Characterization of the perceptual-motor procedural learning deficit in adults with probable Developmental Coordination Disorder

Links with motor, executive, attentional functions and comorbidities

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INTRODUCTION

Developmental Coordination Disorder (DCD)

The **least understood** neurodevelopmental disorder (NDD) in the literature (Bishop, 2010 ; Inserm, 2019)

- **Motor disorder**: **slowness** and **clumsiness** in the execution of movements
  - → Daily life **interference** (American Psychiatric Association, 2013)
  - → 1/3 persistence into **adulthood** (Kirby, 2010)
- **Attentional, executive and visuospatial deficits** but not systematically (Wilson et al., 2017)
- **Comorbidities** with other NDD, like Attention Deficit Hyperactivity Disorder (ADHD) (Kaplan et al., 1998; Inserm, 2019)
  - → Large **heterogenity** of profiles
  - → **Hypothesis** of a deficit of perceptual-motor procedural learning (PMPL) (Figure 1)

Limits in litterature about PMPL in DCD:

→ Studies about PMPL mainly conducted in **children** with DCD

→ Very **different paradigms** in studies on MSL and VMA

→ **Motor, executive, attentionnal functions and comorbidities** not always considered

↳ Larger deficit in VMA compared to MSL in accordance with the hypothesis of a **dysfunction in the cortico-cerebellar loop** in DCD (Gill et al., 2022; Tallet & Wilson, 2020; Zwicker et al., 2015)

Figure 1 : Perceptual-Motor Procedural Learning (PMPL)

Learning of **new motor procedures** with repetition

Allows environment **adaptation** and **autonomy**

(Rosenbaum et al., 2001)

(Doyon et al., 2003)

Motor Sequence Learning (MSL):

→ Learning a succession of movements in a precise order

→ Relies on the cortico-striatal loop

Visuo-Motor Adaptation (VMA):

→ Adapting movements according to changing in visual input

→ Relies on the cortico-cerebellar loop

→ No consensus about a deficit of MSL or/and VMA in adults with DCD

(Lee & Bo, 2015; de Oliveira & Wann, 2010 ; Sinani et al., 2023)

The aim of this study is to evaluate MSL and VMA in adults with probable DCD with comparable tasks and taking into account the links with motor, executive, attentional functions and comorbidities

Figure 2: Evaluation of MSL and VMA performance in a comparable way

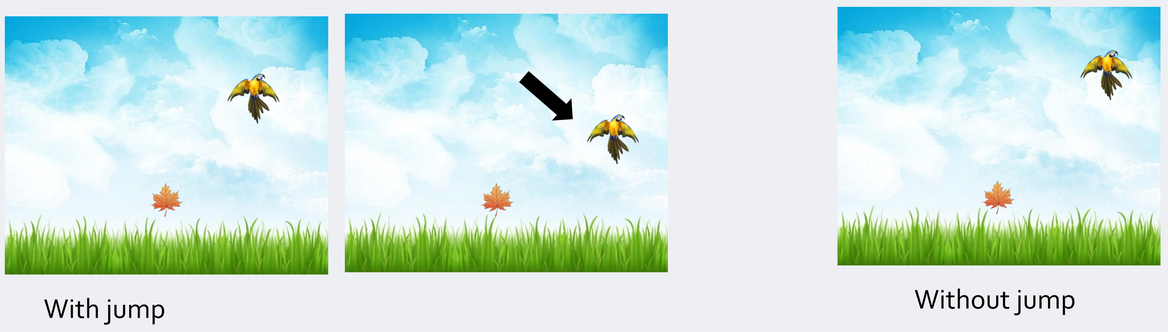
"You have to drag the leaf to the bird as quickly and accurately as possible as soon as it appears "

MSL

Position 1 | Position 2 | Position 3 | Position 4

Sequence : 2-3-1-4-2-1-3-4

VMA



With jump

Without jump

METHODOLOGY

- 2 groups of 21 adults
  - Participants with probable DCD
  - Matched healthy control participants
- 2 experimental tasks measuring MSL and VMA (Figure 2)
- Evaluation of motor, executive, attentional functions and comorbidity with ADHD

EXPECTED RESULTS

- Adults with probable DCD should present deficits in PMPL
- Adults with probable DCD should present more deficits in VMA than in MSL
- Comorbidity with ADHD should negativly impact PMPL
- Motor, executive and attentional scores should be linked with PMPL scores

→ This study will allow a better understanding of PMPL deficit in adults with probable DCD and a better adaptation of reeducation

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