

# Identifying and comparing learning and memory deficits in two different models of repetitive traumatic brain injury

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**Background:** Many pastimes and sporting events today involve regular or repetitive hits to the head, resulting in traumatic brain injury (rTBI) and, chronic traumatic encephalopathy (CTE). These sports include American Football, boxing, martial arts, hockey, lacrosse, basketball, and many more. It has been reported that players who play these sports will undergo a significant behavioral change over time as well as molecular abnormalities such as increased risk of neuroinflammation and tauopathy. Understanding these changes and potentially developing a treatment for them remains to be a crucial mystery researchers could solve. Our lab has investigated the relationship between adverse behavior in the form of memory and learning which is associated with repetitive traumatic brain injury. While there are many different studies associated with rTBI, there seems to be no agreement on optimal experimental conditions.

**Objective:** in this study, two different methodologies will be compared to optimize the effects and safety of experimental subjects. The first method is a repetitive TBI with 48 hours in between each TBI for one week. The second comparative method involves one weekly TBI for four weeks. As a comparison, both methods have two groups: a surgery group where the TBI will be administered and a sham surgery group mimicking the surgery group in all conditions, except TBI. Memory and learning were determined through a T-maze and Open Field task.

**Results:** in the 48-hour repetitive TBI, the surgery group alternated significantly less ( $30\% \pm 12.25$  vs  $90\% \pm 6.124$ ) than the sham group implying a significant difference in cognition. Further the open field heat map showed that the surgery group would cluster towards one side of the open field, whereas the sham group adequately explored more sides of the open field implying again a large difference in learning between the rTBI group and the sham surgery group.

**Keywords:** Repetitive TBI, Neuroinflammation, Open Field, T-Maze, Memory and Learning

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