

A Prospective Perception-Action Strategy in Children with Autism during Smart-Tablet Gameplay

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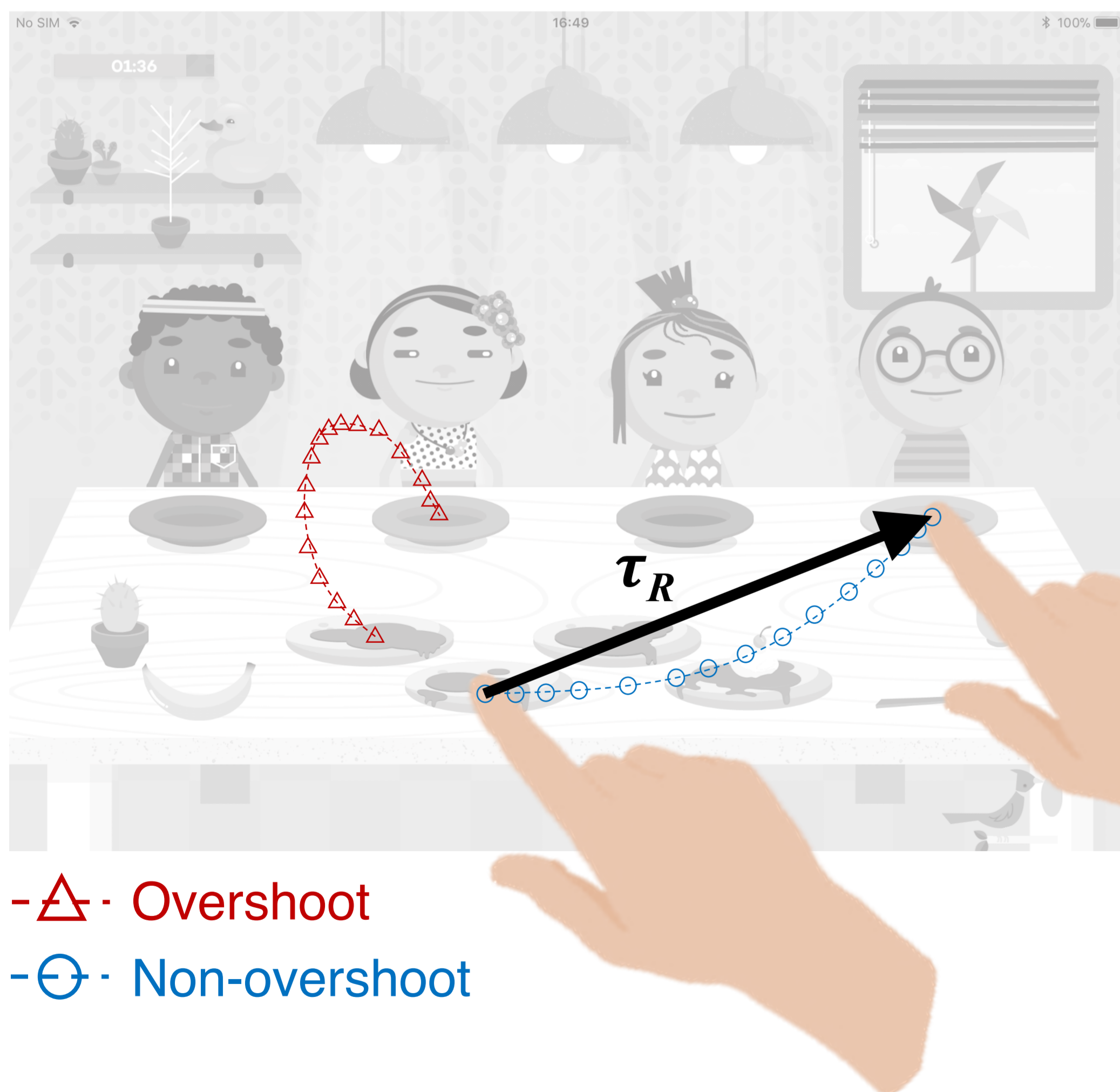


1. Introduction

General tau theory has been used to describe goal-oriented perception-action strategies.¹ It proposes an intrinsic action guide generated by the nervous system coupled to the motor command to guide the physical movement. The **coupling constant** between the two is assumed to be set by the brain to coordinate the kinematic profile of the goal-oriented action.

Objective: This study aimed to test potential differences in the perception-action strategy between children with autism spectrum disorders (ASD) and typically developing (TD) children when performing goal-oriented swipes during smart-tablet gameplay.

2. Methods



Goal-oriented swipes were extracted from young children when playing a “Food Sharing” game on smart-tablet.² Only the swipes without overshooting the target were included for further analysis.

$$\tau_R(t) = k_{R,G} \tau_G(t)$$

$\tau_R(t)$ is action-gap

$k_{R,G}$ is coupling constant

$\tau_G(t)$ is intrinsic guidance

-△- Overshoot
-○- Non-overshoot

The timestamped x- and y-coordinates of those non-overshoot swipes were used to compute the change of distance between the instant moving point and the end point (i.e., the action gap). Then the percentage of tau-coupling in each swipe and the tau-coupling constant were determined.

3. Results and Discussion

A total of 500 swipes obtained from 32 children with ASD (aged 33-79 months), and 1426 swipes were obtained from 44 TD children (aged 36-74 months).

		TD	ASD	
% of movement tau-coupled	Mean	98.98	97.90	t test p = 0.01*
	S.D.	7.54	10.49	F test p < 0.01*
tau-coupling constant	Mean	0.41	0.40	t test p = 0.70
	S.D.	0.15	0.93	F test p < 0.01*

Percentage of movement tau-coupled: In comparison to the TD children, children with ASD demonstrated significantly **less tau-coupling with higher variability** when performing goal-oriented swipes during smart-tablet gameplay.

The tau-coupling constant: Significantly more variable coupling constant was observed in children with ASD, however, the mean value was similar to what was observed in TD children. This observation may imply that, **for the overall movement, children with ASD and TD used similar strategies to perform the goal-oriented swipes while greater fluctuations were observed in ASD.**

4. Conclusion

Our findings are consistent with previous reports indicating increased motor variability in individuals with ASD.^{3,4} In addition, increased acceleration and jerk amplitudes were noted in adults with ASD,⁵ suggesting disruption at the level of brainstem.⁶

In summary, this study supports that the disruption to efficient perception-action regulation by tau-coupling might be a critical motor disturbance in ASD.⁷

References

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