+DD performance variability.

Results

Z-scores comparisons

Significant effect of Group for all indices (VT, H(3)=28.38; p=.000; HT, H(3)=38.85; p=.000; Ratio, H(3)=9.19; p=.027; Errors, H(3)=20.84; p=.000).

Pairwise comparisons:
- DCD differed from TD children only for the Errors (z scores (p<.008); DD and DCD+DD had lower z-scores than TD for the horizontal time, vertical time and in the Errors (z score (p<.0001); Differences between DCD, DD and DCD+DD groups were not significant.

Oculomotor response types

Distribution of the response types depended on the group (chi2=37.5, p=.001).

Pairwise comparisons showed differences between DD and other groups (p<.008) but not between DD, DCD and DCD+DD groups.

References


This work has been funded from support from the French Government, managed by the French National Agency for Research (ANR), under the project title DYSTAC-MAP (ANR-13-APPR-0010)