Abstract Title: The threshold effect of repeated head trauma on brain structure and cognition: The Professional Fighters Brain Health Study

Objective: To determine the relationship between exposure variables, cognition, and MRI brain structural measures in a cohort of professional combatants

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Background: Repeated head trauma, as occurs in combat sports such as boxing and mixed martial arts (MMA), is a risk factor for neurodegenerative conditions. While prior research in boxing has linked duration and intensity of fighting to cognitive impairment in professional fighters, little is known about how these changes develop.

Methods: 78 fighters participating in the Professional Fighters Brain Health Study, a longitudinal cohort study of licensed professional combatants, were included for analysis. Each subject underwent computerized cognitive testing and volumetric brain MRI. Fighting history, including years of fighting and fights per year were obtained from self report and published records. The fighters were divided into two groups based on median years of fighting (equal/greater or less than 9 years) and the relationship between exposure variables, brain volumetrics and cognitive results were examined by correlational analysis.

Results: The study cohort (35 boxers, 43 MMA) were predominantly male (94%), had a mean age of 29 years (range 19-42), with years of fighting range from 1-25. In both groups, greater years of fighting and fights per year were associated with lower volumes of bilateral hippocampi, caudate, and thalamus. While there was no relationship between any of the cognitive measures and the exposure variables in the group with less years of fighting, in those who had fought 9 years or more, more fights per year was negatively correlated with scores on tests of memory (r=-.44) and processing speed (r=-.58). This relationship remained even when adjusting for the effect of age.

Conclusion: There may be threshold at which continued repetitive head trauma begins to produce measurable changes in cognition, despite volumetric brain changes that can be detected earlier.

Study Supported by: Lincy Foundation