

Introduction

Autism Spectrum Disorder (ASD) is a prevalent neurodevelopmental condition characterized by a complex and still unknown aetiology. According to the National Autistic Society in the UK, **over 1 in 100 individuals** in the country are part of the autism spectrum, equating to approximately 700,000 autistic individuals in the UK alone¹. This underscores the compelling need for us to delve deeper, meticulously unravel its intricacies, and strive to gain a comprehensive understanding of ASD. According to the DSM-5, ASD is characterised by difficulty in communication and interaction with people, restricted interest, repetitive behaviours, and symptoms that affect their ability to function at school, work and other areas of life².

Aim

To investigate the behavioural characteristics of ASD in marmoset monkeys. The study used a **social prediction task** that employed a **touch screen** to collect data and computational analysis to analyse behaviour using MATLAB.

Methodology

4 Marmoset Monkeys were chosen for the project and were given a step wise progression in terms of task difficulty and were adjusted for their spatial biases. Moreover, for the cross-species analysis, A Macaque Monkey named “Alvar” was chosen for the Step 3.

Step 1 – Reward was given on touching either button on left or right of the screen.

Step 2 – Reward was given on touching the button which was against their spatial bias.

Step 3 – Contingency shifted after 36 trials with 95% chance of reward.

Study Conditions:

- Each task was given for 30 minutes to each marmoset.
- There was no food or water restriction, and fruit juice was given as a reward for the task.
- All Marmoset were in 12 hours cycle of light and dark.
- Average temperature of the Marmoset unit was 25.6 degree Celsius.
- Marmosets during the task were separated with each other in the same cage.

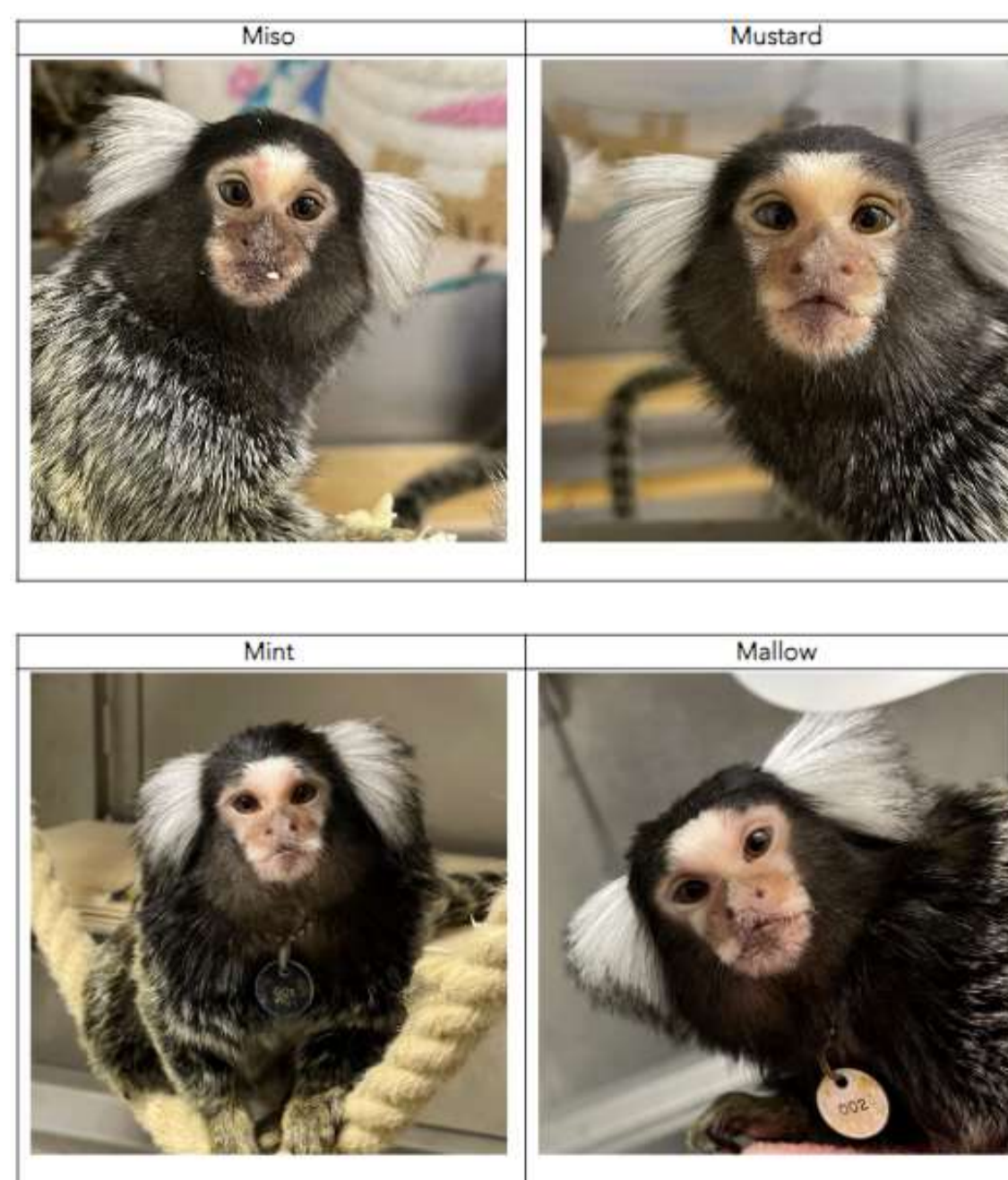


Fig 1: 4 Marmosets part of the study

Results

Step1: 3 marmosets participated in step 1. Among them, two exhibited a spatial bias, with 87% and 84% in favour of the right button, while the third marmoset displayed a spatial bias of 93% toward the left button. On average, each marmoset completed approximately 496.6 trials during this step, with trial counts ranging from 463 to 549 trials.

Step 2: It was essential training for the marmosets to progress to step 3. Initially, all marmosets showed strong biases and hesitated to touch the opposing button, but after a week of trials, they adapted.

Step 3 and Cross species analysis: Only one of the marmosets consistently yielded usable results for analysis. This marmoset conducted a total of 247 trials, with 120 of them being correct (48.5% accuracy). Conversely, the macaque named Alvar completed a total of 2160 trials, of which 1244 were correct (57% accuracy). Notably, when we scrutinized the initial 247 trials of Alvar, his accuracy was significantly higher at 81.3%.

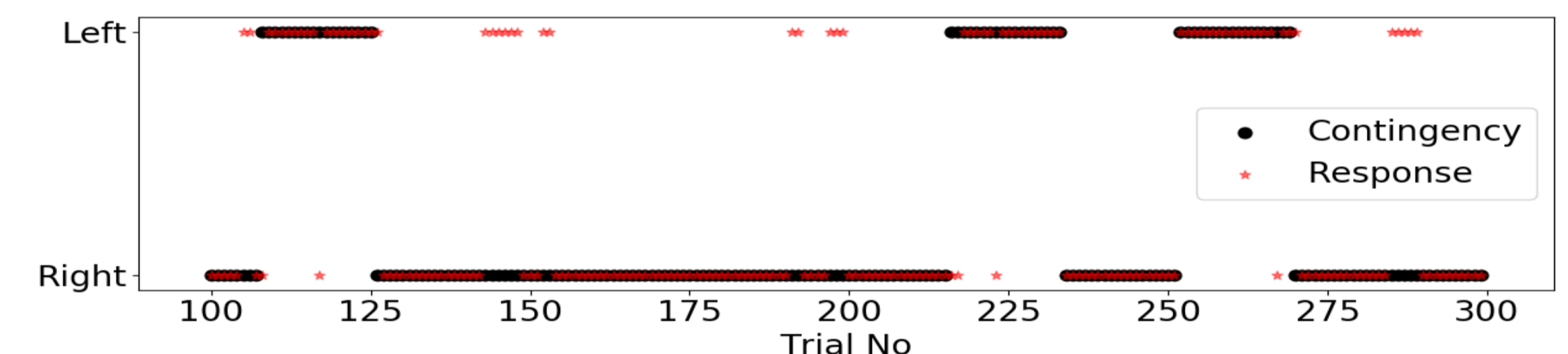


Fig 2: Task contingency and Alvar responses for the initial 300 trials

Limitations of the study

1. **Limited Time for Model Development:** Time constraints prevented the creation of a comprehensive marmoset translational model.
2. **Inconsistent Task Performance:** Marmosets exhibited varying approaches to the task, introducing variability in results.
3. **External Influences:** Human presence and other external factors played a role in marmoset task performance.

Conclusion

In summary, our study explores spatial bias and adaptation among marmosets. Cross-species analysis reveals fluctuating accuracy, possibly due to an **undisclosed bias**, with Alvar's accuracy declining over 2160 trials, nearing that of the marmoset. **These findings aid in developing translational animal models for autism and highlight the significance of appropriate primate models and species-specific traits in research.**

References:

1. Brugha T, Sa C, Mcmanus S, Purdon S, Smith J, Scott. Estimating the Prevalence of Autism Spectrum Conditions in Adults: Extending the 2007 Adult Psychiatric Morbidity Survey. 2007 [cited 2023 Oct 8]; Available from: www.ic.nhs.uk
2. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. Diagnostic and Statistical Manual of Mental Disorders. 2013 May 22;

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