

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 :

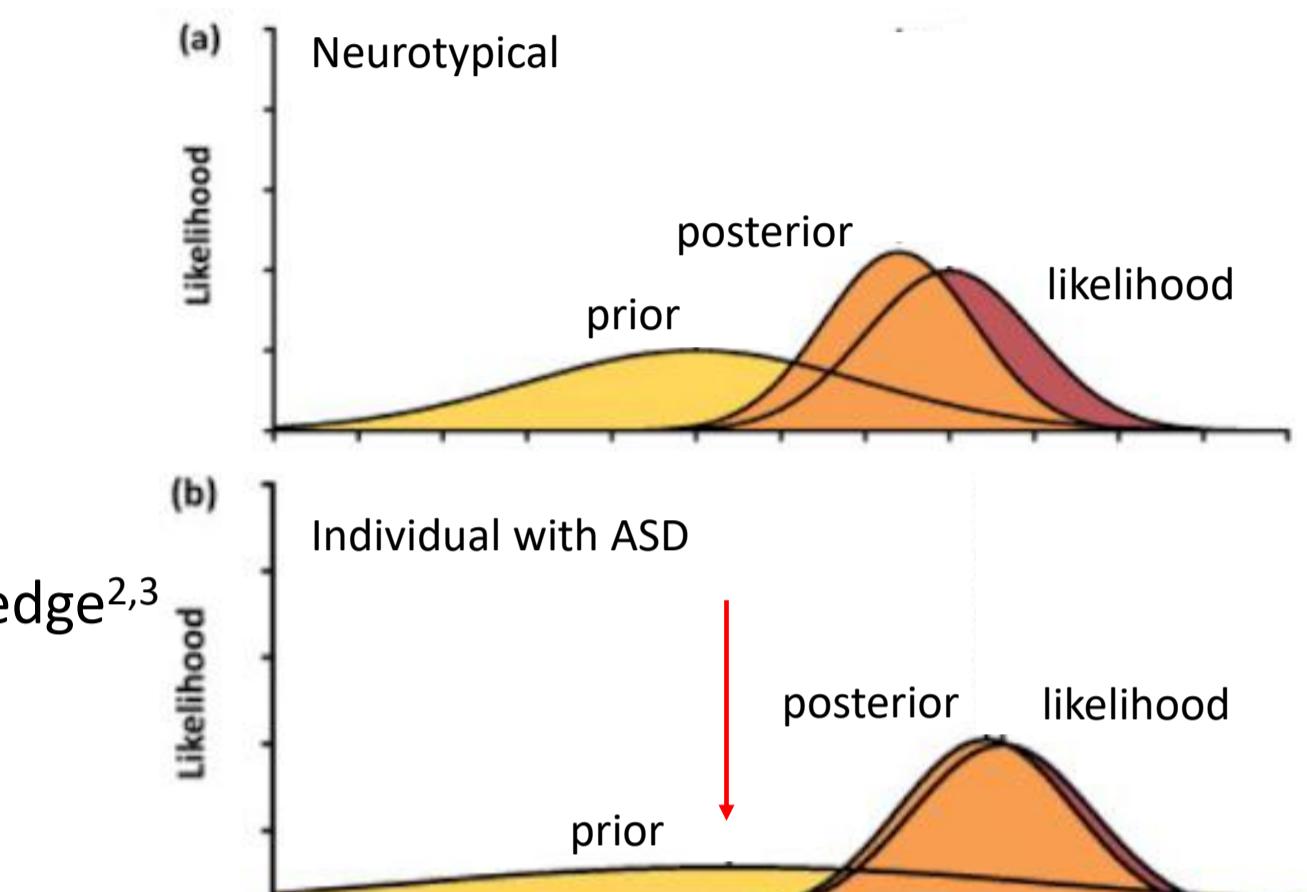
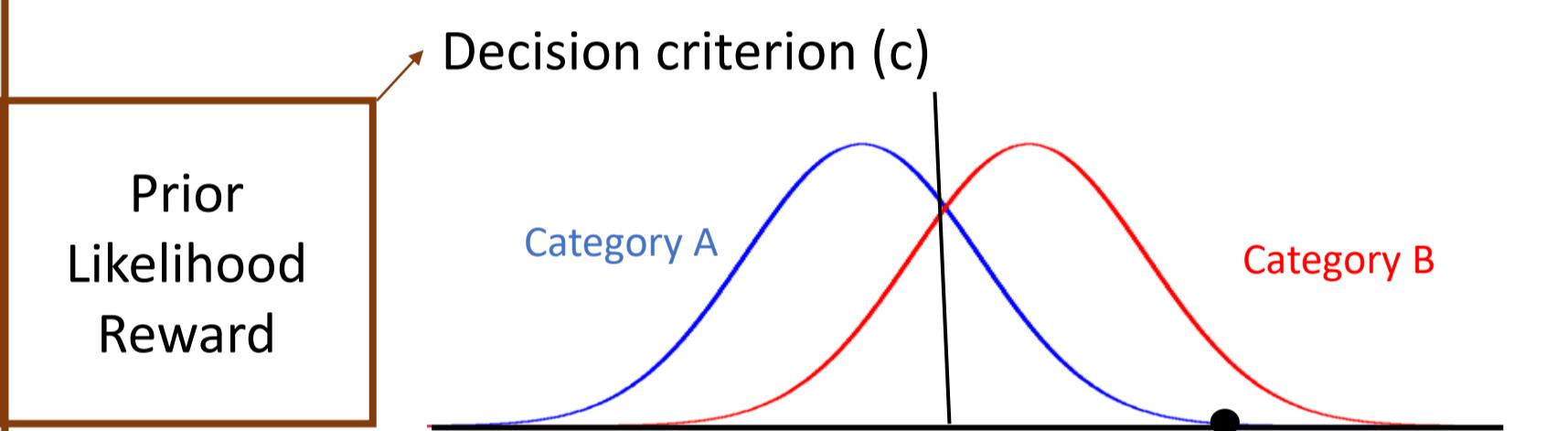
- **Prior** = The initial probability for a given stimulus (Expectation)
- **Likelihood** = The sensory evidence (Noisy signal)
- **Reward** = The Expected cost of each action (Motivation)

ASD

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

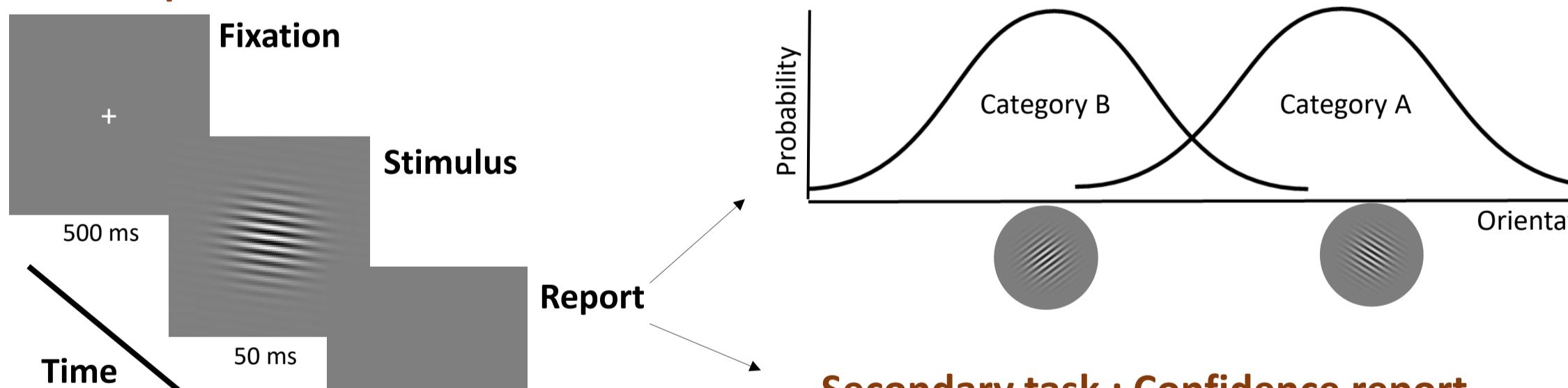
Hypothesis of attenuated priors in ASD⁴

Signal Detection Theory

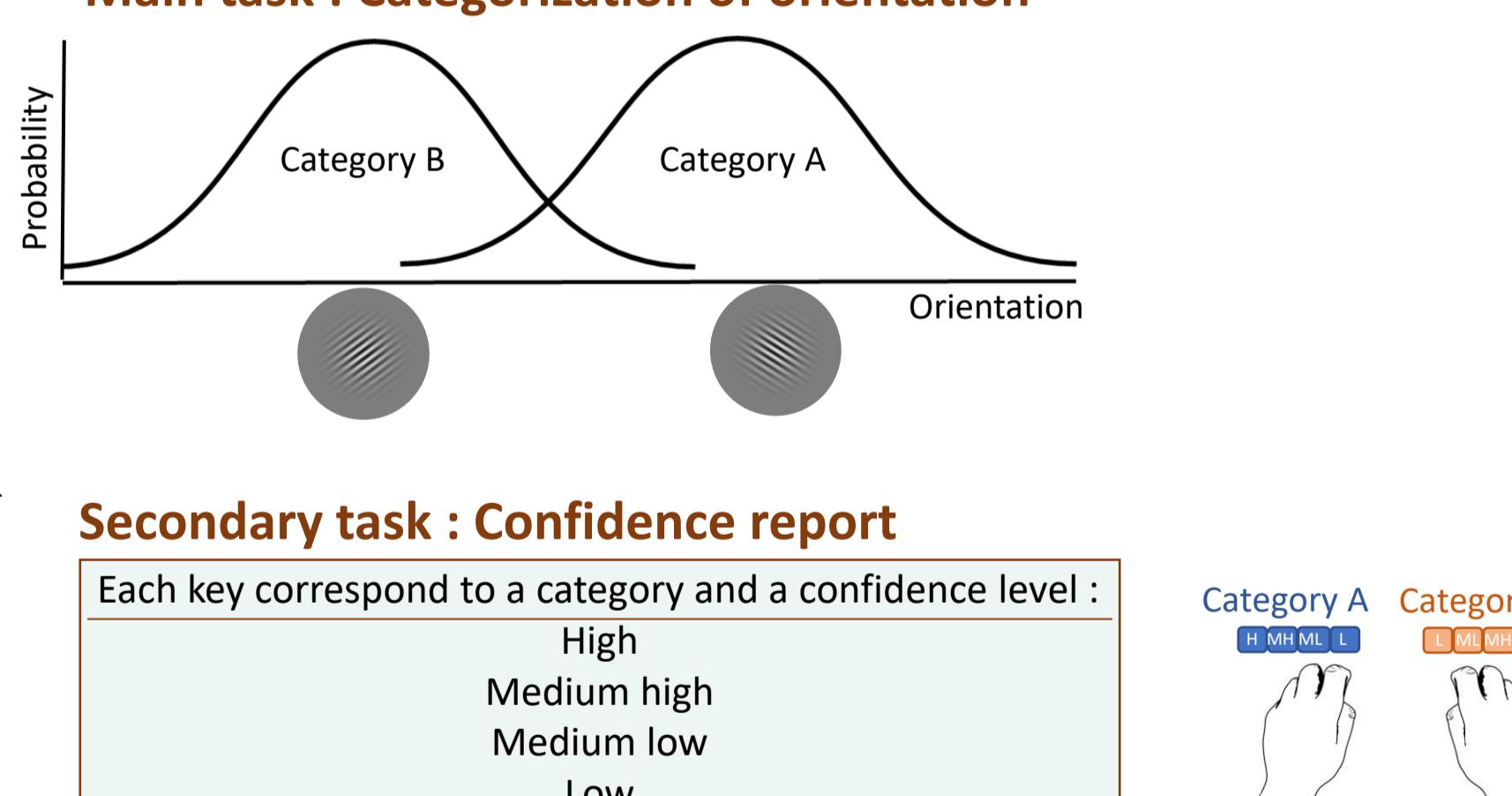


Method

Trial sequence

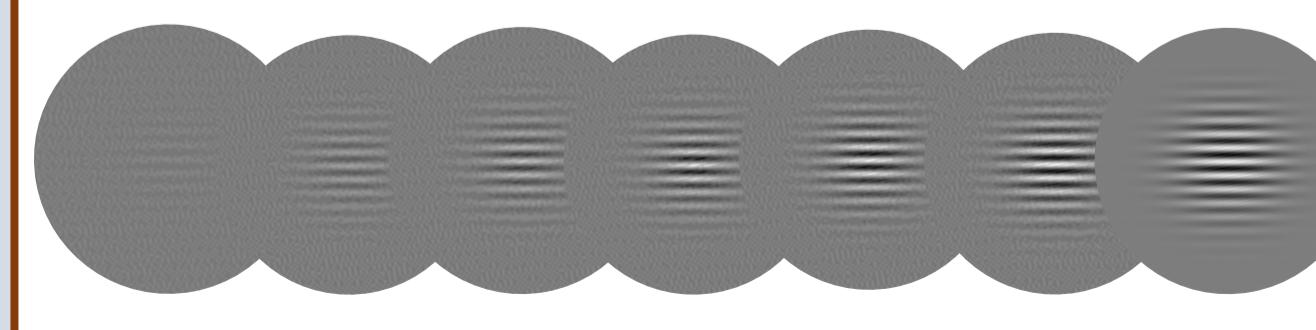


Main task : Categorization of orientation



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



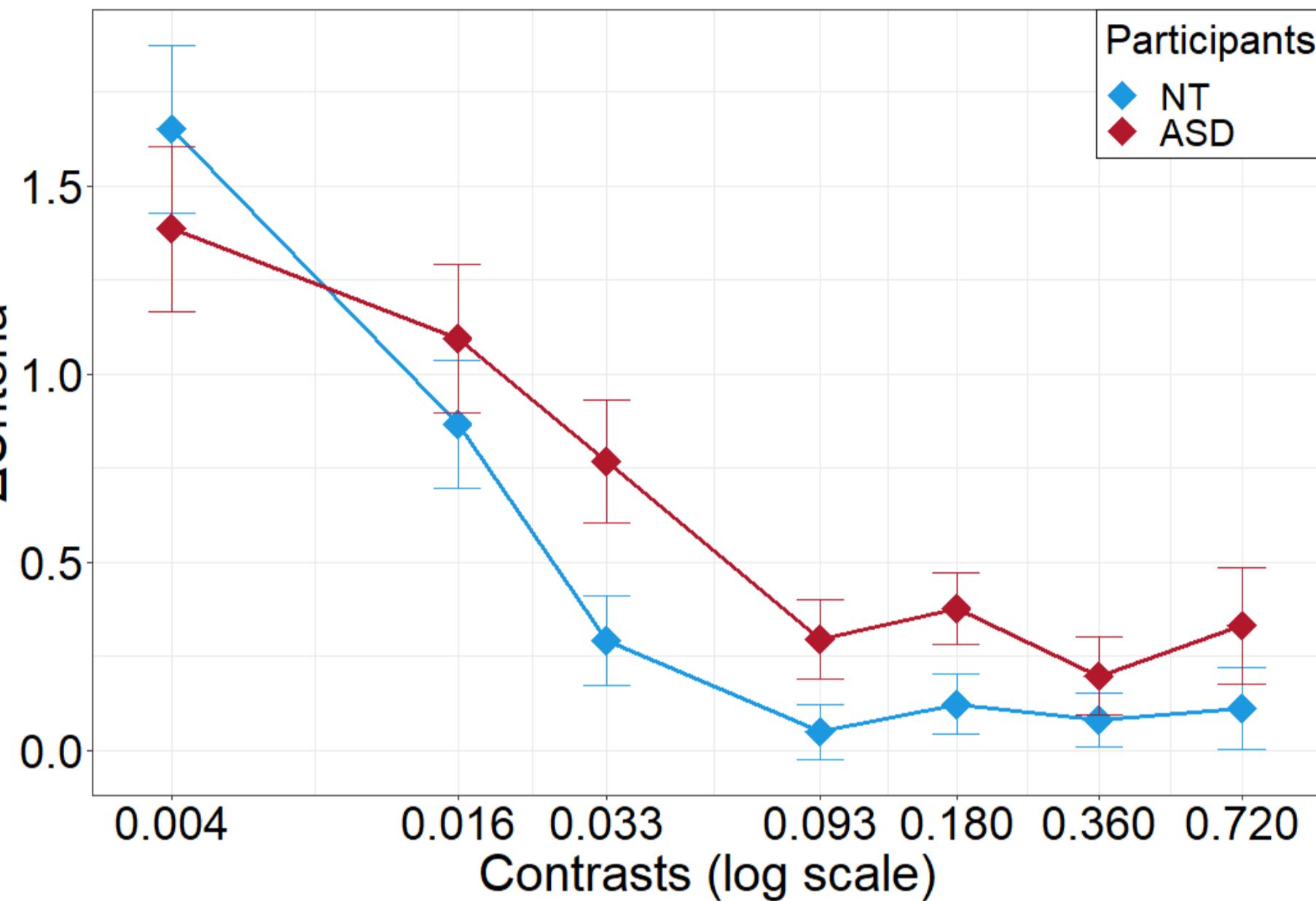
b) Prior manipulation check

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

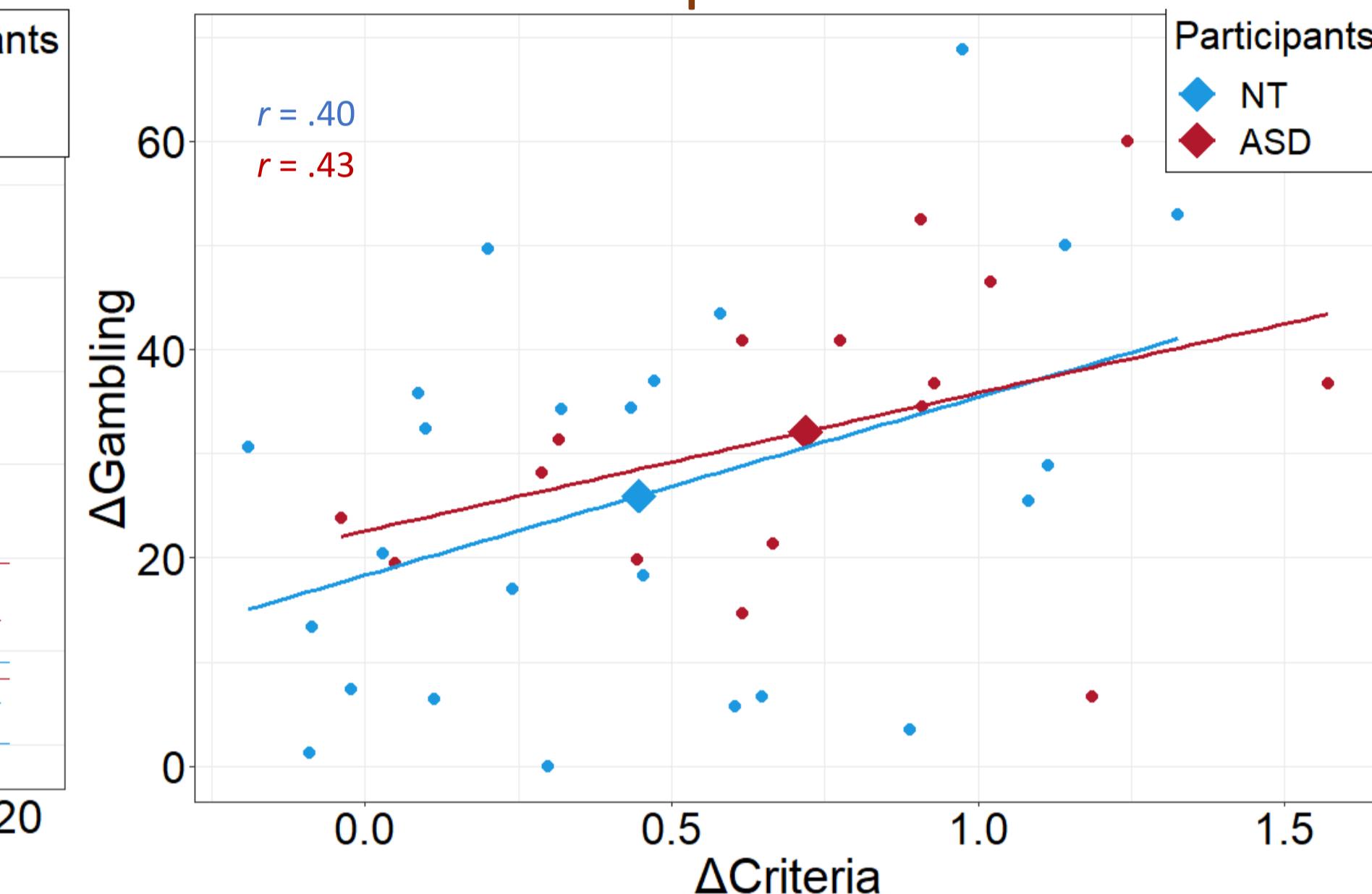
From 0 to 99, how much do you gamble on the category A ?

Results

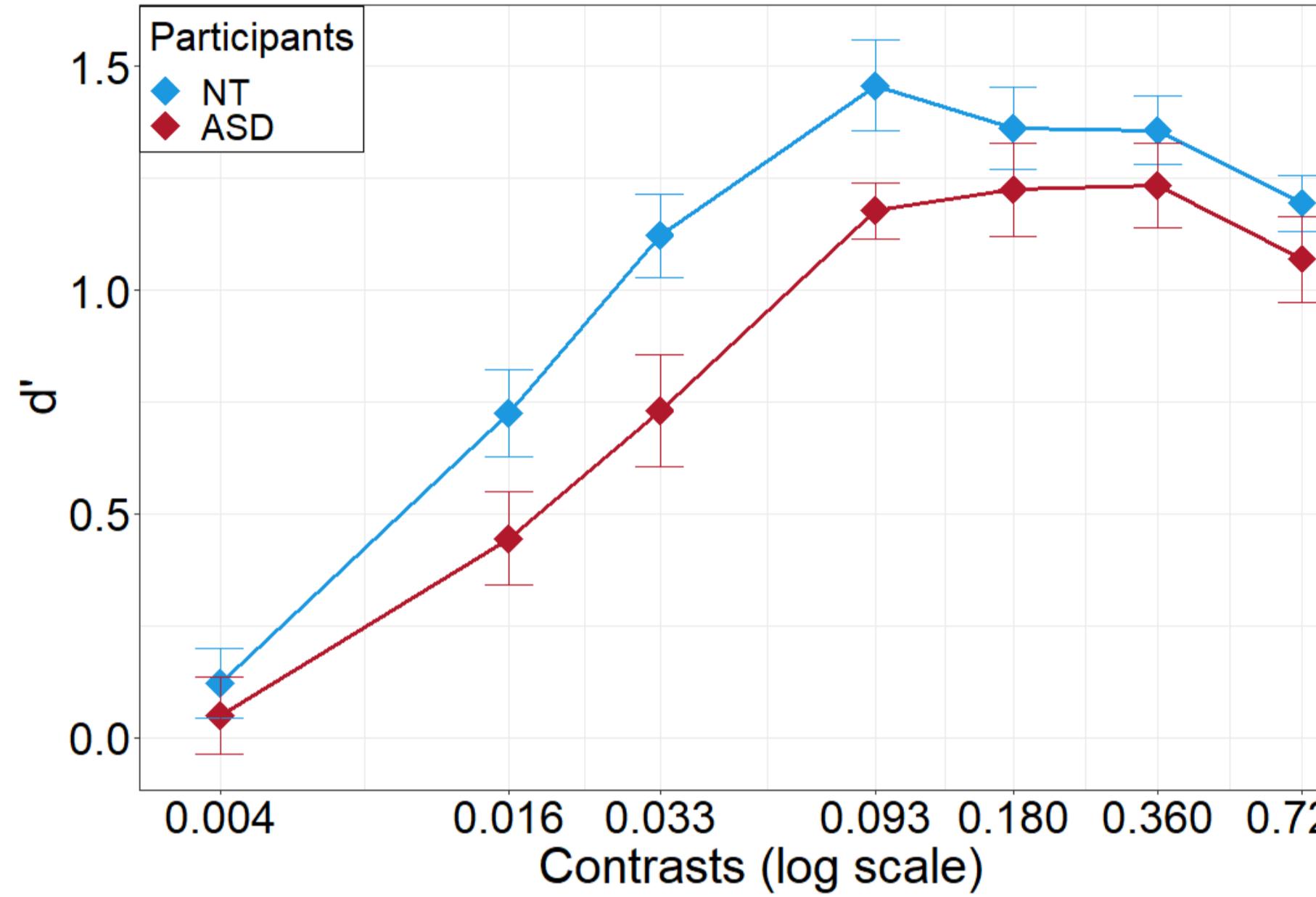
Similar criteria shift between ASD and NT



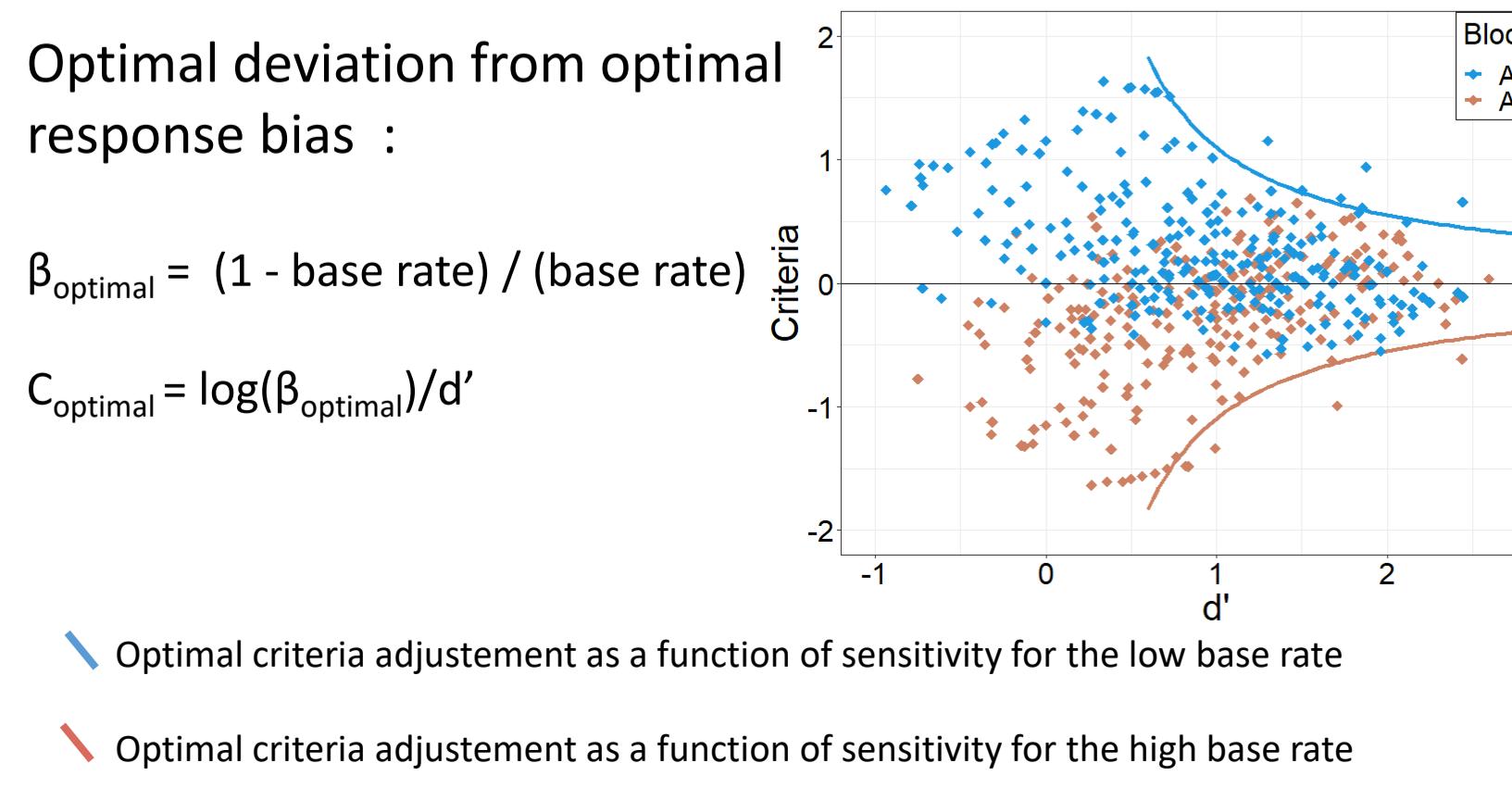
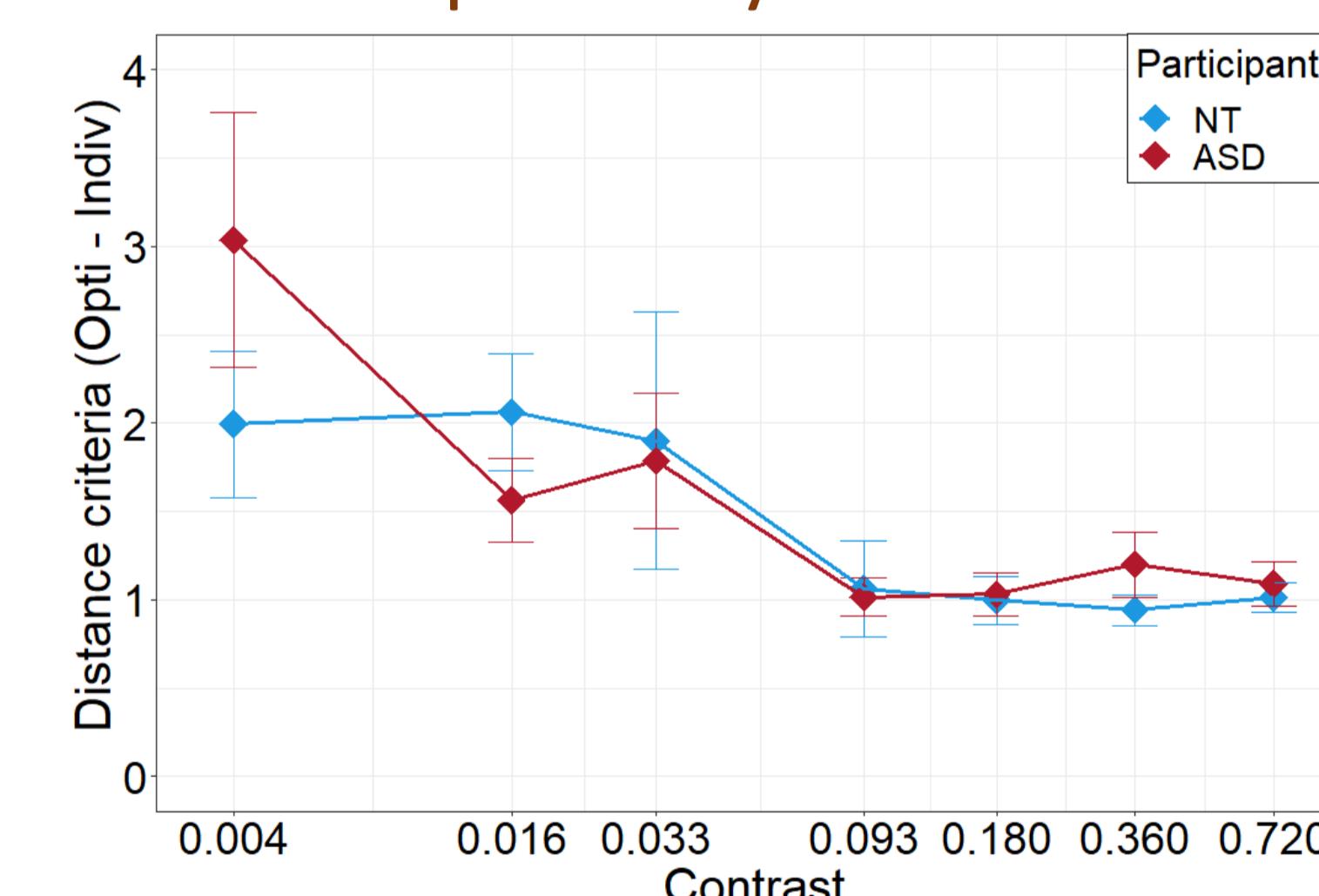
Criteria shift is correlated with prior comprehension



Lower sensitivity in ASD



Similar optimality of criteria shift



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

1. Rahnev, D. & Denison, R. N. Suboptimality in perceptual decision making. (2019) doi:10.1017/S0140525X18000936.
2. Lawson, R. P., Rees, G., & Friston, K. J. (2014). An aberrant precision account of autism. *Frontiers in human neuroscience*, 8, 302.
3. Król, M., & Król, M. (2019). The world as we know it and the world as it is: Eye-movement patterns reveal decreased use of prior knowledge in individuals with autism. *Autism Research*, 12(9), 1386-1398.
4. Pellicano, E., & Burr, D. (2012). When the world becomes 'too real': a Bayesian explanation of autistic perception. *Trends in cognitive sciences*, 16(10), 504-510.
5. Adler, W. T., & Ma, W. J. (2018). Comparing Bayesian and non-Bayesian accounts of human confidence reports. *PLoS computational biology*, 14(11), e1006572.