

Early executive function development and autistic traits: Longitudinal findings from the Gaze@Toddler study

Takio, F.^{1,2,3}, Saarimäki, H.¹, Saaristo, V.¹, Mattila, H.¹, Husu, E.¹ & Kylliäinen A.¹

1. Faculty of Social Sciences / Psychology, Tampere University, Finland; 2. Centre of Excellence for Learning Dynamics and Intervention Research (InterLearn), University of Turku and University of Jyväskylä, Finland, 3. Child Psychiatry, University of Helsinki and Helsinki University Hospital, Helsinki, Finland.

Background

- Executive function (EF) difficulties are common in neurodevelopmental conditions such as autism.
- EF difficulties may act as early endophenotypic markers before formal diagnosis.
- Little is known about how EF develops early in children with elevated likelihood for autism.

Objectives

- Investigate EF development between 18 and 24 months using both parent-reported and lab-based measures in a heterogeneous sample of toddlers.
- Examine whether autistic traits at 18 months are associated with variability in EF development across this period.

Methods

Participants	
Sample size	N = 115
Sex distribution	64% boys
Study context	Participants drawn from the longitudinal Gaze@Toddler study
Screening at 18 months	General population sample screened with M-CHAT-R/F
Screen-positive invited	n = 87
Screen-negative invited	n = 28
Autistic traits	Assessed with ADOS-2 Toddler Module at 18 months
EF assessment timepoints	S1: 18.3 months, S2: 25 months

The **Early Executive Functions Questionnaire (EEFQ)** is a validated caregiver-report measure designed for children aged 9–30 months, assessing **everyday behaviors** related to emerging EF. It includes 28 items covering the following domains: **Cognitive Executive Function (CEF)**, **Working Memory (WM)**, **Inhibitory Control (IC)**, **Flexibility (FX)**, **Regulation (RG)**.

Children completed three EEFQ-aligned **behavioral games** during lab visits. These games targeted core EF processes: **Finding game (WM)**, **Waiting game (IC)** and **Sorting game (FX)**, providing direct **performance-based** indicators of early EF abilities.

Results

Parent-reported EF (EEFQ)

Domain	Change 18→24 mo	statistic	p-value
IC	↑ Improvement	t(64) = 3.06	.003
RG	↑ Improvement	t(64) = -2.25	.028
CEF	No change	—	n.s.
FX	No change	—	n.s.
WM	No change	—	n.s.

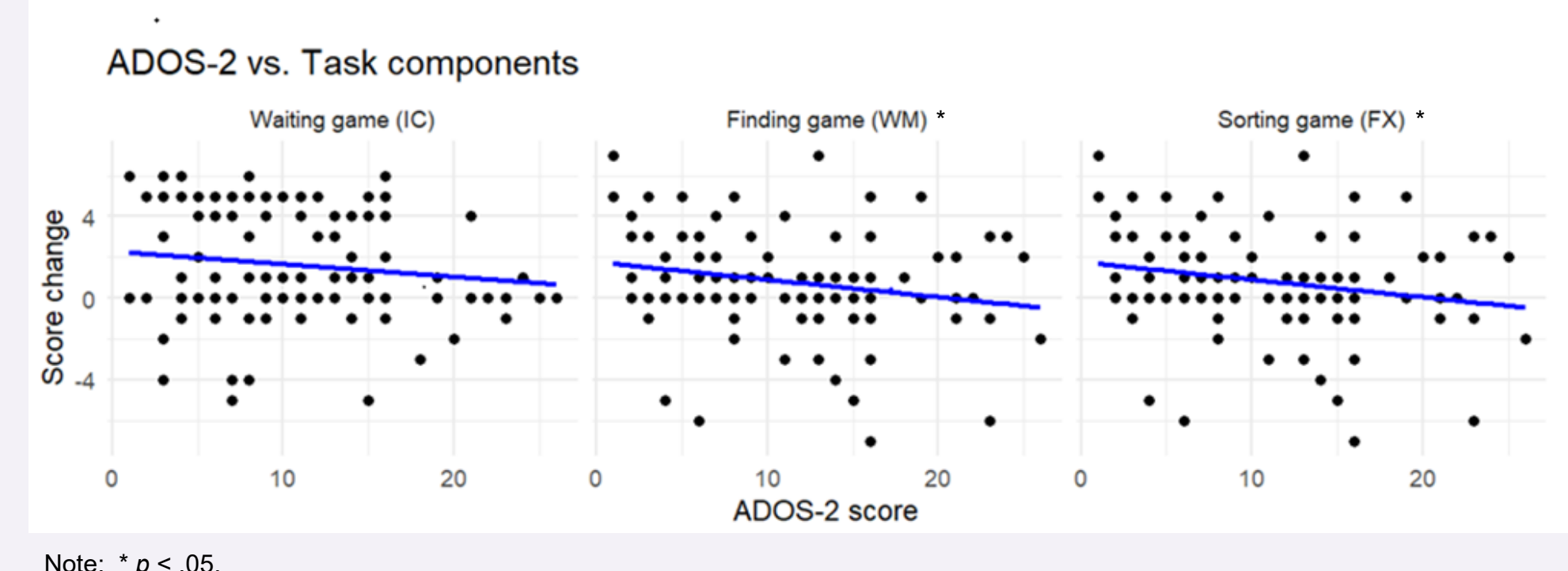
Lab-based EF games (EEFQ)

Domain	Change 18→24 mo	statistic	p-value
IC	↑ Improvement	V = 2593.5	< .00001
WM	↑ Improvement	V = 2042.5	.00037
FX	↑ Improvement	V = 2318.5	< .00001

Association with ADOS-2 at 18 months

- No associations with parent-reported EF change.
- Higher ADOS-2 scores were associated with less improvement in lab-based WM and FX game performance.
- No association with changes in IC game performance.

Figure 1. Associations between ADOS-2 scores and changes between S1 and S2 in EEFQ game performance.



Conclusions

Group-level EF development was observed between 18–24 months across the whole sample, consistently detected in both parent reports and lab-based measures, showing that EF change can be reliably captured in this early developmental period.

Higher autistic traits were linked to smaller gains in lab-based WM and FX game performance, suggesting subtle EF differences already before formal diagnosis.

Early EF assessments are valuable for understanding individual developmental variability. Longitudinal studies integrating parent reports and behavioural measures are needed to clarify how early self-regulatory processes shape later neurodevelopment.

