

Effects of genetic deficiency of tryptophan hydroxylase 2 on attentional processes in the five choice serial reaction time task in rats

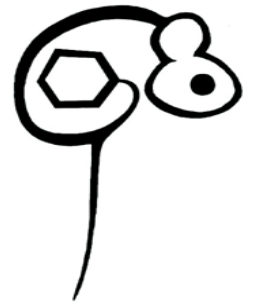


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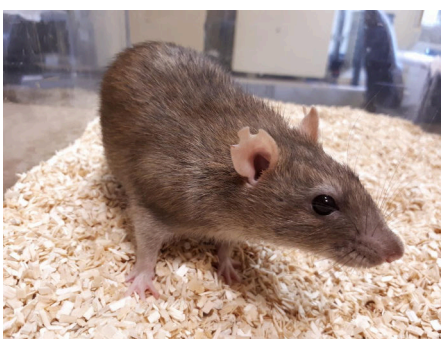
INTRODUCTION

Serotonin is postulated to play an important role in the pathogenesis of neurodevelopmental disorders (ADHD, ASD, and schizophrenia). In the central nervous system (CNS), serotonin synthesis is restricted to serotonergic neurons in the raphe nuclei of the brain stem. Tryptophan hydroxylase 2 (TPH2) is a rate-limiting enzyme of this reaction. Therefore, TPH2 - deficient (Tph2^{-/-}) rats, created using zinc-finger nuclease technology, represent a valuable model to study the consequences of central serotonin depletion. The goal of the current experiment was to examine the sustained attention in two groups of rats Tph2^{-/-} (KO) and Tph2^{+/+} (WT) using the 5-choice serial reaction time task (5-CSRTT).



MATERIALS AND METHODS

Animals



Male **Dark Agouti** rats
Tph2^{+/+} (N=15)
Tph2^{-/-} (N=14)
Created using **zinc-finger nuclease** technology.

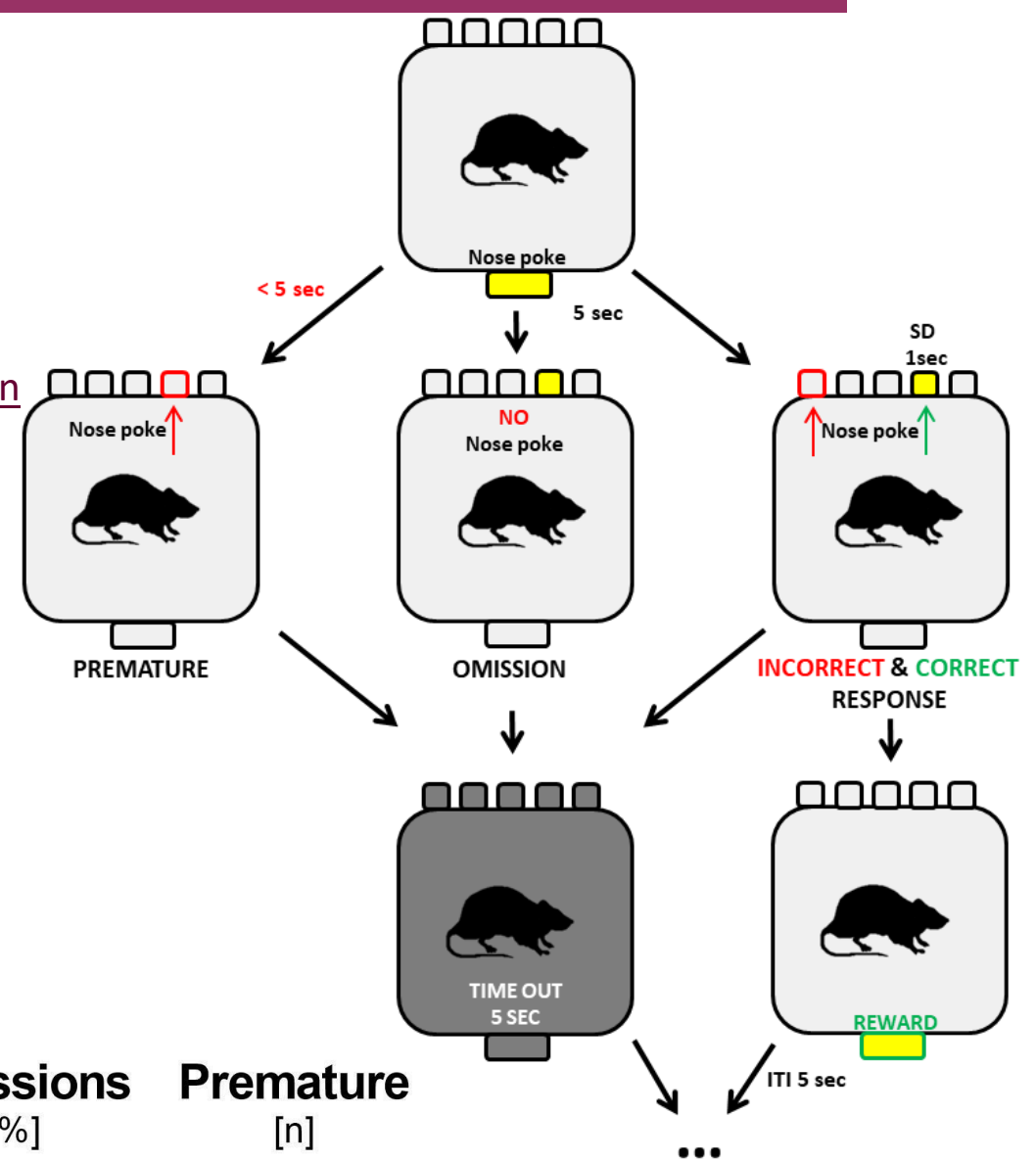
Apparatus

5-choice operant chambers (Med Associates, USA), contained arrays of five nose-poke holes arranged on a curved panels. Each hole was equipped with a detector and a yellow stimulus light at its rear. The food magazine, was located on the opposite wall.

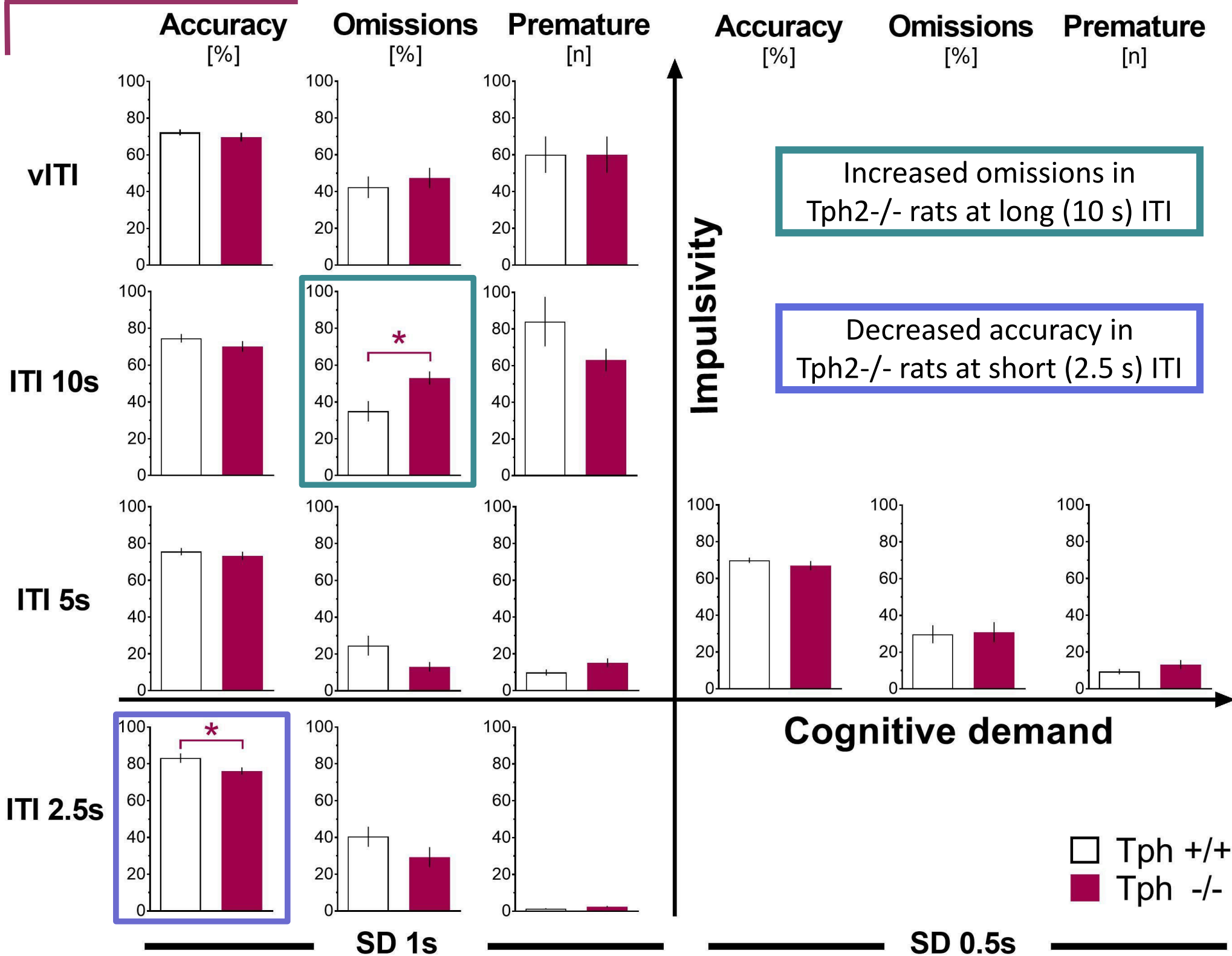


5-CSRTT – 5-choice serial reaction time task

- ❖ **Accuracy**
measure of attention
correct responses/total number of correct + incorrect responses*100
- ❖ **Omissions**
measure of attention/motivation
number of omissions/number of omissions + number of correct + incorrect responses*100
- ❖ **Premature responses**
measure of inhibitory control
the number of anticipatory responses made before the onset of the visual stimulus



RESULTS



CONCLUSION

There were no significant differences between Tph2^{-/-} and Tph2^{+/+} rats in the basic (ITI 5 s, SD 1 s) 5-CSRTT protocol. The differences appeared when the cognitive demands of the task increased. Specifically, **increased ITI duration led to attention impairment (↑ omissions)** while **shortening of ITI resulted in decreased accuracy**. These results demonstrate that complete absence of 5-HT in the brain may affect attentional performance.

Acknowledgements

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