

The effect of Hyperbaric Oxygen Therapy on autistic behaviors in valproic acid induced autistic rats

Yalda Mohtaj Khorassani^{1*}, Delaram Hassani², Javad Torbati Gah³, Mohammad Reza Khakzad⁴, Masoud Fereidoni¹, Ali Moghimi¹

1. Rayan Research Center for Neuroscience & Behavior, Department of Biology, Faculty of Science, Ferdowsi University of Mashhad, Iran
2. Department of Cellular and Molecular Biology, Faculty of Advanced Science and Technology, Tehran Medical Science, Islamic Azad University, Tehran, Iran
3. Department of Biology, Mashhad Branch, Islamic Azad University, Mashhad, Iran
4. Innovative Medical Research Center and Department of Immunology, Mashhad Medical Branch, Islamic Azad University, Mashhad, Iran

Introduction

Autism Spectrum Disorder is a developmental condition with serious behavioral complications. Although the symptoms and severity vary from person to person, all types of autism affect the ability to communicate with others. Although, there are variety cognitive-behavioral and pharmacologic therapeutic methods, because of complexity of its pathophysiologic mechanisms, many patients suffer from its symptoms during life. So, investigating new treatments is a hot field of research and one of them is using hyperbaric oxygen therapy (HBOT) for autism models in laboratory animals.

The purpose of this study was to investigate the effect of HBOT on behavioral changes in valproic acid induced autistic rats.

Methods

20 male Wistar rats were divided into 2 groups (Saline and VPA). Pregnant rats were injected with normal saline (3.3 ml/kg) as control and 500 mg/kg VPA (valproic acid) IP on gestational day 12.5 as experimental group. Rats were undergone behavioral tests (Morris Water Maze, Elevated Plus Maze, Y-Maze, 3 chamber Social Interaction test) at the age of 25 days, autistic rats were exposed to HBOT (2 absolute atmospheric pressure) in a special chamber for 14 days. Each oxygen therapy session lasts 60 minutes. After which, the behavioral tests were performed again.

Results

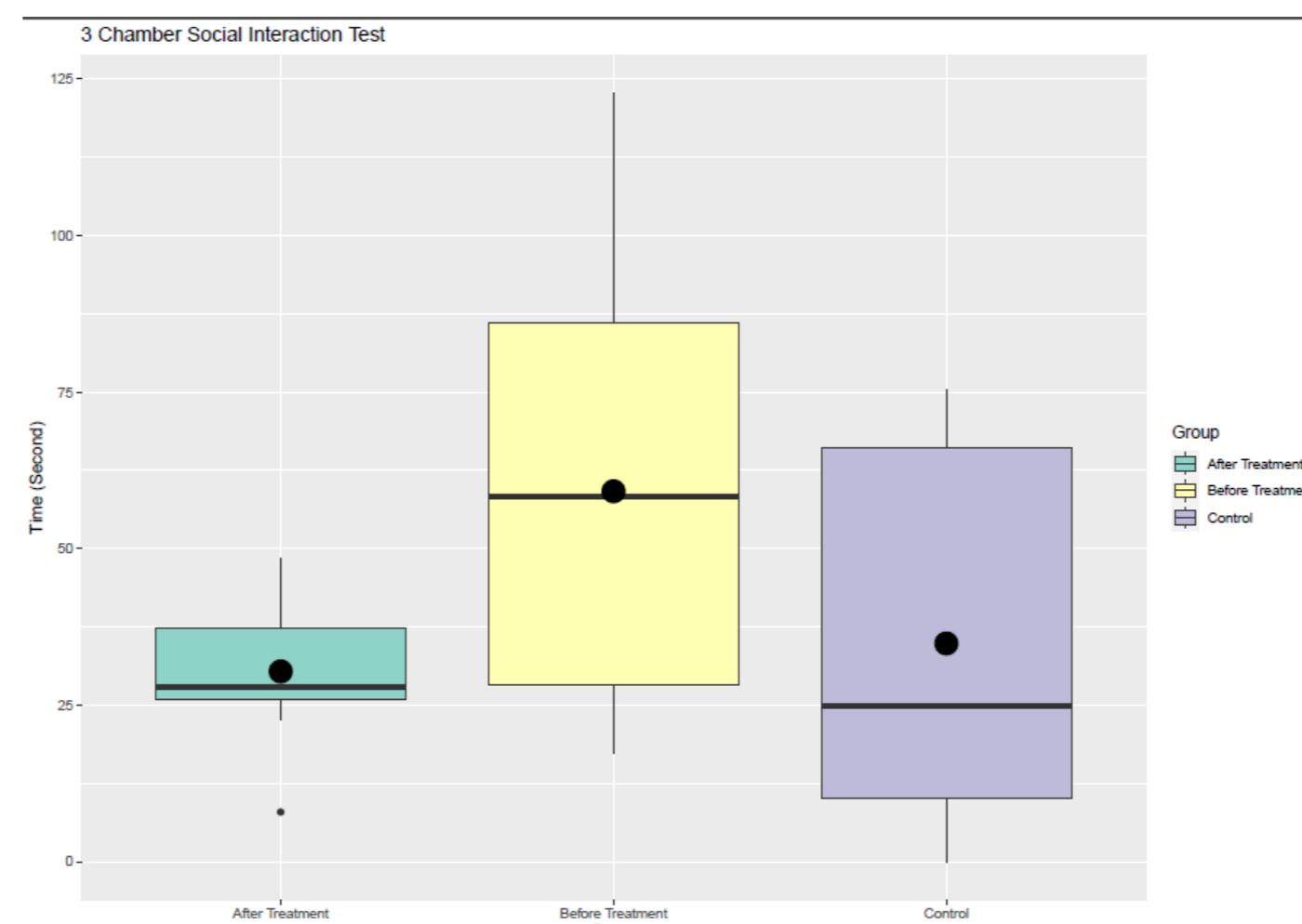


Figure 1. As demonstrated in Figure 1, HBOT-treated autistic rats spent less time interacting with the older stimulus in 3 chamber social interaction test.

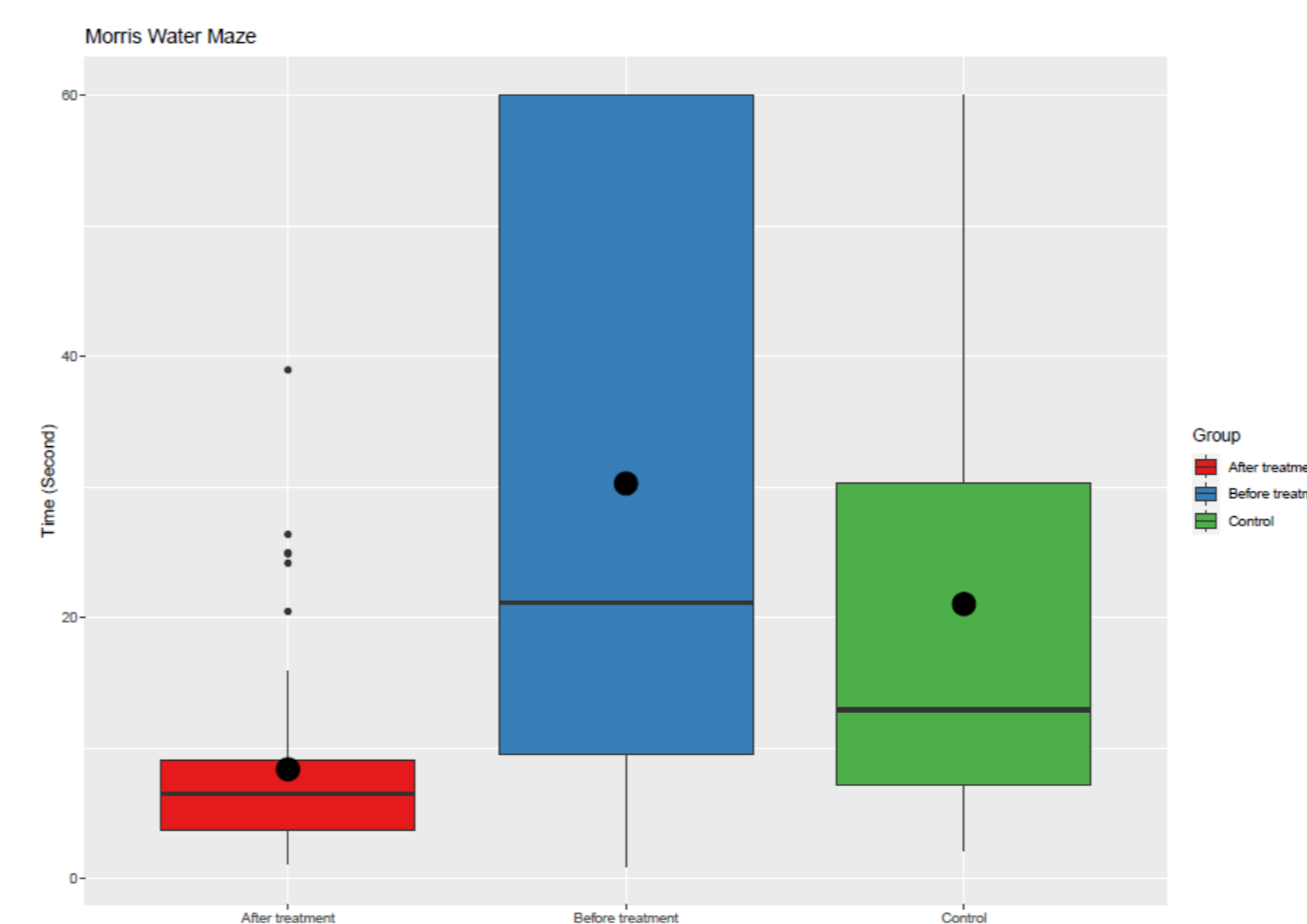


Figure 2. As illustrated in the second graph of the memory and learning test using the Morris Water Maze, the time to reach the rescue platform is significantly decreased in HBOT-treated autistic rats.

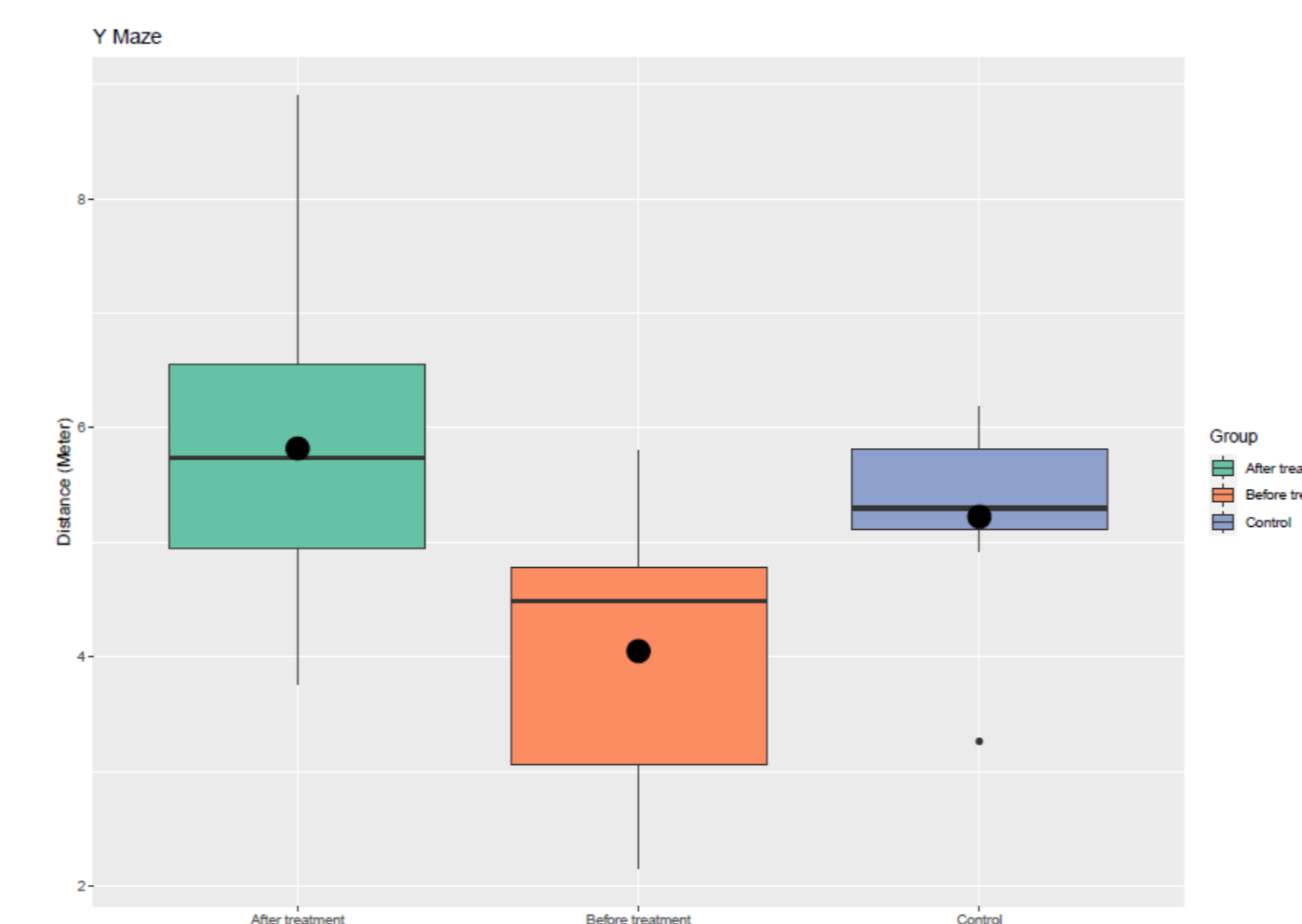


Figure 3. We observed a significant increase in the distance traveled by HBOT-treated autistic rats during the y-maze test.

Discussion

The pathology and etiology of autism have shown that children with autism have serious problems in their social interactions. The same disorder occurs in the animal model of autism. Therefore, according to the results (Figure 1), autistic rats treated with HBOT showed signs of improvement in this behavior. Likewise, people and animals with autism have learning disorder. In the MWM test, subsequent to the use of hyperbaric oxygen therapy, it was found that there was a significant improvement in the rats' learning compared to the before treatment group (Figure 2). Eventually, the Y Maze test, used for the exploratory behavior of the autism model, was indicative of an increase in mobility and exploratory behavior following the HBOT treatment. Regarding that in the pathology and neurobiology of autism, there are changes in synaptic function and neuronal metabolism as well as the inflammatory process, hyperbaric oxygen can be effective in reducing the symptoms of autism in the experimental model through intervention in various pathways including increasing tissue oxygen levels, reducing the intensity and function of inflammatory pathways and decreasing the oxidative stress. Further studies are required to trace the molecular mechanism and histopathological changes that are being conducted in this project.

References

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