

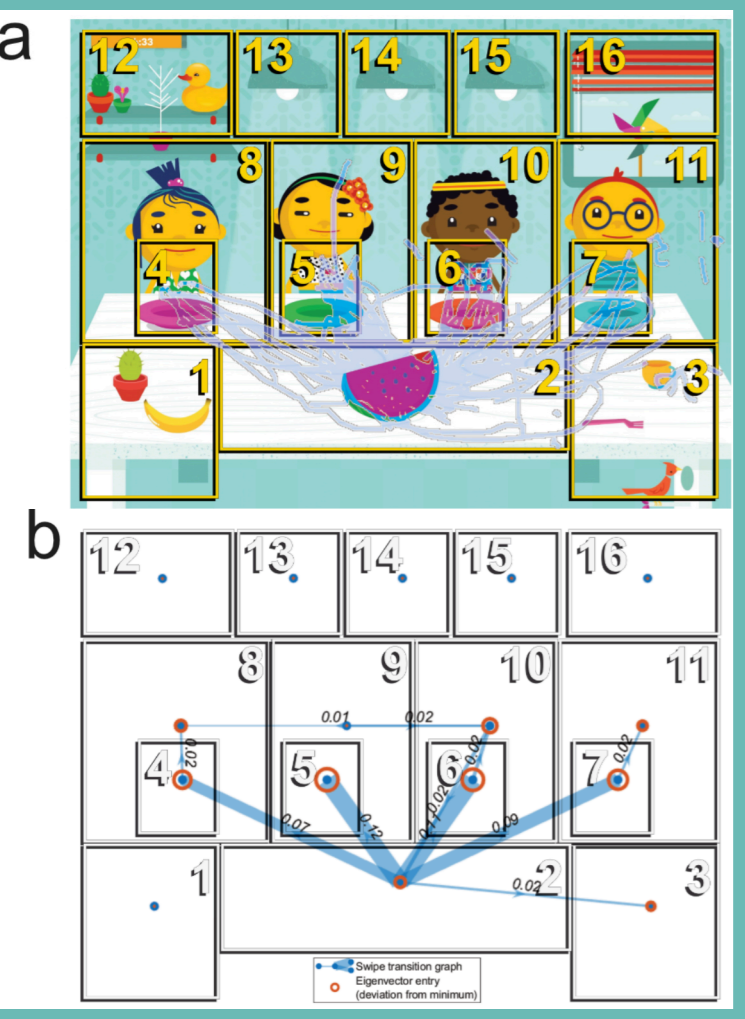
Characterising gameplay development in autism with swipe pattern networks

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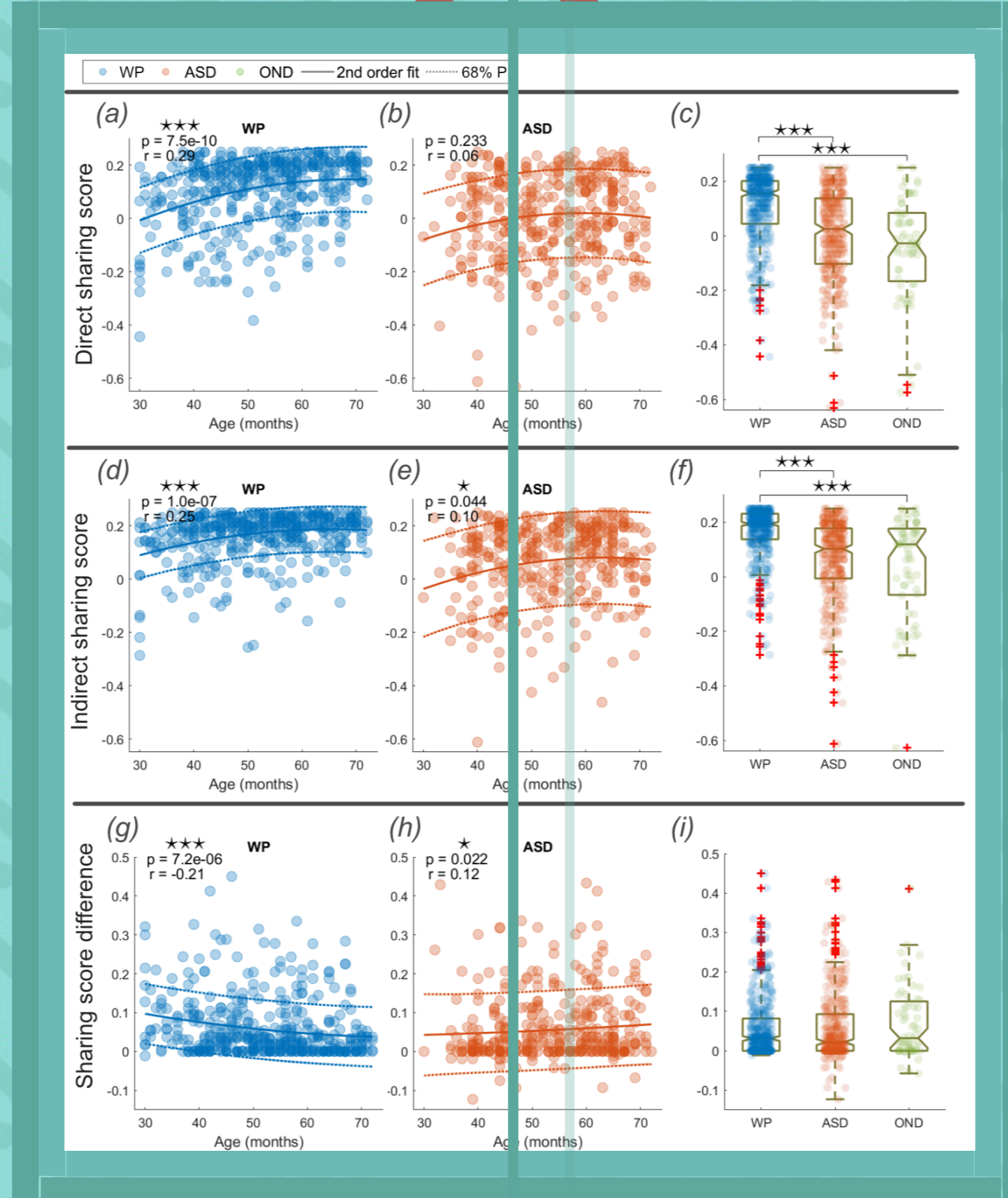
Autism spectrum disorder (ASD) is a neurodevelopmental condition where early identification and therapeutic intervention can produce lifelong health and economic benefit. Tablet games provide an accessible form of assessment.

The food sharing game encourages social, sharing, gameplay. Users drag four pieces of food from a serving area to the four characters; triggering animated celebrations.



The **swipe pattern network** (A):

- Swipe transition matrix T is added to a complete graph C.
- T is created by defining zones on the screen and monitoring the origin and destination of swipes, as shown above.



Direct sharing score: only direct food-to-plate swipes connect to plate zones in A.

Indirect sharing score: swipes moving food from one plate to another plate is allowed in A.

Sharing score difference: indirect minus direct sharing score

Sharing score

A graph metric (sharing score) was created to monitor food sharing.

- First left eigenvector v of A, captures the popularity of swipe destinations.
- Four plates are commonly the most popular destinations.
- Sharing score is the perturbation p that ensures the four largest entries of v are not the four plates.
- p is increased until the sharing score is found, as shown below.



Participating children were 2.5–6 years of age²; 441 without known neurodevelopmental problems, 373 with ASD, and 64 with other neurodevelopmental disorders(OND).



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Conclusions

Autistic children develop an **indirect, two-step**, sharing process in contrast to the **direct, single-step**, approach employed by children without neurodevelopmental disorders; insights that can support early diagnosis.

Example patterns: direct sharing indirect sharing

1. T.S. Brugha, et al., Archives of general psychiatry 68(5), 459 (2011)
2. L. Millar, et al., BMJ open 9(7), e026226 (2019)

