

Adults with ASD use prior in a visual categorization task

Laurina Fazioli, Bat-Sheva Hadad, Amit Yashar

Introduction

A Bayesian model of perception

According to **Bayesian theory**, perception incorporates 3 sources of information¹:

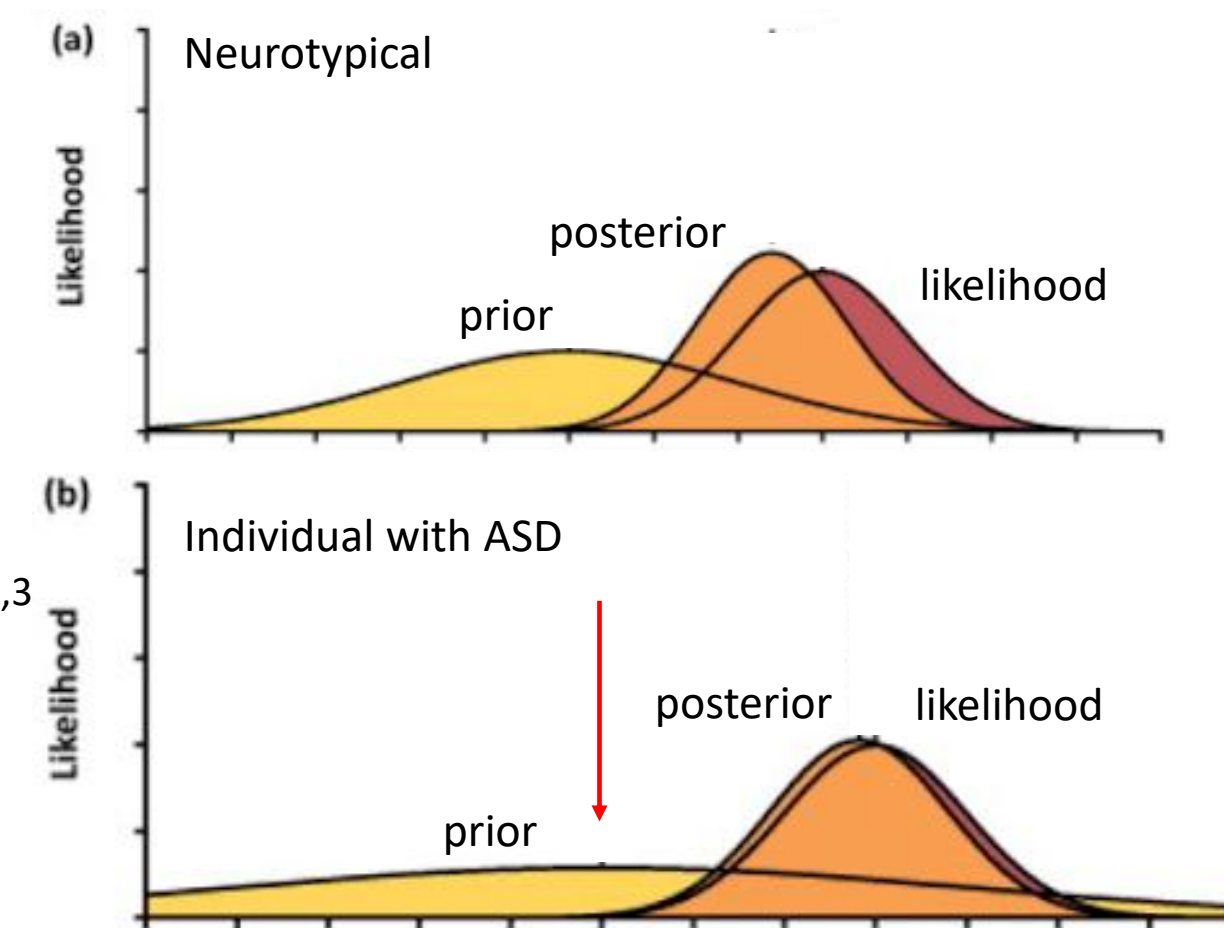
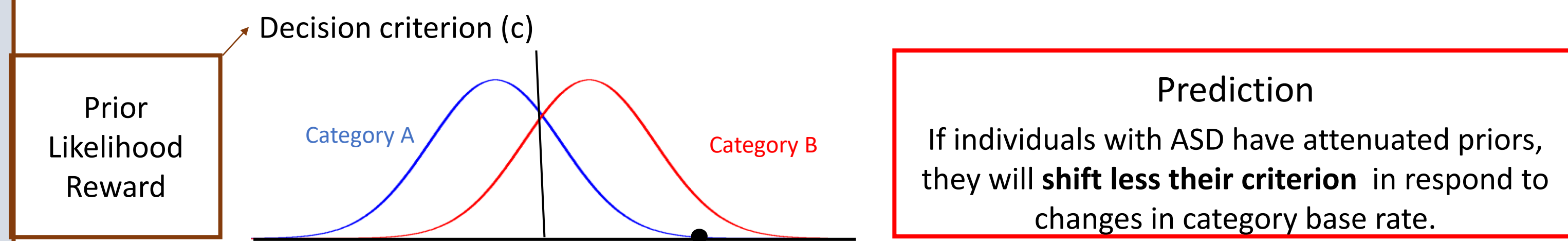
- **Prior** = The initial probability for a given stimulus (Expectation)
- **Likelihood** = The sensory evidence (Noisy signal)
- **Reward** = The Expected cost of each action (Motivation)

ASD

Recent model: Individuals with ASD rely less on prior knowledge^{2,3}

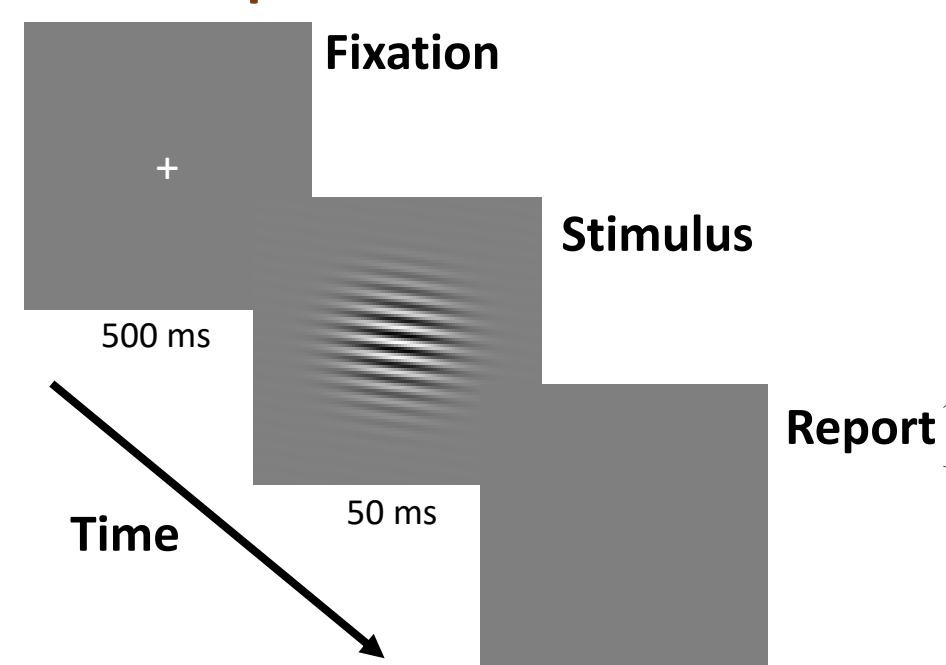
Hypothesis of attenuated priors in ASD⁴

Signal Detection Theory

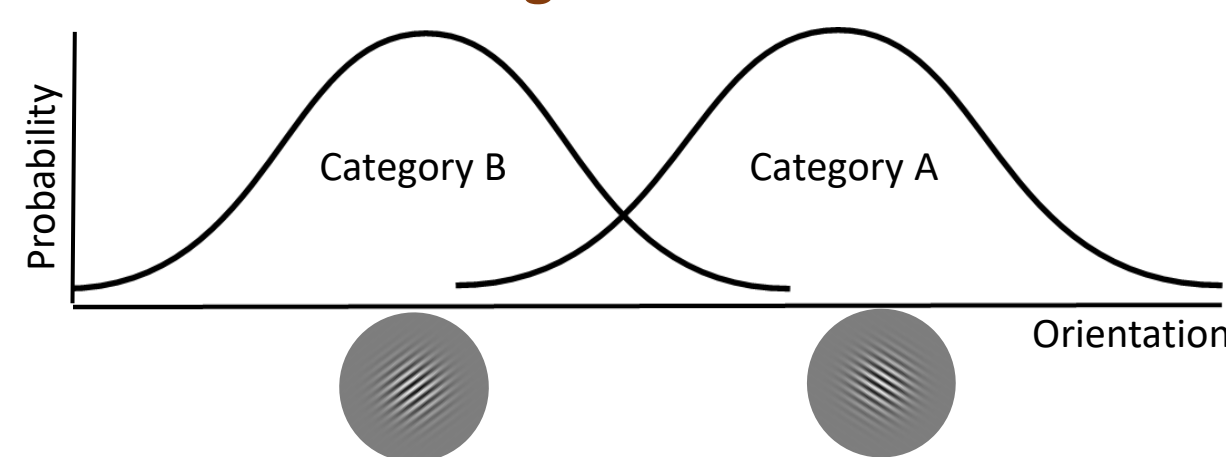


Method

Trial sequence



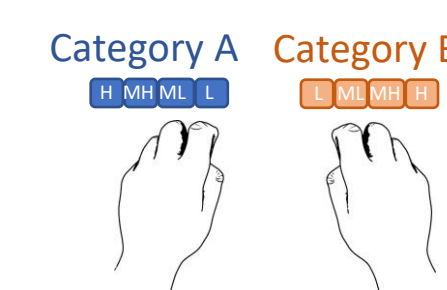
Main task: Categorization of orientation



Secondary task: Confidence report

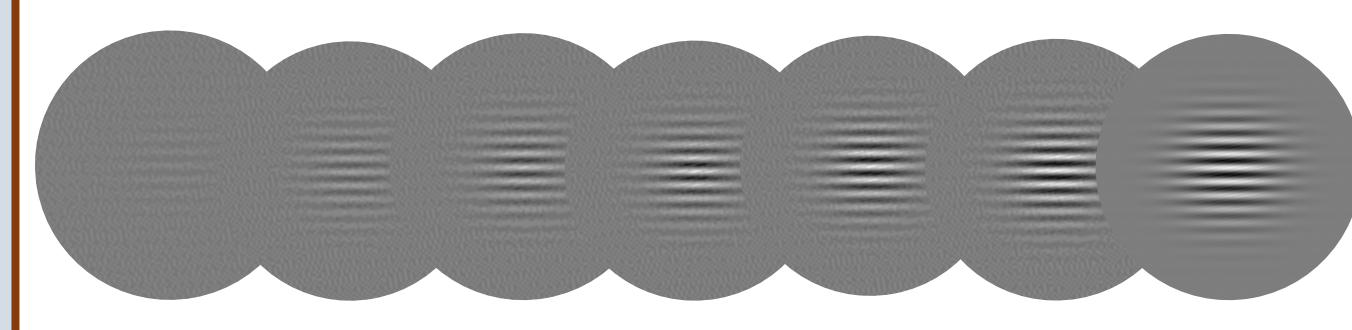
Each key correspond to a category and a confidence level:

High
Medium high
Medium low
Low



Likelihood Manipulation

With 7 level of contrast

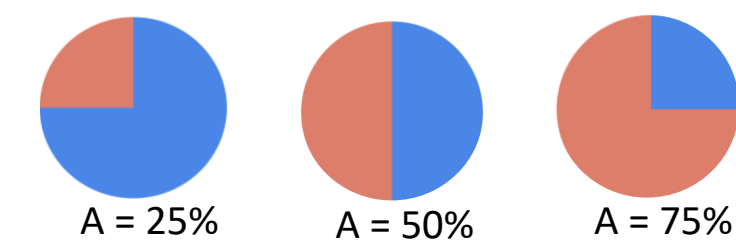


Impact the d' (sensitivity)

Prior manipulation

We varied category base rate within a block

a) 3 blocks of probability of appearance for each category



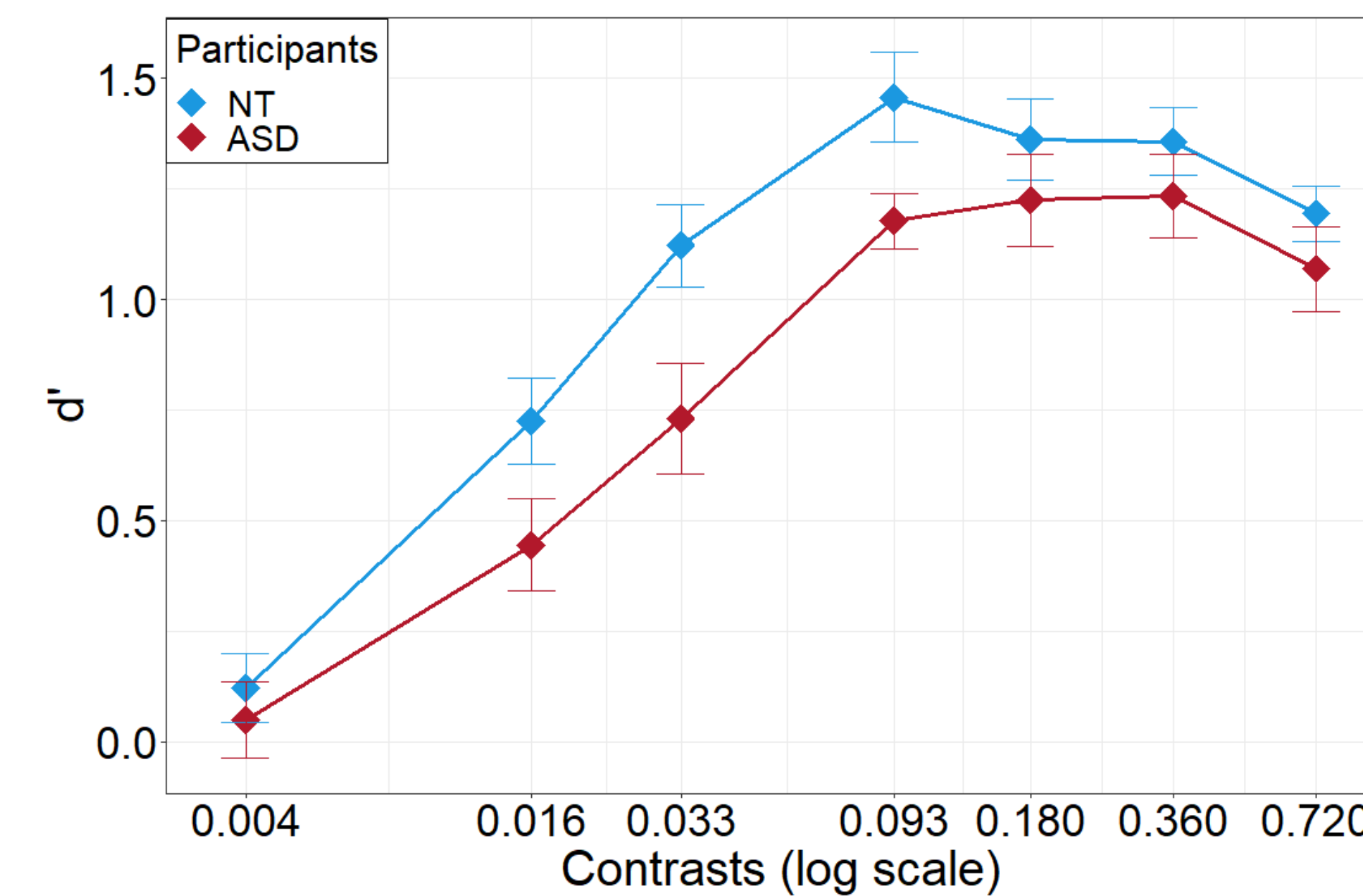
b) Prior manipulation check

We asked observer to gamble on the orientation category in the upcoming trial

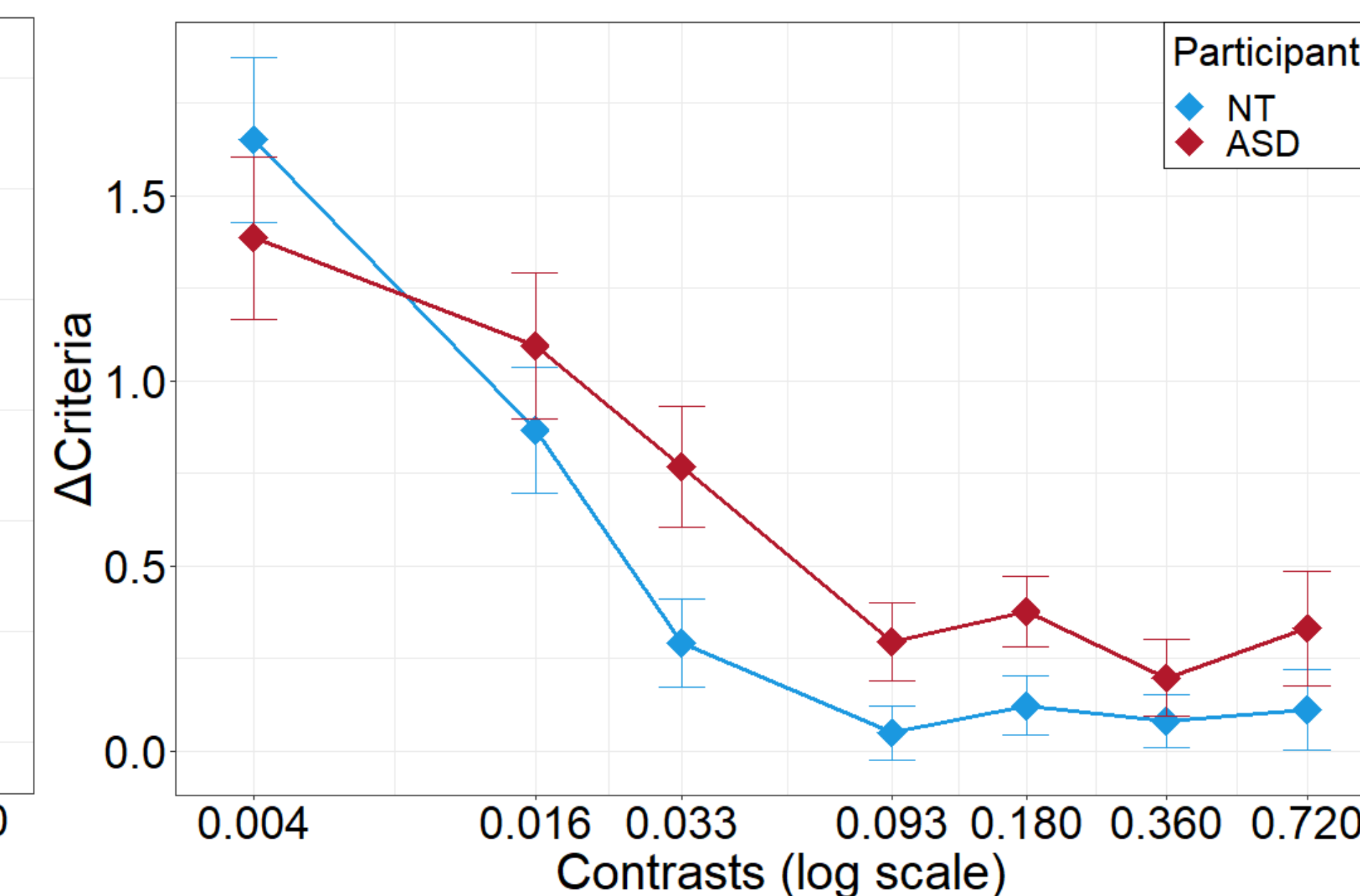
From 0 to 99, how much do you gamble on the category A?

Results

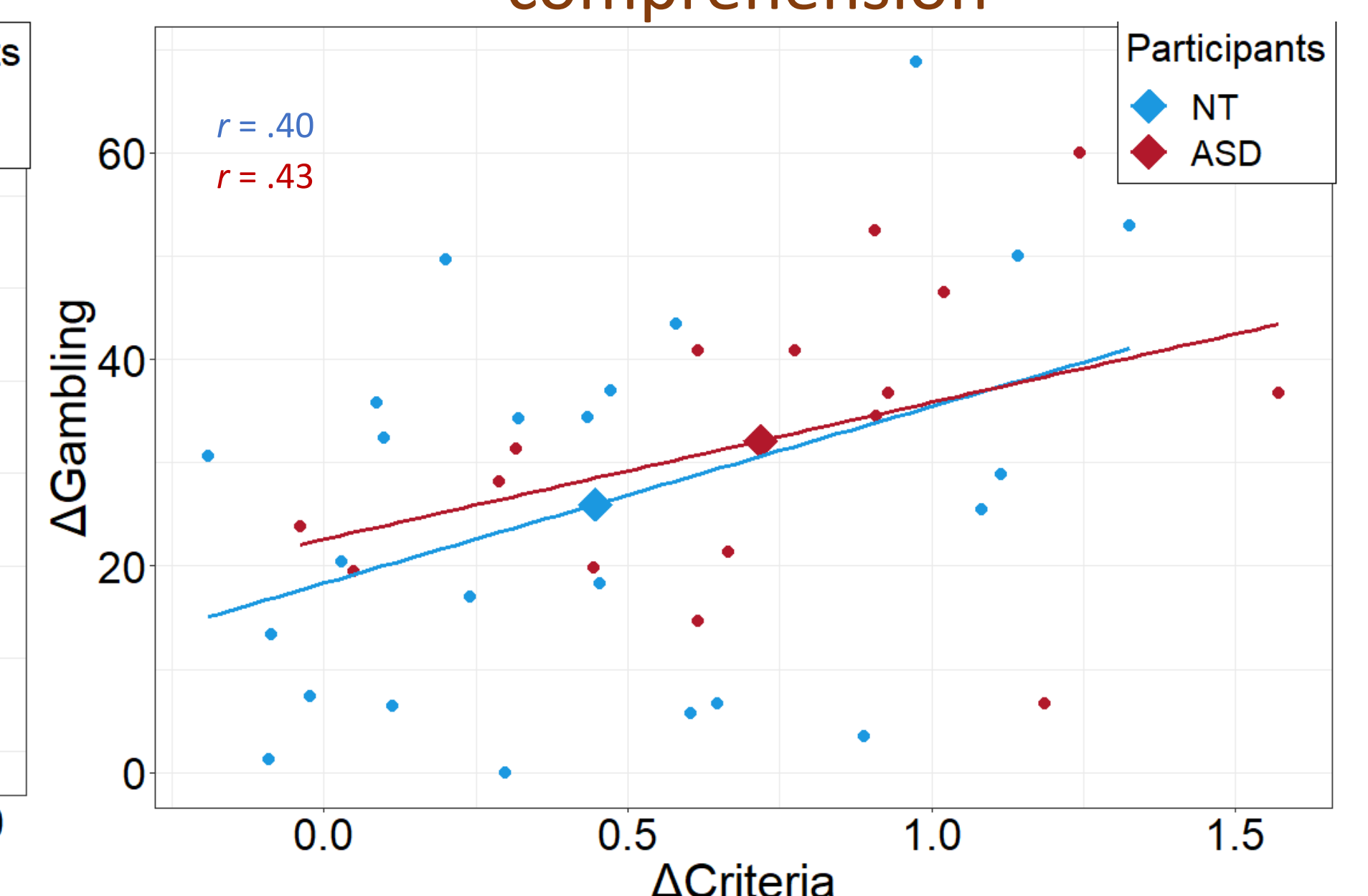
Lower sensitivity in ASD



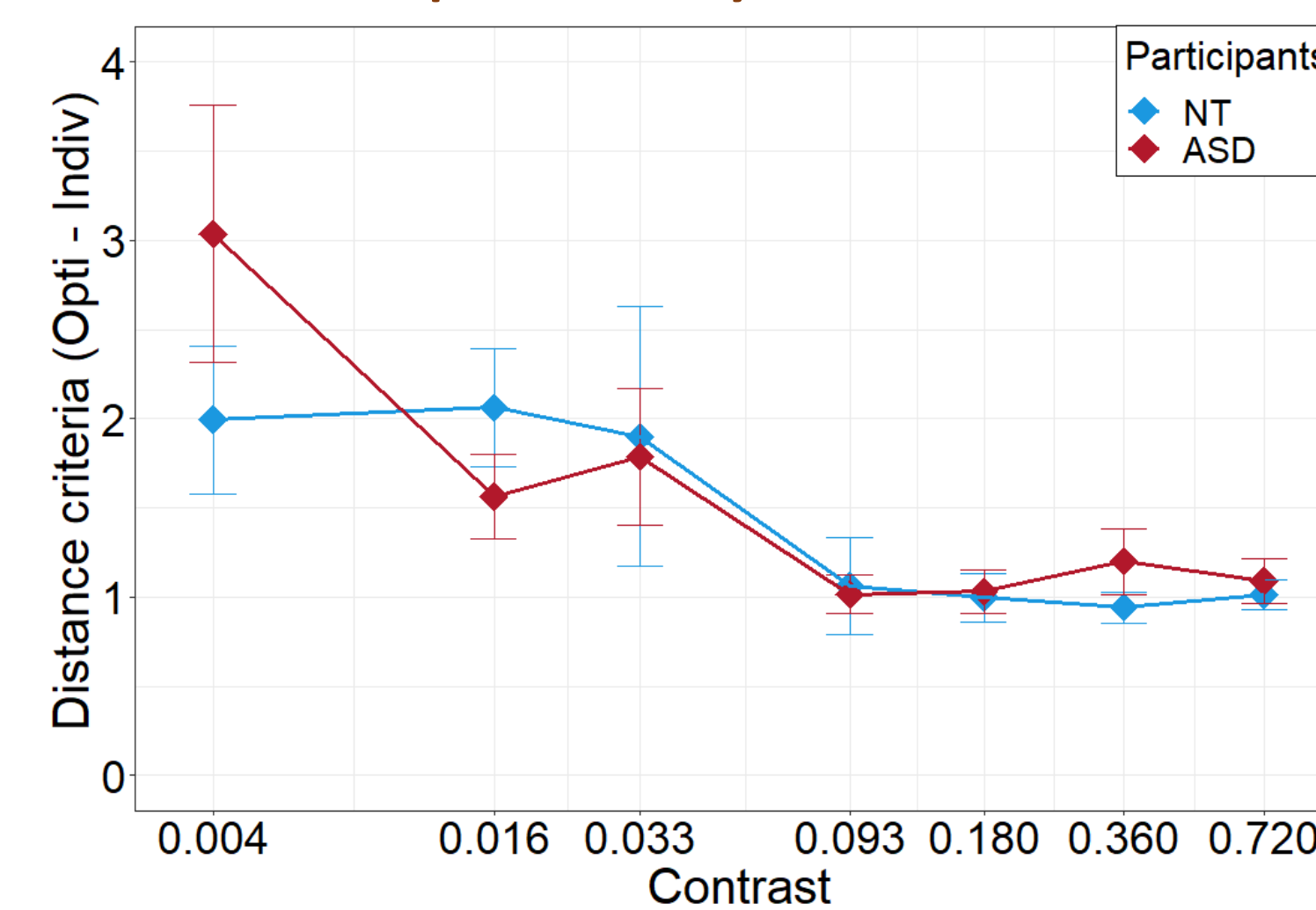
Similar criteria shift between ASD and NT



Criteria shift is correlated with prior comprehension



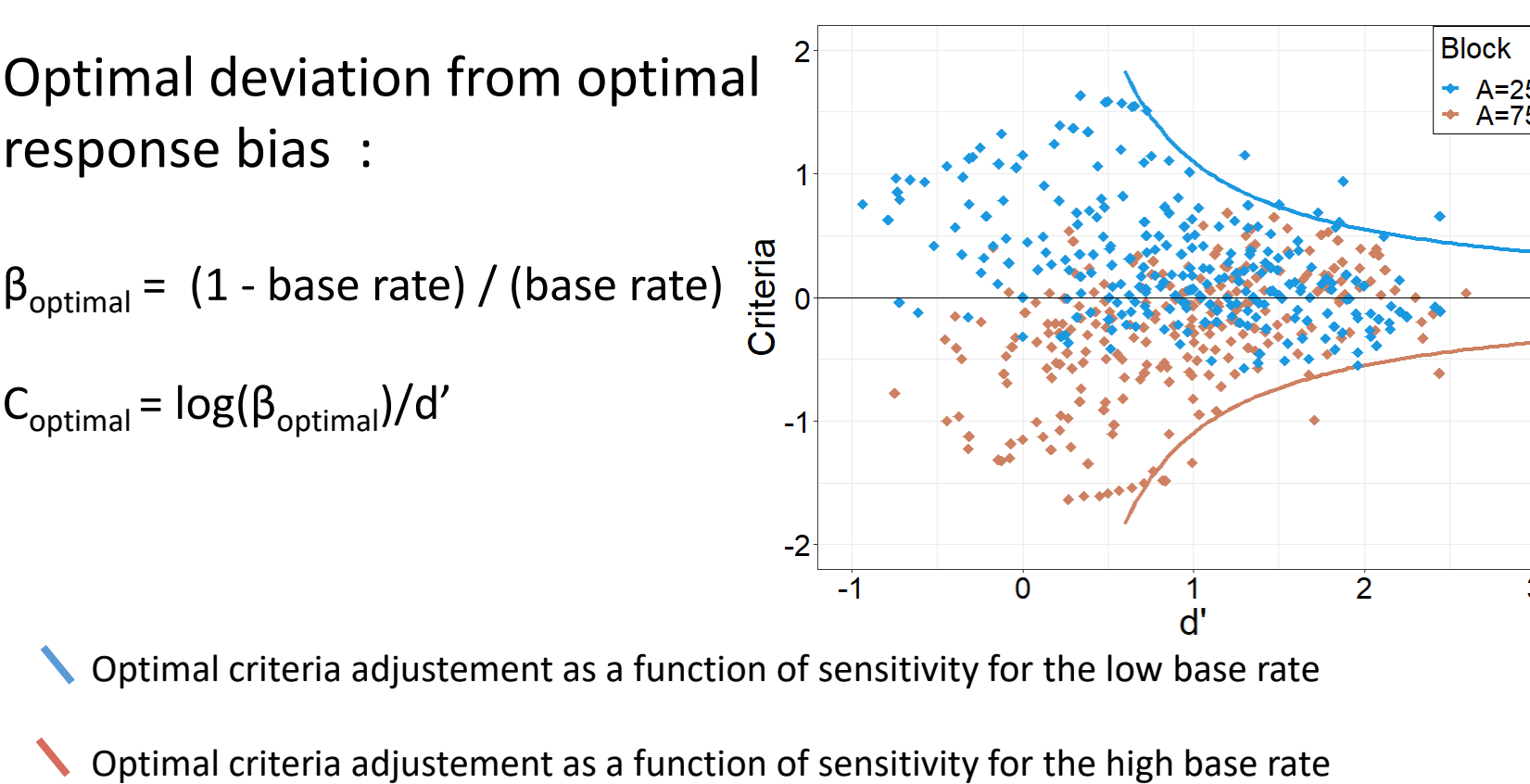
Similar optimality of criteria shift



Optimal deviation from optimal response bias:

$$\beta_{\text{optimal}} = (1 - \text{base rate}) / (\text{base rate})$$

$$C_{\text{optimal}} = \log(\beta_{\text{optimal}}) / d'$$



Conclusions

1. Individuals with ASD show **lower sensitivity** compared to NT in an orientation discrimination task
2. Both groups are sub-optimal
3. The **criterion adjustment correlates with explicit prior knowledge**

Individuals with ASD use perceptual prior similarly to NT

- ☐ Conducting two experiments to manipulate the **Reward** and the **Likelihood** to analyse whether and how they influence the criteria shift, and if we can observe a difference between NT and ASD

References

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Laurina.fazioli@hotmail.fr