

## Introduction

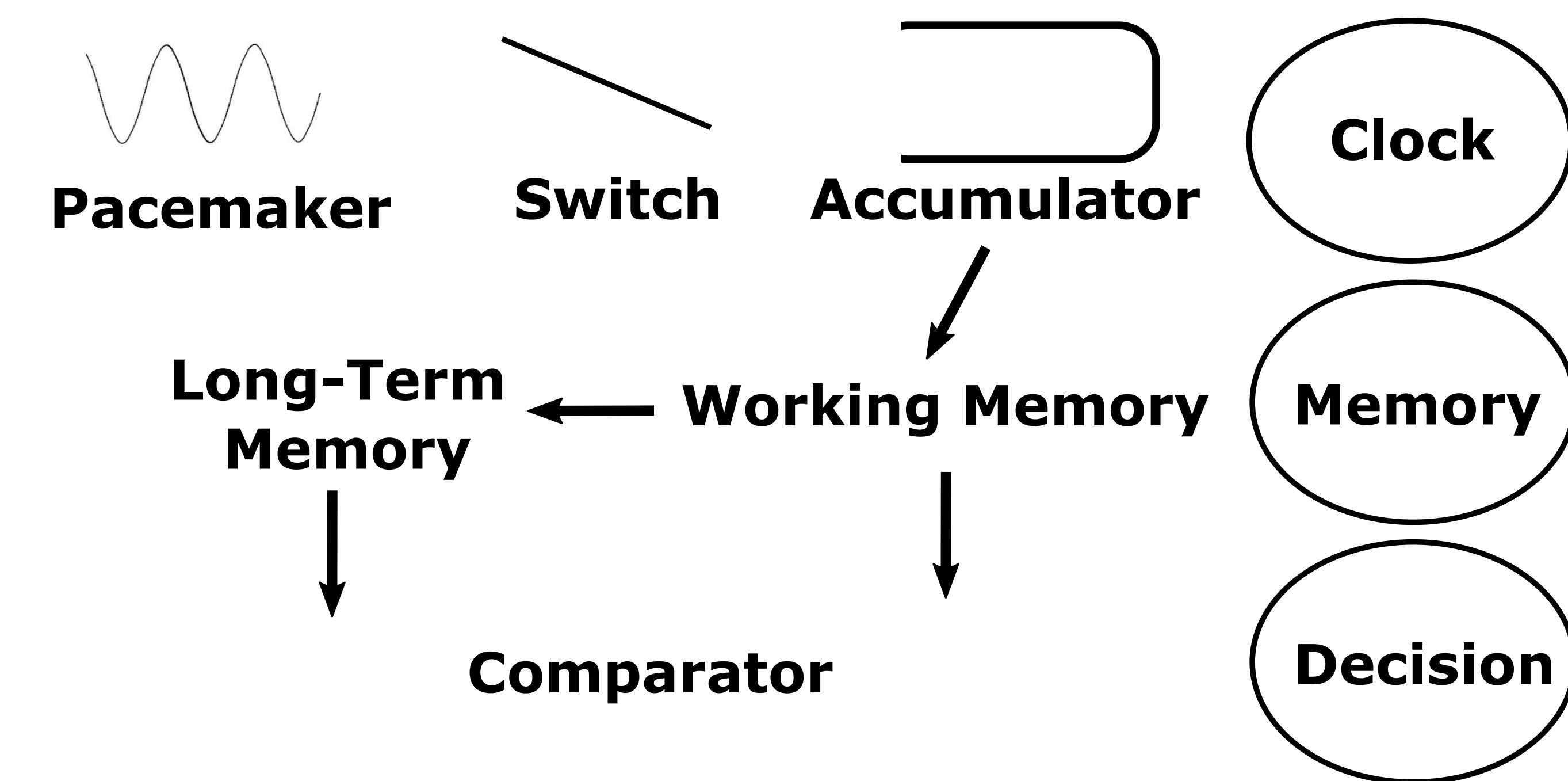
- Autism is a lifelong, neurodevelopmental condition which can impact communication, social interaction, sensory processing and motor control
- The temporal deficit hypothesis (Allman, 2011) proposes that timing and time perception is disrupted in the condition. Deficits in sub-second timing are proposed 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 timing deficits in autism are mixed and dependent on the nature of the task. Work to date has not been well grounded in established models of time perception
- We used a battery of timing tasks derived from Scalar Expectancy Theory and recruited a large sample of participants

### Research questions

Is precision in estimates of duration reduced in autistic adults in comparison with non-autistic (neurotypical) controls?  
Is there a general timing impairment in autism?

## Scalar Expectancy Theory

- Dedicated 'clock' type timing system in the brain



## General Method

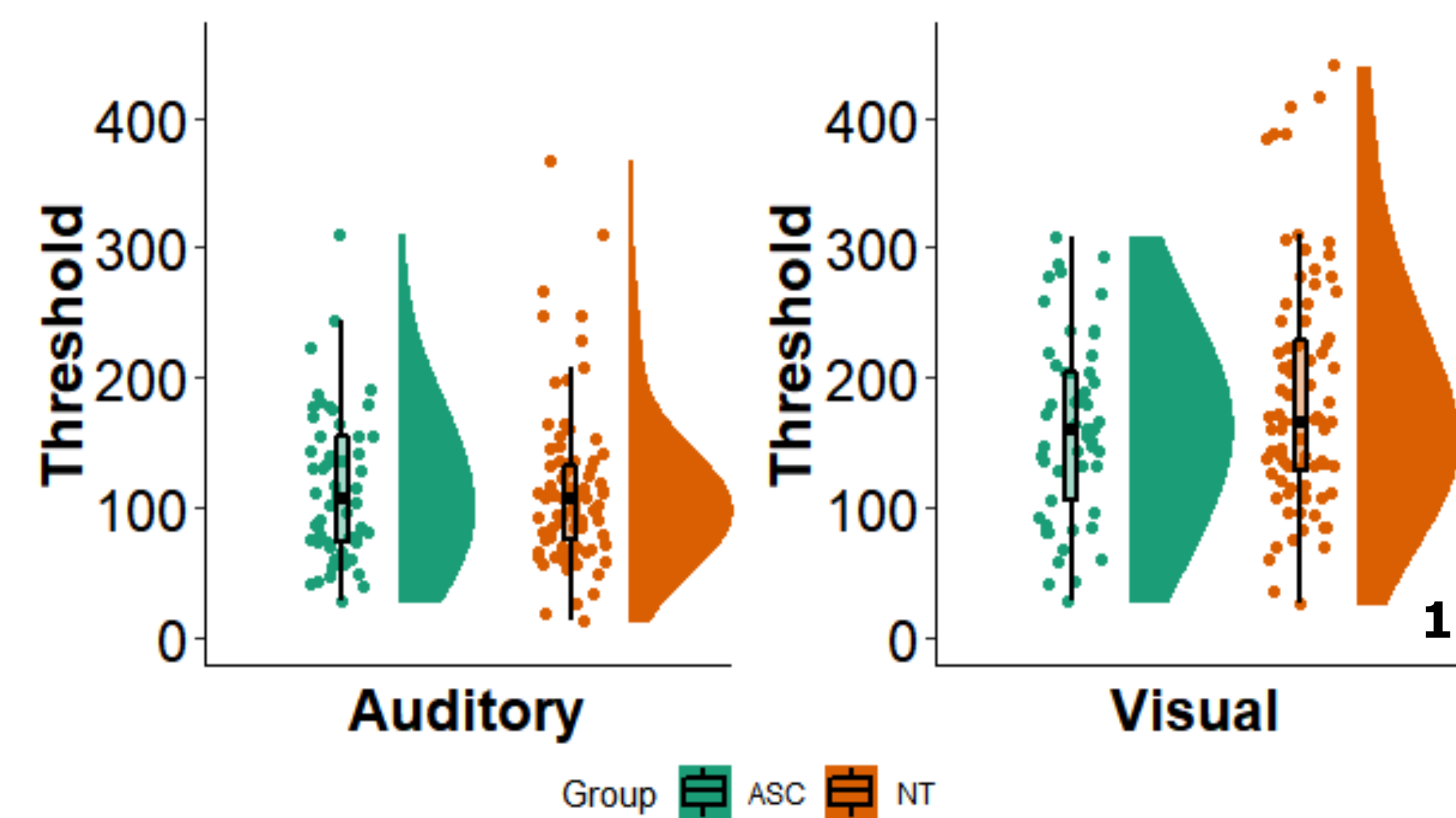
	Autistic (n = 57)	Neurotypical (n = 91)
Age	31.34 ± 8.91	30.38 ± 7.75
FSIQ	115.51 ± 13.21	114.99 ± 11.42

- 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/>

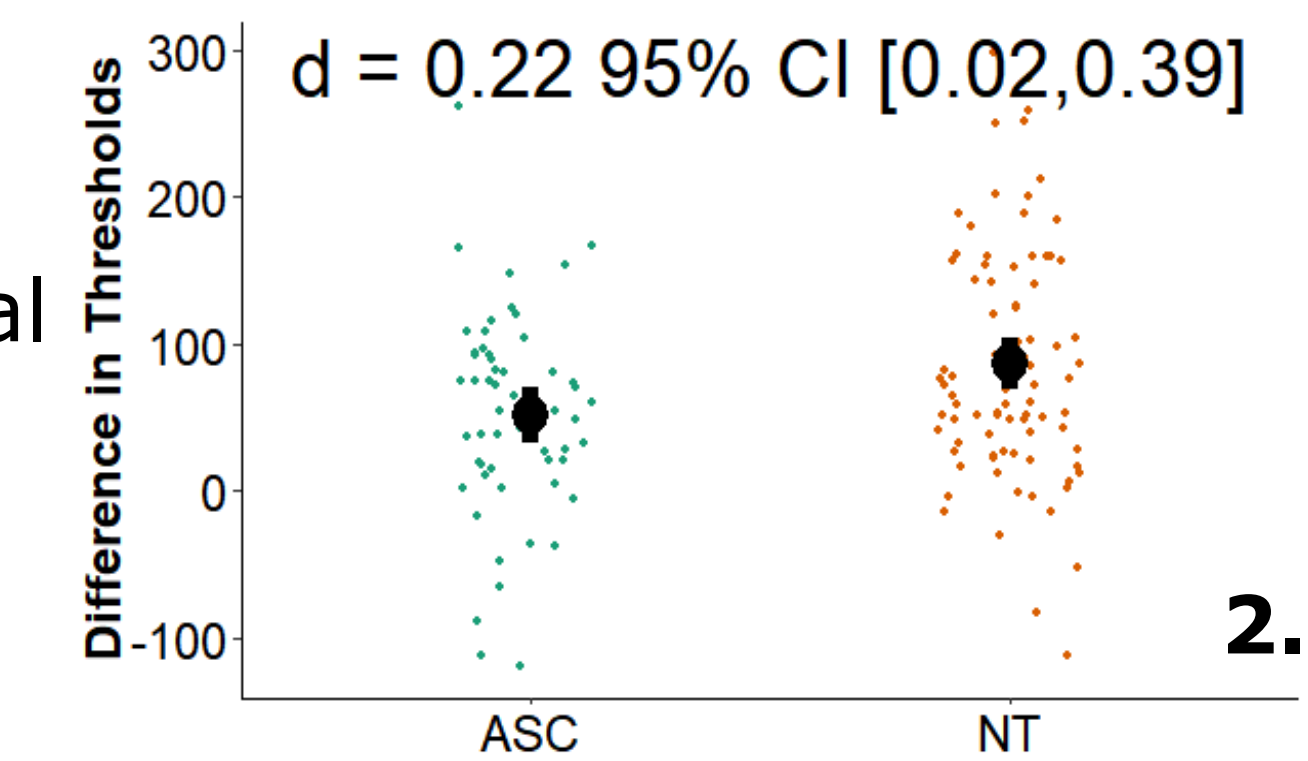
## Threshold Task



- 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)
- Lowest threshold determined after two runs taken as threshold for that condition (lower threshold = more precise)



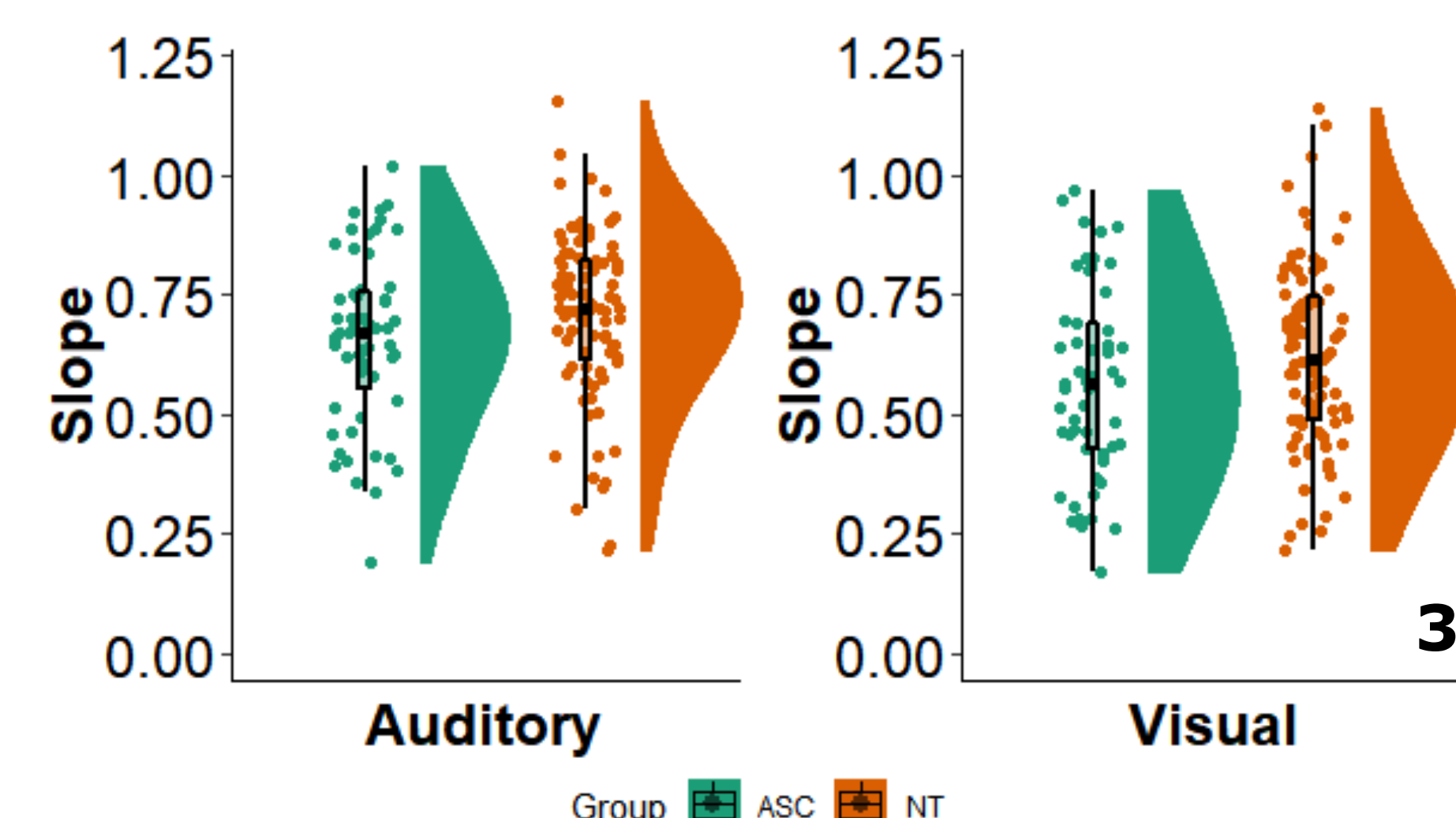
- Thresholds reduced for auditory durations (see Fig 1)
- No difference in auditory or visual thresholds between groups, but difference between thresholds was smaller for autistic group (see Fig 2)



## 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)

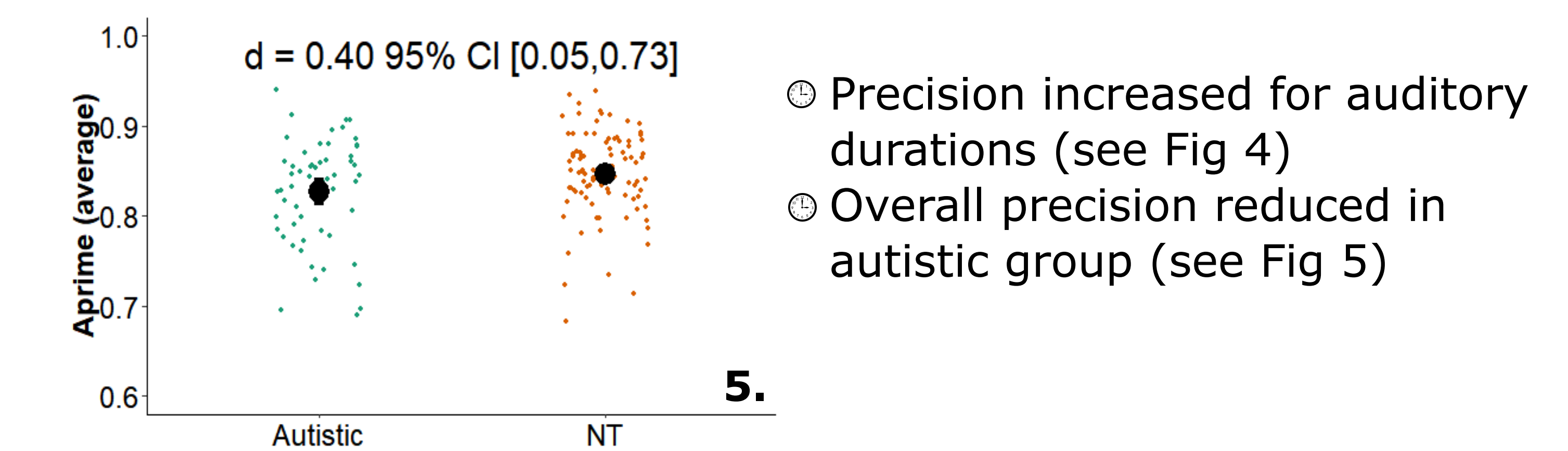
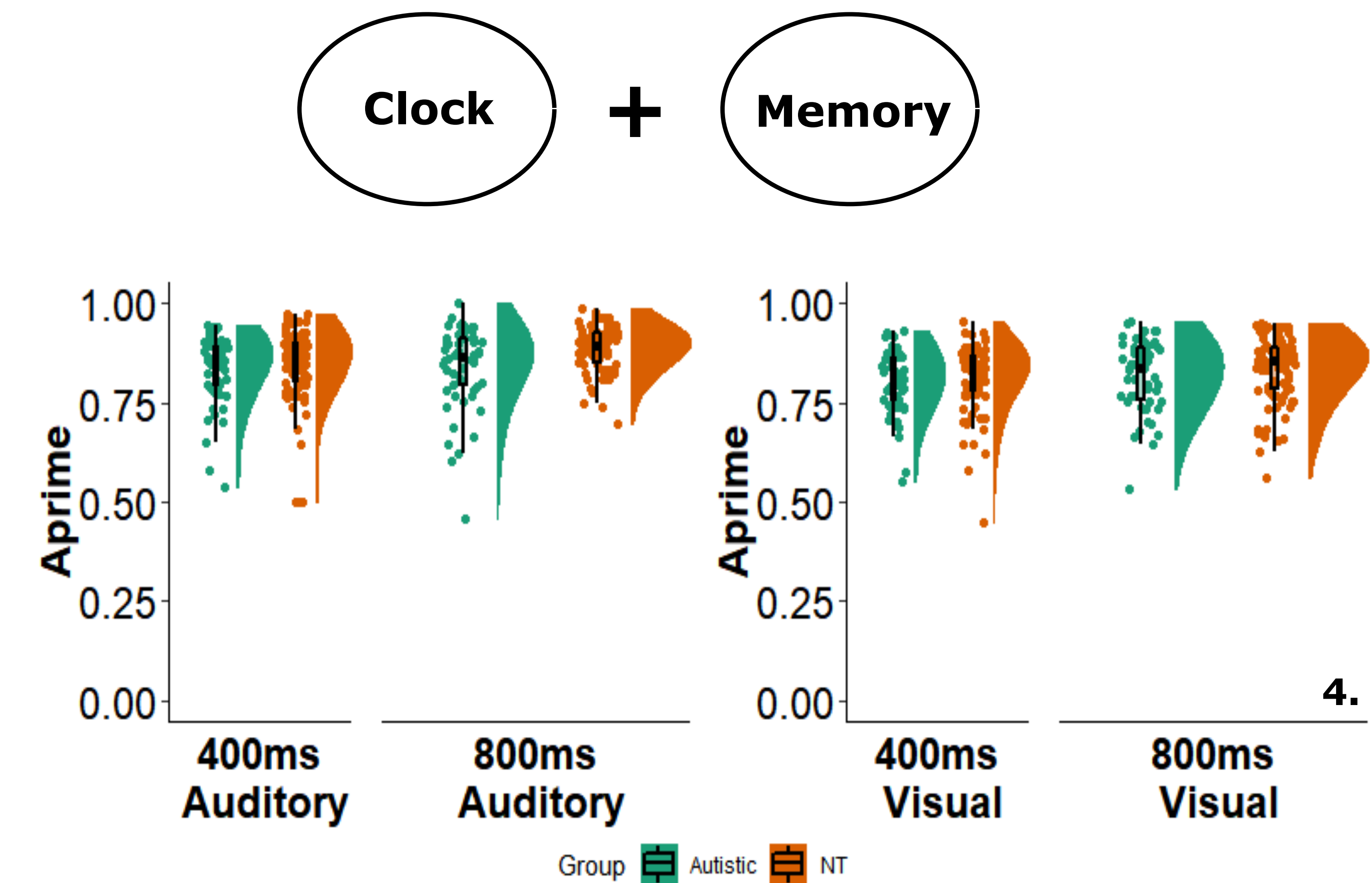


- Slopes increased for auditory durations
- No differences between the groups (see Fig 3)

## Temporal Generalisation Task



- Participant asked to remember a standard (400ms or 800ms duration) and is asked if comparison durations are the same as the one they remembered
- Signal detection analysis to extract A'Prime a non-parametric measure of sensitivity (increased A'Prime = more precise)



- Precision increased for auditory durations (see Fig 4)
- Overall precision reduced in autistic group (see Fig 5)

## Discussion

- Smaller modality effect in autistic group observed in threshold experiment, but not replicated across tasks
- Memory for duration may be implicated in autism
- In further analysis we are using unsupervised learning to identify any sub-groups in the autistic and neurotypical groups

**There is no generalised timing impairment in autism**

### References

Allman, M (2011) *Frontiers in Integrative Neuroscience*, 5 2  
Casassus M. et al (2019) *Autism Research*, 12 (10): 1440 - 1462