Effects of Environmental Enrichment on Repetitive Behaviors in the BTBR T+tf/J Mouse Model of Autism

Abstract Synopsis: This study focused on the effects of environmental enrichment on repetitive behaviors in a mouse model for autism. This topic is important for future practice because it raises awareness for the use of sensory stimulating activities (enrichment) to reduce repetitive behaviors in children with ASD and anxiety.

Background: Lower and higher order repetitive behaviors have been documented in the BTBR T+tf/J (BTBR) mouse model. The purpose of this study was to evaluate the effectiveness of environmental enrichment for reducing repetitive behaviors in the BTBR mice. We hypothesized that housing in an enriched condition would reduce the number of higher and lower order repetitive behaviors seen in this strain.

Methods: All research was conducted in a laboratory setting at the University of Florida. Subjects were 15 BTBR male mice and 16 control C57BL/6J (B6) male mice; mice from each strain were randomly assigned to either control or enriched housing. Lower order behaviors were captured by assaying the time and sequence of grooming, while higher order behaviors were measured using a pattern analysis of an object exploration task from digital recordings. Baseline scores were established at 7 weeks of age, followed by 30 days of housing in either standard or enriched cage. Baseline scores were compared between strains at baseline using T-tests; Post-tests scores were analyzed using a two-way analysis of variance which allowed us to examine differences based on strain, housing condition, and the interaction of strain x housing condition.

Results: As expected, BTBR mice spent significantly more time grooming and had more rigid grooming sequence than control mice at baseline. After 30 days of enrichment housing, BTBR mice demonstrated a significant reduction in time spent grooming, resulting in levels that were lower than those exhibited by BTBR mice in standard housing. No changes were seen in the rigidity of the grooming sequence. In contrast to previous findings, no differences were found for higher order repetitive behaviors between strains at baseline. Subsequently, enrichment did not significantly alter the number of higher order repetitive behaviors at posttest.

Conclusion: The results suggest that environmental enrichment may be beneficial for reducing the time spent engaging in lower order repetitive behaviors, but may not change the overall quality of the behaviors when they do manifest.

Limitations: Extracting information about human ASD from animal models must be done with caution. That said, our research supports a hypothesis that therapeutically engaging children with ASDs in stimulating sensory-motor activities may be beneficial in reducing some types of repetitive behavior.

Reference: