Investigating Timing Processes in Autistic Adults

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Introduction
Autism is a lifelong, neurodevelopmental condition diagnosed according to differences in social and communication function and restricted behaviours.
The temporal deficit hypothesis (Allman, 2011) proposes that timing and time perception is disrupted in autism. Deficits in sub-second timing are proposed to underly behavioural and cognitive differences which are characteristic of the condition.
In a systematic review (Casassus et al., 2019) we found that the evidence for diminished timing in autism is mixed and dependent on the nature of the task.
We used a battery of established timing tasks, plus questionnaires measuring timing in everyday life in the same sample of autistic and neurotypical (NT) participants.

Research question
Is there a generalised ‘timing impairment’ in autism?

General Method

<table>
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<tr>
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<th>Autistic (n = 57)</th>
<th>Neurotypical (n = 91)</th>
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<tbody>
<tr>
<td>Age</td>
<td>31.34 ± 8.91</td>
<td>30.38 ± 7.75</td>
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<tr>
<td>FSIQ</td>
<td>115.51 ± 13.21</td>
<td>114.99 ± 13.42</td>
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- Participants completed battery of psychophysical tasks involving timing judgements about identical stimuli.
- Visual (grey square presented at fixation) and auditory (tones presented through speakers). Chin rest to control distance from screen.
- Study was pre-registered: https://osf.io/pcahj/

Retrospective Estimate

How long has passed since x happened?
- Each participant was asked for their phone/watch at the beginning of the testing procedure and at a fixed point (mean 52 minutes, SD 12) was asked how long had passed since then.
- Participants in both groups tended to underestimate the duration. No difference between the groups (Fig 1).

- No differences between the groups (Fig 3).

Threshold Task
- Asked which of two consecutive stimuli was longer. Standard (700ms) or comparison (variable duration).
- Duration of comparison adjusted using an adaptive staircase procedure (3 up 1 down - point at which participant can discriminate ~ 75% accuracy).

Temporal Generalisation Task
- Participant asked to remember a standard (400ms or 800ms duration) and is asked if comparison stimuli are the same duration.
- A-Prime used as measure of precision (increased APrime = more precise). Calculated using signal detection analysis.

Verbal Estimation Task
- Participant asked to estimate the duration of a stimulus (in ms) 77 - 1183 ms.
- Fit linear regression to mean estimate at each duration.
- Slope used as measure of precision (closer to 1 = more precise).

Questionnaire measures
- Scores on It’s About Time lower in the Autistic group.
- Scores on Time Structure increased in the Autistic group.

Discussion
- Questionnaires highlight differences in timing in daily life in autistic group.
- Smaller modality effect in autistic group observed in threshold experiment, but not replicated across tasks.
- Memory for duration may be implicated in autism.

References
Allman, M (2011) Frontiers in Integrative Neuroscience, 5 2

We did not find evidence of a generalised ‘timing impairment’ in the autistic group.