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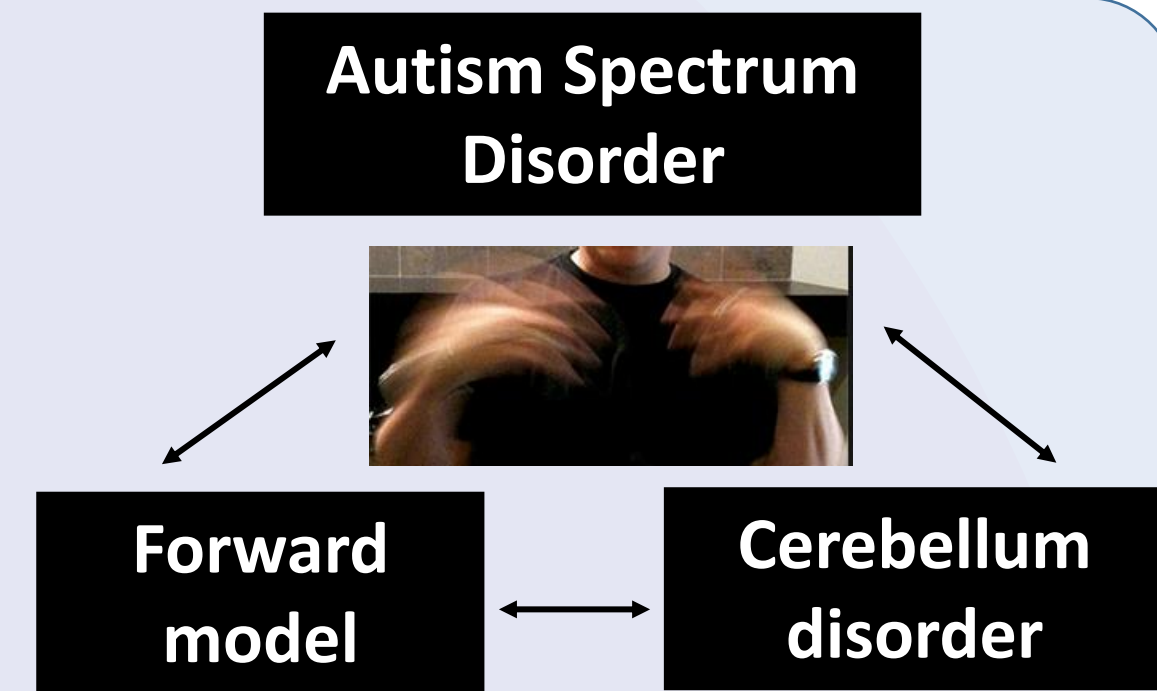
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Motor anticipation in ASD children: the experience of a sequential pointing task

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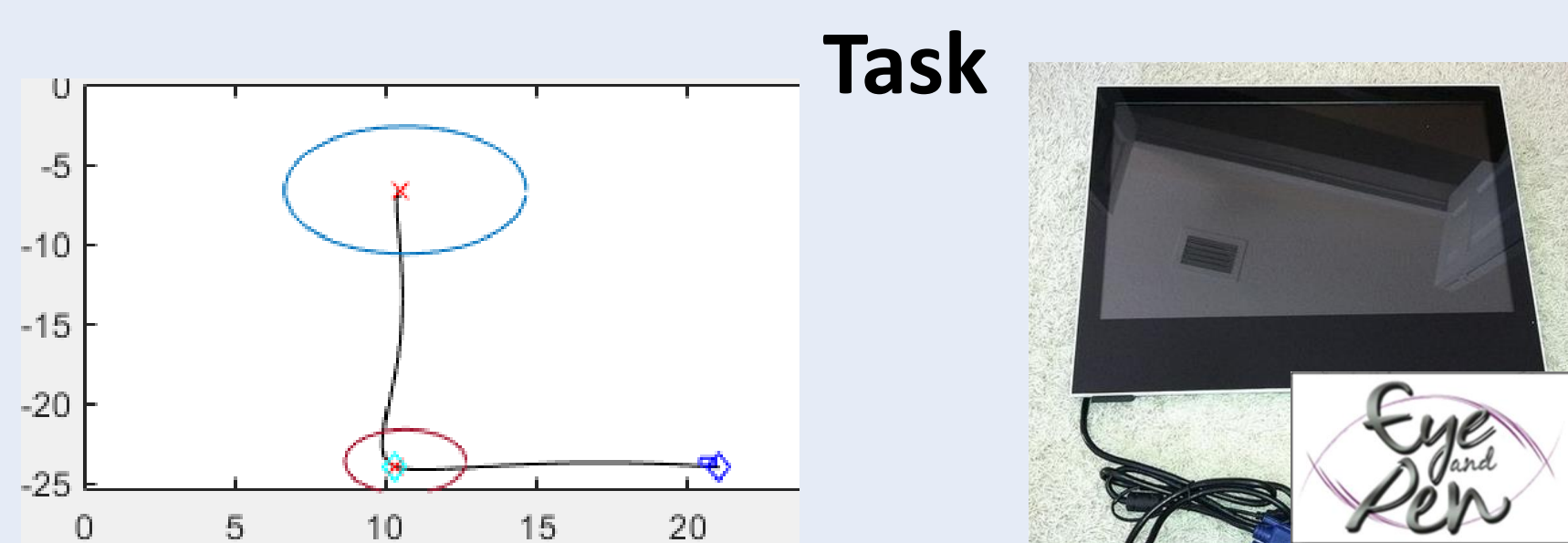
Introduction

- **Autism Spectrum Disorder (ASD)** is a neurodevelopmental psychiatric condition characterized by difficulties with social interactions and communication, repeated and stereotypical movements or restricted interests.
- But ASD children also display **altered motor control** (Kanner, 1943), which remain poorly understood.
- Recently, altered motor control was observed in ASD animal models and related to **cerebellum disorders** (Jaber, 2017).
- A central concept of motor control relies on **anticipation** of the sensorimotor consequences of motor commands via a **forward model** (Wolpert, 2000).
- Recently, the cerebellum has been suggested to play a key role in the **forward model** (Therrien, 2019).
- To study the cerebellum hypothesis on ASD, we proposed an **anticipation motor activity** via a **sequential pointing task** of two to-be-reached visual targets.



Question: Is the motor control of end-point anticipation impaired in ASD children ?

Method

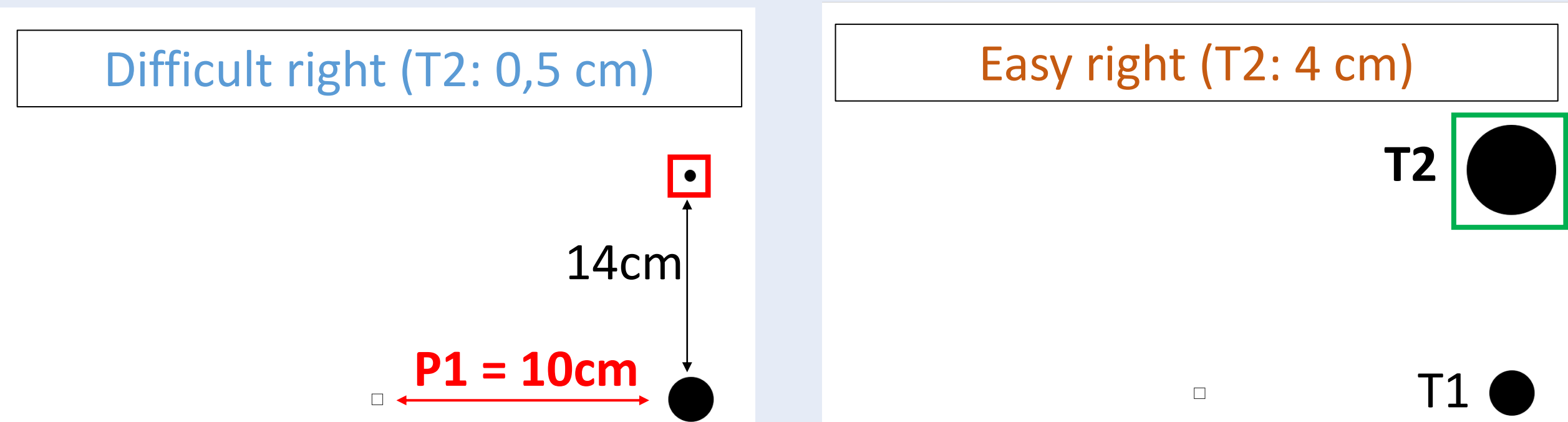


Task



- Matlab software (R2021b)
- Eye and Pen software
- Digitizer (Yiyonova MSP19U)

- T1's widths remains constant (2cm)
- 5x(2 widths for T2: 0,5cm (**difficult**) or 4cm (**easy**) * 2 sides (left, right))

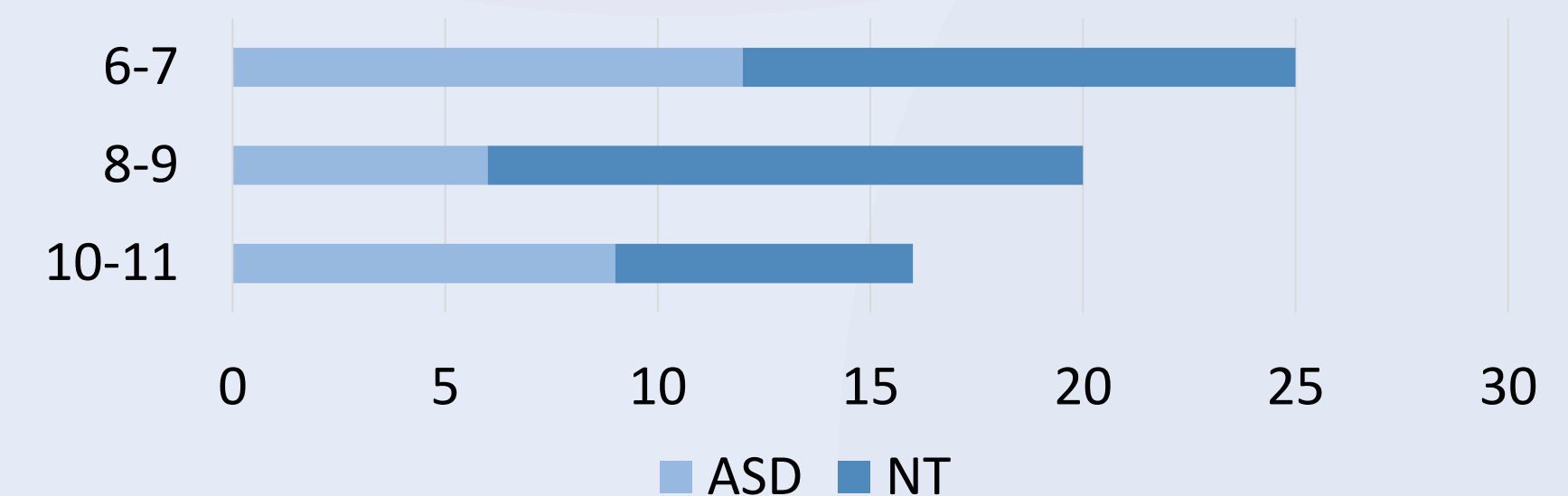


➤ We focused on motor anticipation of the second movement end which occurs during the production of the first part of the sequence (P1).

Participants

34 NT (neurotypical) children (18 girls)
 Mean ages : 6,51 years / 8,46 years / 10,07 years
27 ASD children (10 girls)
 Mean ages : 6,69 years / 8,93 years / 10,82 years

Number of NT and ASD children

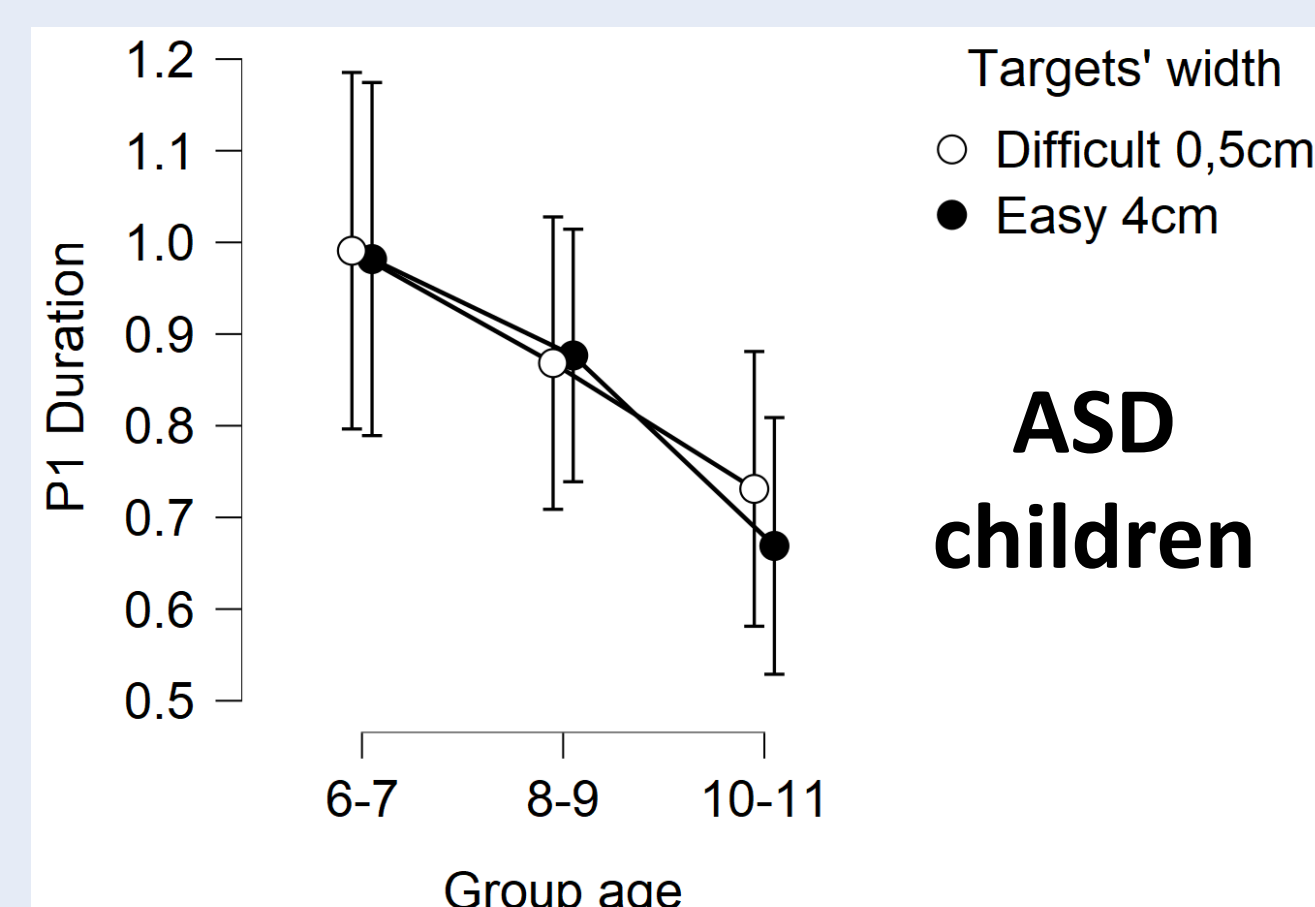
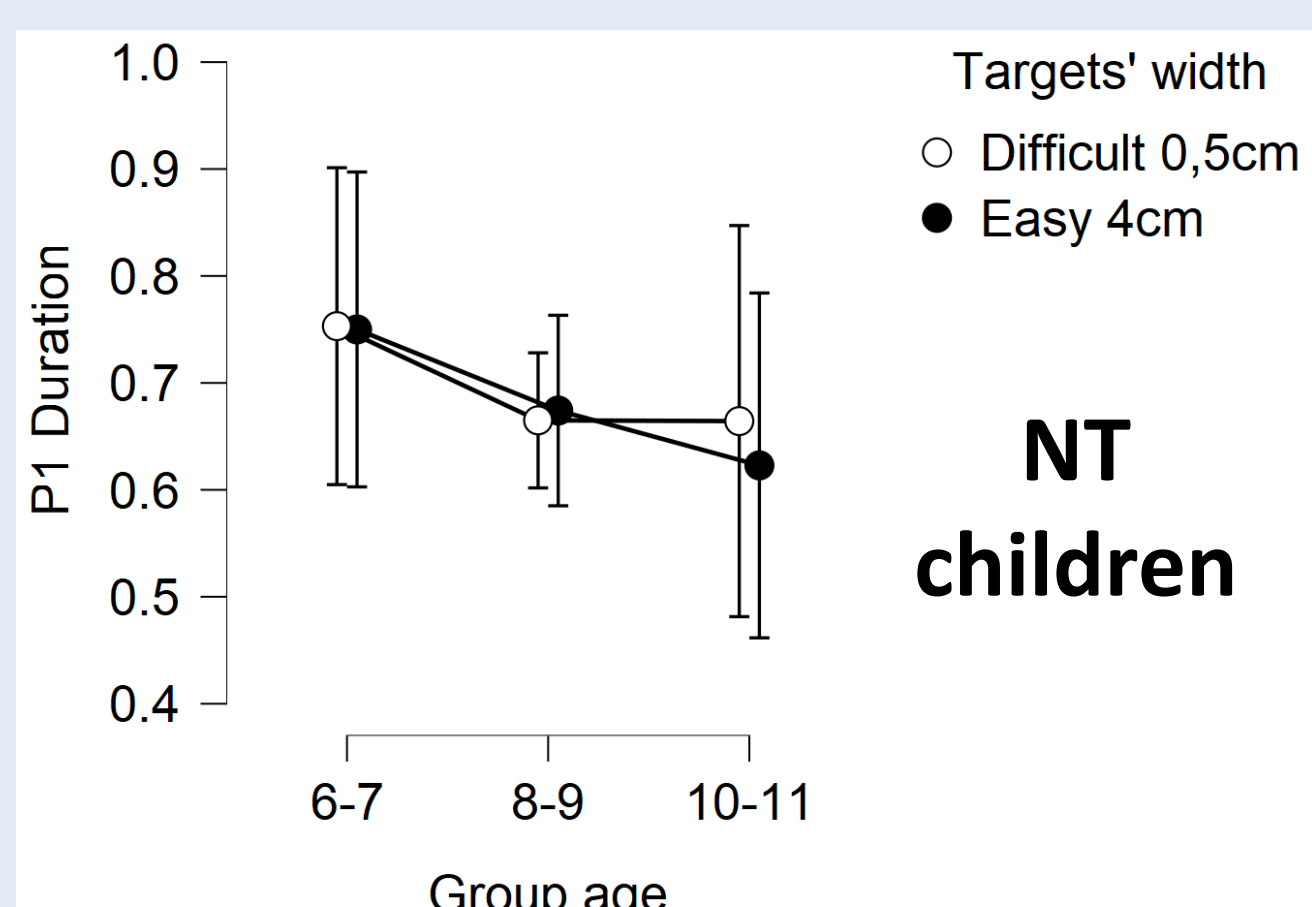


Participants' duration data at $\pm 2SD$ were excluded from these analyses (1 ASD child & 2 NT children)

Results

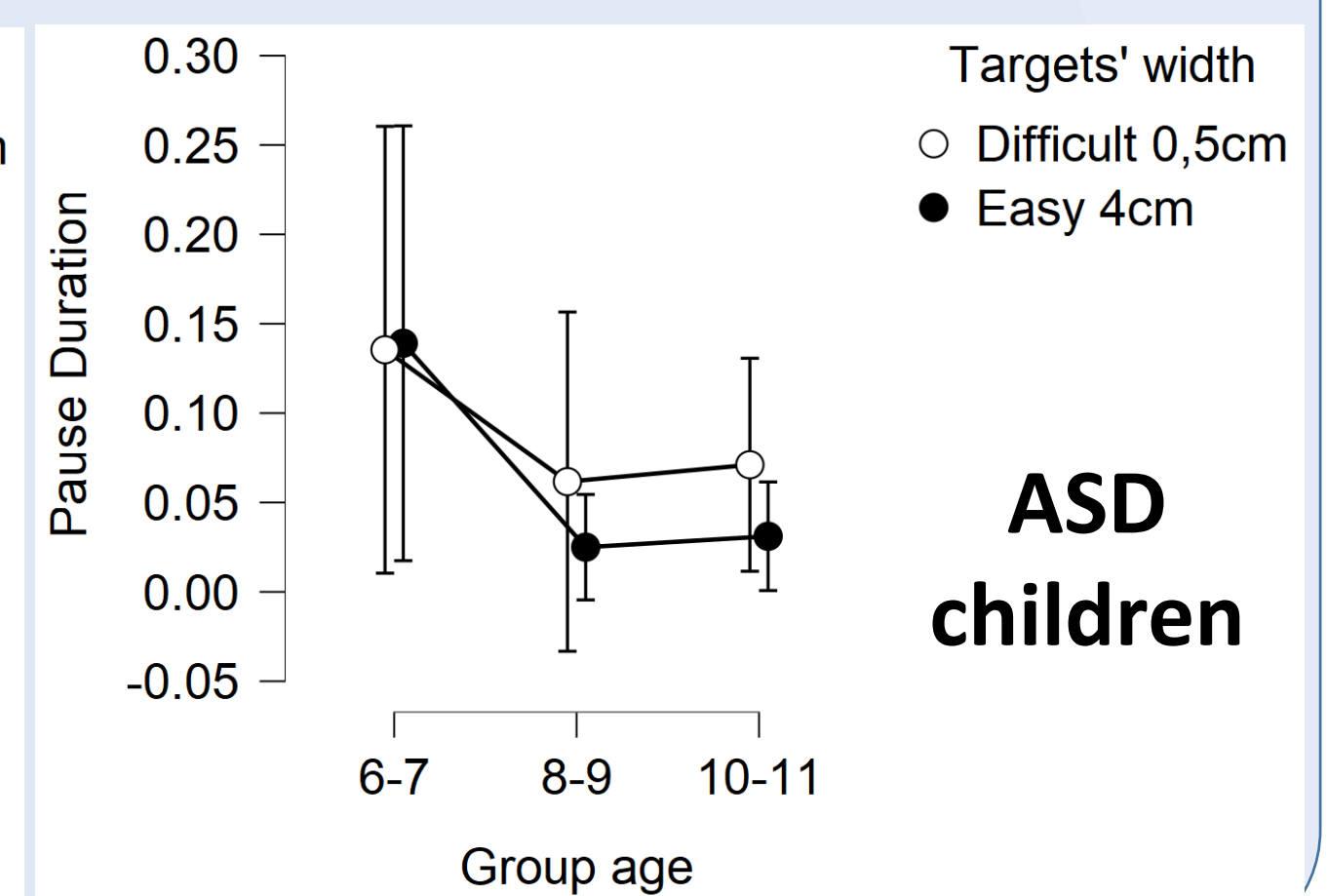
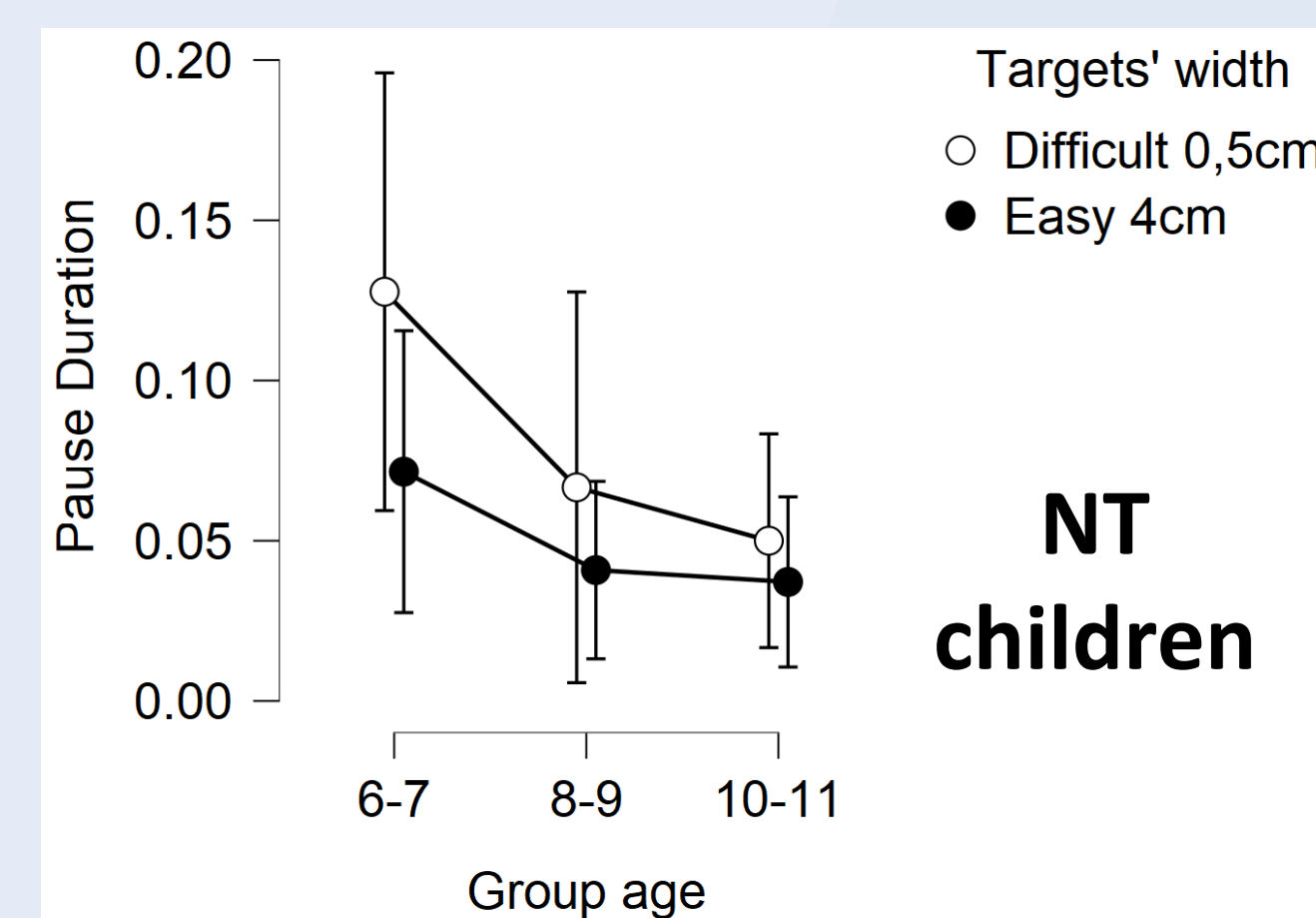
P1's duration according to the second target's size and the age

No interaction group*target's width ($p = .64$): ASD children can anticipate the difficulty as NT do
 Significant interaction age*target's width ($p = .05$): motor capacities increase in the two groups
 Post hoc analysis (Bonferroni's test) revealed a significant difference between younger and older ($p = .03$)
 Significant effect of group ($p < .01$): ASD children are slower than NT



Pause duration between the two reaching movements

Significant effect of difficulty level ($p = .03$)
 Significant effect of age ($p = .03$)
 No effect of the group ($p = .65$)



Discussion / Conclusion / Limits

ASD children:

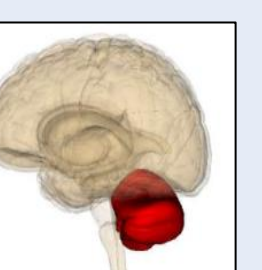
- Can anticipate the production of the second movement during the execution of the first one.
- Their motor anticipation capacities increase with age.
- Present global motor slowness.

Limits:

small size of each group, heterogeneity in the ASD cognitive profiles and of the ASD severity

➔ Anticipation emerges in ASD and NT children from 10 years old.

➔ In ASD, the cerebellum may contribute to anticipatory control as NT do, but its alteration seems to slow down the movement execution



References

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