

# Dyspraxia subtyping and DCD

## Research on their nature and etiology

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### Background, Endpoints

#### Overview

- Developmental dyspraxia is not a simple version of adult dyspraxia and it is connected to maturational processes in the CNS.
- Varying terminologies used in the medical literature are confusing when we try to characterize children with coordination difficulties.
- According to DSM-IV-R criteria, children with DCD are a heterogeneous group, embracing clumsiness, developmental dyspraxia, and developmental coordination disorder. However, comorbidities and soft signs are rarely taken into account.

#### Aims

- To shed light on currently proposed classifications and clinical indicators.
- To finely delineate DCD vs. developmental dyspraxia by using a complete testing battery (50 items), including neuro-psychological, neuro-psychomotor and neuro-visual assessment and aMRI.

### Methodology

- N=43 children (8.3 ± 2.4 years old, 5-15) having DCD following DSM-IV-R criteria
- 2 years study (2005-2007) with patients followed at the Paediatric Department of Port-Royal Cochin Hospital and the Child Psychiatry Department of Necker Hospital (Paris, France)
- Inclusion criteria: no previous assessment, no medication, no therapy follow-up

#### Neuro-psychological assessment

WPPSI-R or WISC-III  
 visual-perceptual-motor tests (block design, VMI, Rey figure...)  
 handwriting, executive & memory tasks, visual perception & attention language screening battery (N-EEL)

#### Neuro-psychomotor assessment

functional development assessment (NP-MOT<sup>[6]</sup>), Imitation of gestures<sup>[5]</sup>  
**Neuro-visual examination et aMRI**  
 ERG, VEP, motor electro-oculogram aMRI 3D

### Results 1: Clinical assessment

#### Clinical diagnosis

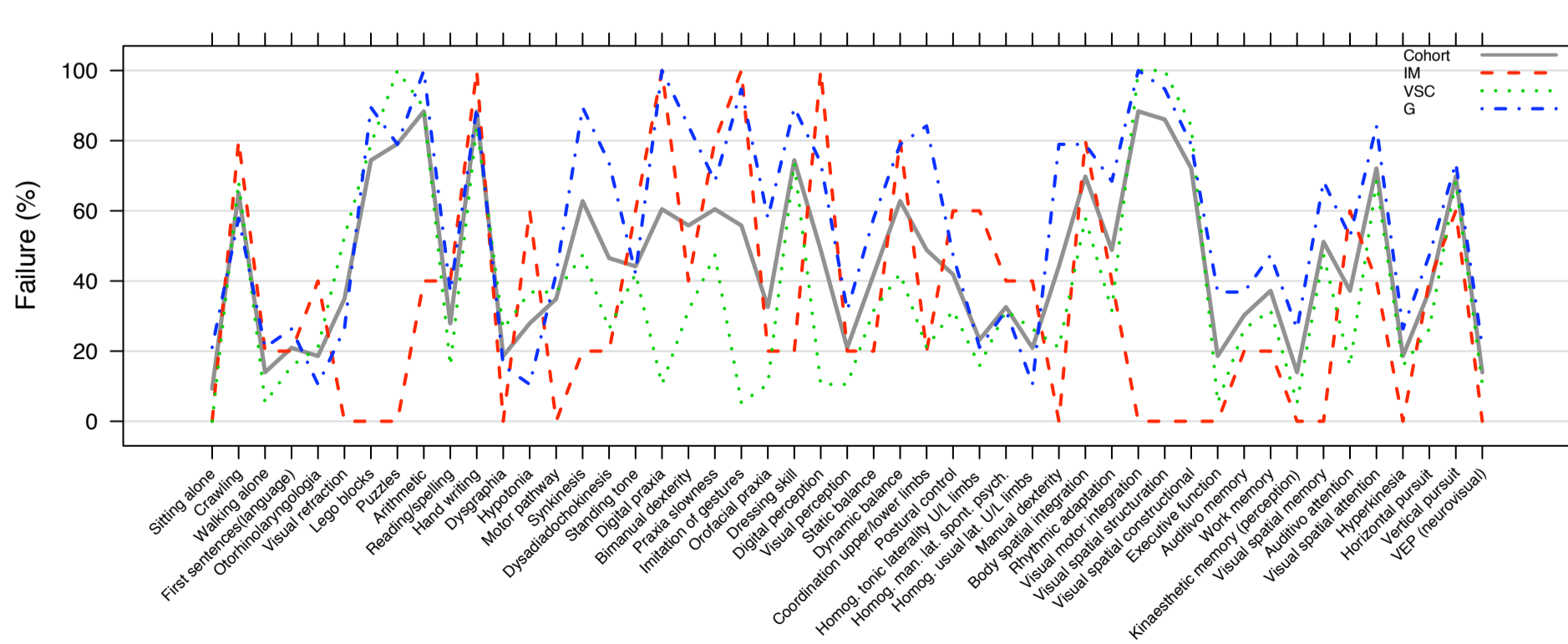
Constitution of 3 main subgroups of dyspraxia based on the interpretation of failure to specific items.

|                     | Ideo-motor (IM)   | Visuo-spatial/constructional (VSC, with dressing skill)  | Global (G = IM+VSC+comorbidities)   |
|---------------------|---|--|---|
| N                   | 5 (12%)   | 19 (44%)   | 19 (44%)  |
| Age                 | 8.2 ± 2.6   | 8.9 ± 3.0  | 7.7 ± 1.5   |
| Items failure > 60% | crawling, digital praxis, praxic slowness, imitation of gestures, digital gnosis, dynamic balance, postural control, body spatial integration, handwriting, hypotonia, standing tone, homogeneous tonic laterality, H/V visual pursuits | visual motor integration, visual spatial structuring, puzzles, arithmetic, visual-spatial constructional tasks, handwriting, vertical pursuit<br><i>n=2 (5%) showed only a pure form of visual spatial dyspraxia with dressing-skill</i> | visual spatial memory, attention, <b>coordination between upper and lower limbs*</b> , visual motor integration, visuo-spatial structuration, <b>manual dexterity</b> , executive function, synkinesis, <b>dysdiachokinesia, oro-facial praxia</b> , bimanual dexterity, arithmetic |

#### IQ

Significant differences - FIQ, PIQ and VIQ - were found between dyspraxia subgroups (between-groups ANOVA,  $p < .01$ ).

\* Highlighted in boldface are specific abnormalities characterizing DCD



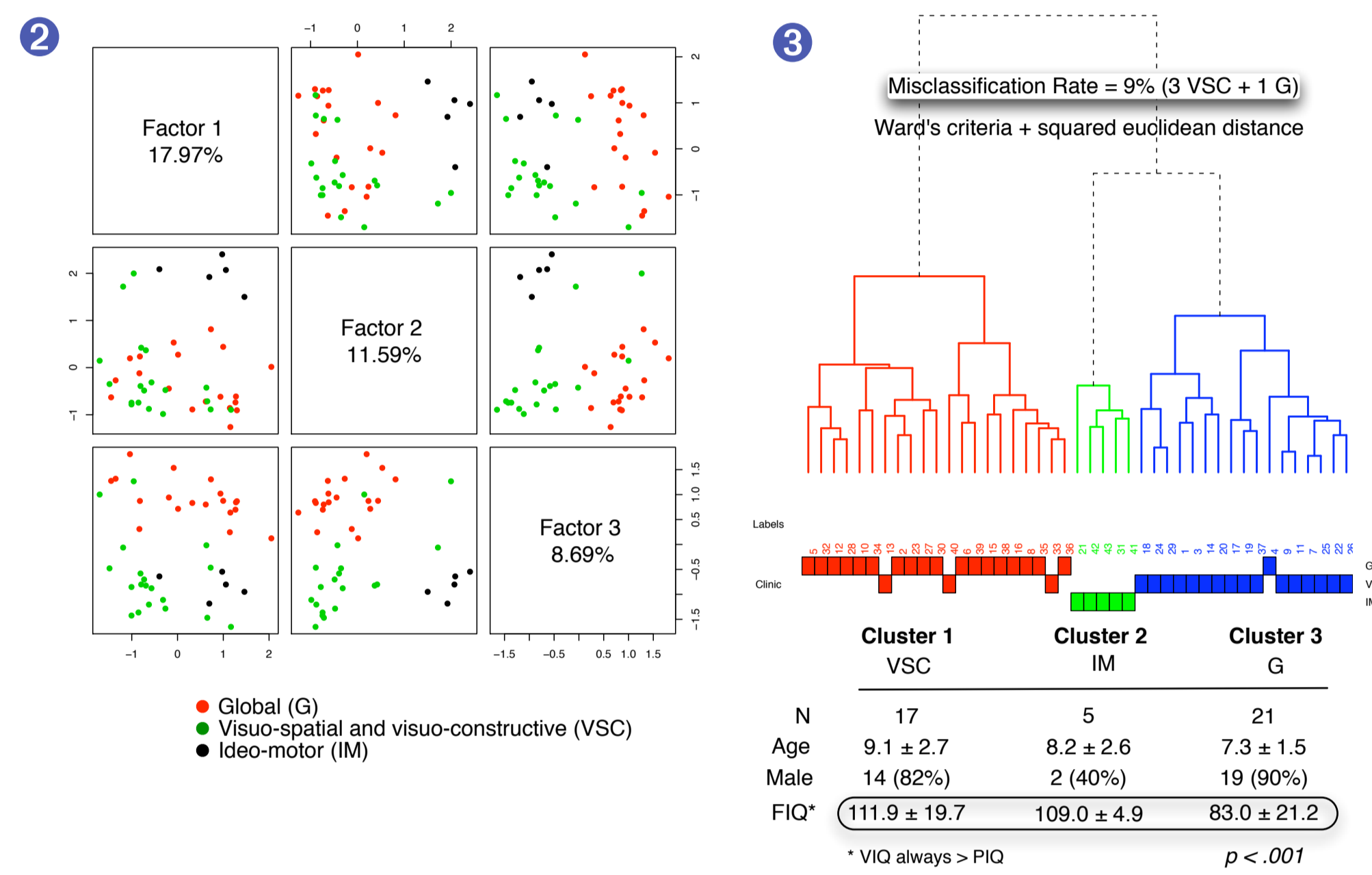
### Results 2: Statistical classification

#### Factor Analysis

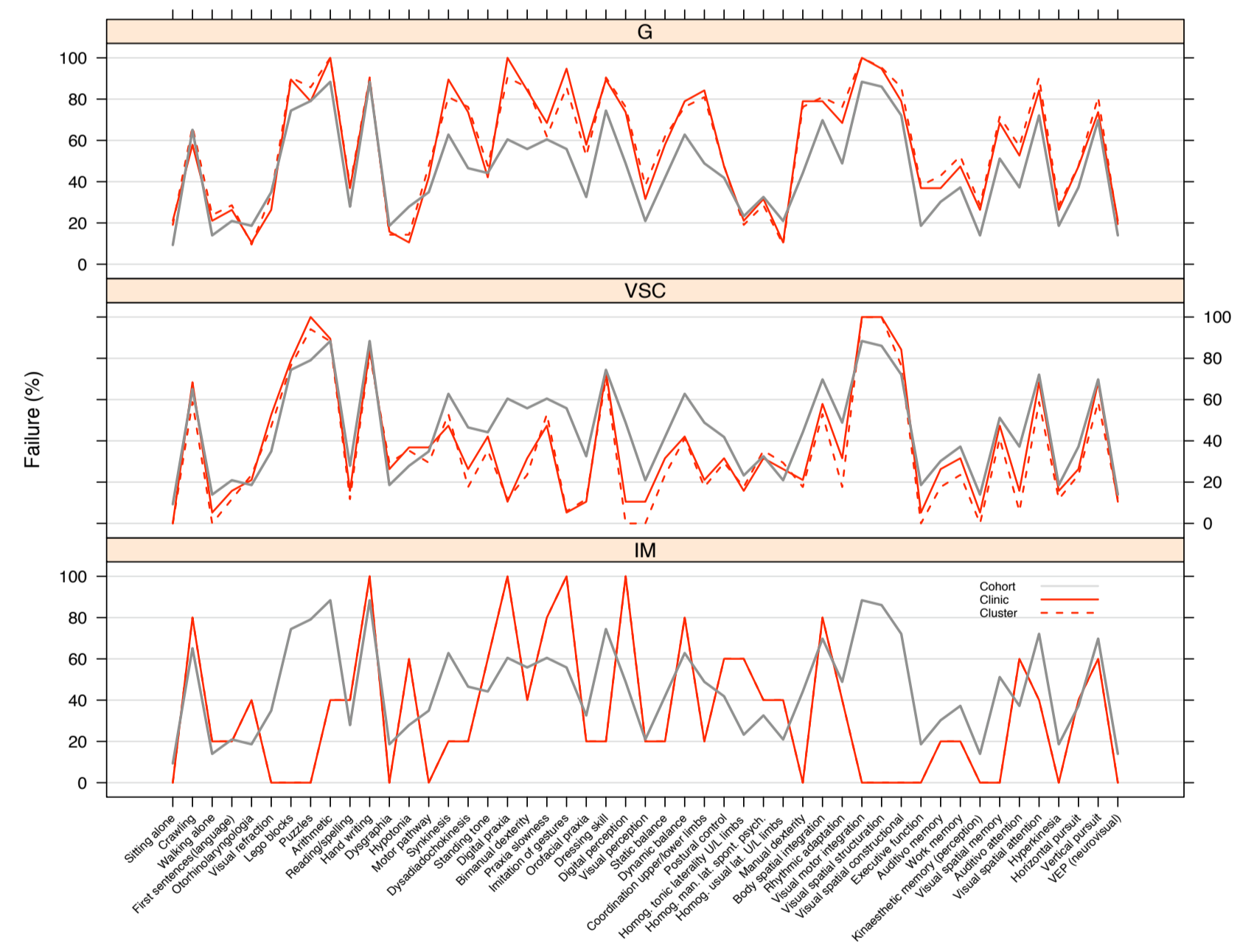
- Factor analysis leads us to consider 3 factors that account for ~ 40% of total variance: (1) tonico-sensory-motor disabilities, (2) visuo-spatial-motor disabilities and (3) learning disabilities.
- Individual projection map shows well defined clusters (Fig. 2), in agreement with clinical diagnosis.

#### Cluster Analysis

- Both agglomerative (Fig. 3) and iterative partitioning clustering methods indicate that a 3-clusters solution provides a good description of the cohort.
- Misclassification rate is low in both case and clusters statistics match clinical characteristics, as well as mean profiles of responses to items (Fig. 4).



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### Conclusions

#### Nature and etiology of developmental dyspraxia and DCD

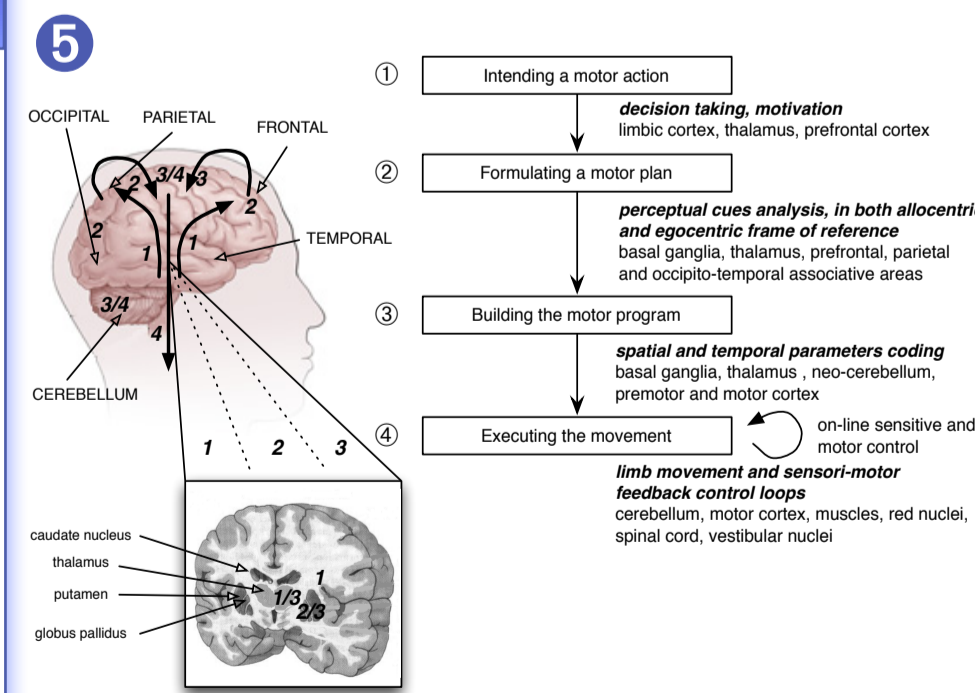
- Specific motor disorders in global dyspraxia are characteristic of DCD and learning disabilities
- Planning and programming problems ≠ motor execution or neuro-visual disorder (Fig. 5).
- Specific clinical criteria of dyspraxia diagnosis (cf. Results 1)

#### Clinical perspectives

- Need for a wide range battery of neuro-psychological and psychomotor tests with a standardized neuromuscular tone examination in order to better diagnose DCD vs. developmental dyspraxia.

#### Limitations and future

- Low number of patients included in this study impact statistical power; Imbalance between subgroups of dyspraxia might be overcome when enrolling new patients.
- MRI: upcoming VBM analysis



### References

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### Acknowledgments

Dr Dominique Hasboun (Paris 6, La Salpêtrière Hospital), Héléne Khéroua and Isabelle Alric (INSERM)

### Statistical Analysis

- **Factorial Analysis** on principal components with VARIMAX rotation (SPSS, v. 16)
- **Cluster Analysis** : agglomerative hierarchical + iterative partitioning (k-means) clustering (R, v. 2.7)
- **Descriptive statistics and Group comparisons** for patients classified according to clinical expertise and cluster solution