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## Introduction

- Repetitive head impacts often afflict athletes in contact sports, including professional fighting
- Impact of winning versus losing on head injuries has been studied in other contact sports including football
- Some data indicates that athletes on losing teams suffer head injuries more frequently than those on winning teams
- Has not been studied in fighting sports

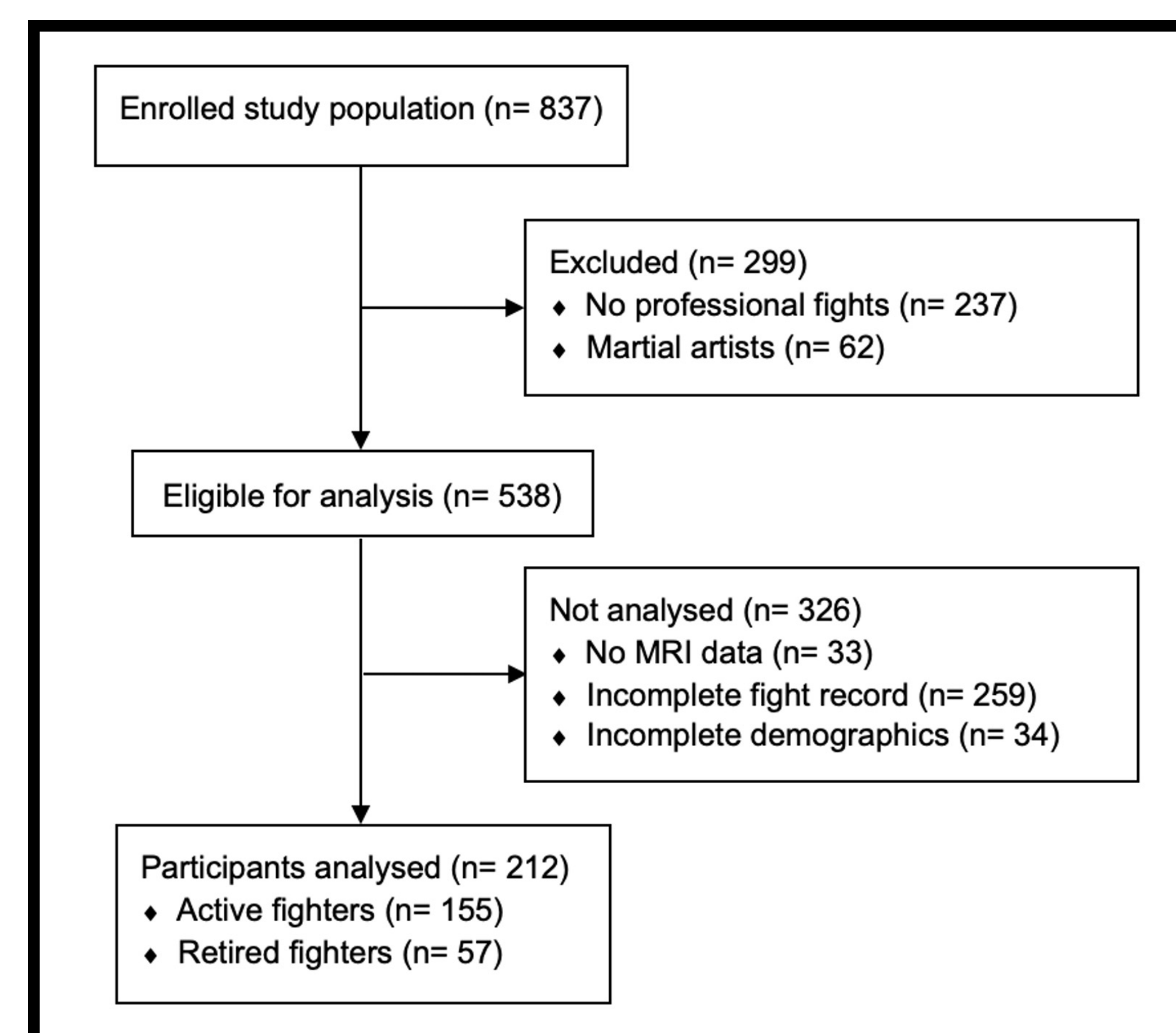
## Objectives

- To establish the relationship between win-loss record in fighting sports and:
  - Regional brain volumes
  - Neuropsychiatric symptoms
  - Cognition
- We hypothesized that fighters with a worse fighting record (higher proportion of losses) would exhibit worse brain health outcomes

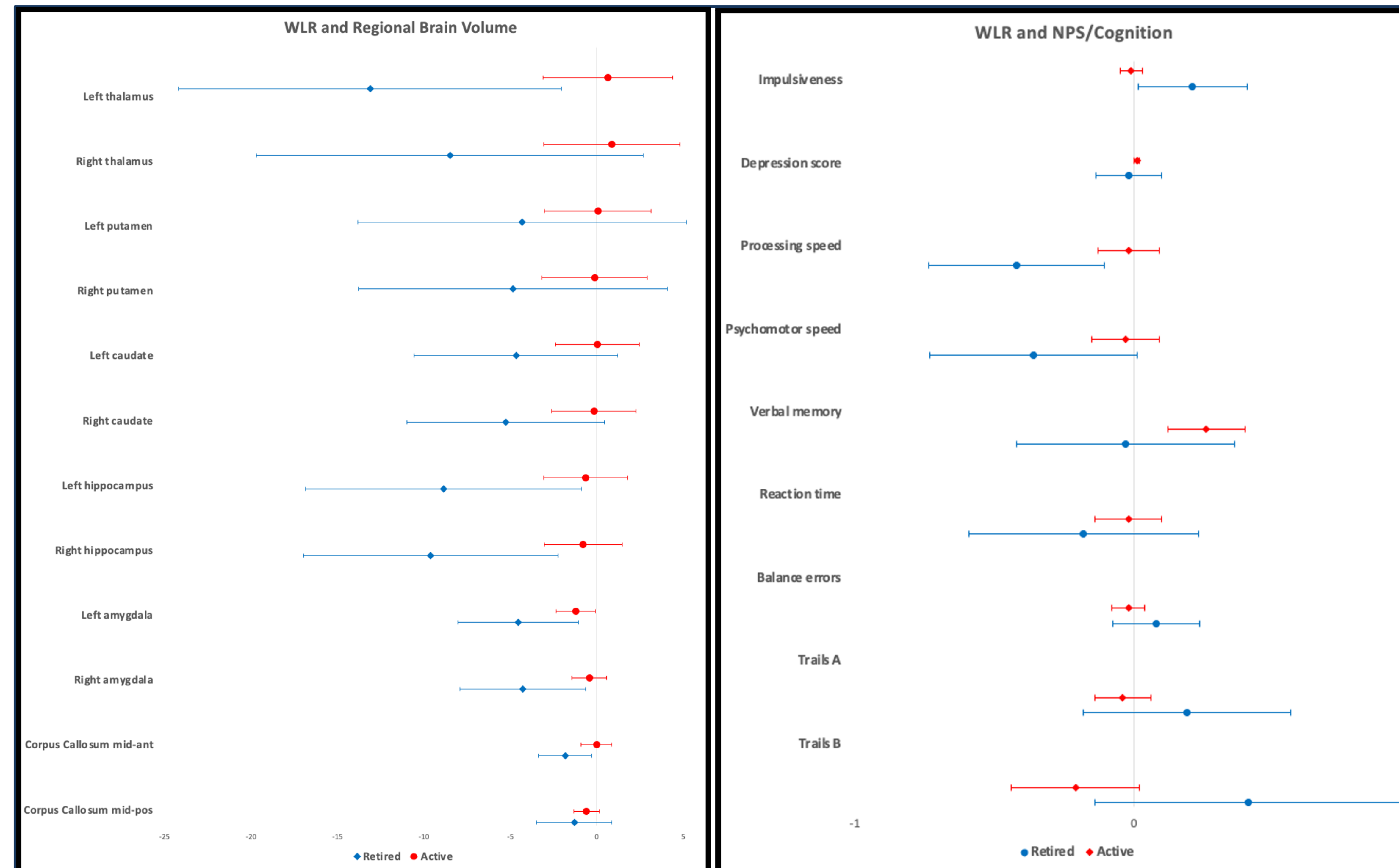
## Materials and Methods

- The Professional Fighters Brain Health Study has collected data on professional boxers and MMA fighters since 2011
- Analyzed the relationship between professional win-loss ratio (WLR) and brain health outcomes for both active/retired fighters
- Controlled for age, education level, race, ethnicity, fighter type (boxing versus MMA), and number of professional bouts
- Cross-sectional analysis performed using participants' data from first study visit

**Figure 1 – Study participant flow diagram.**



## Results



**Figure 2 – Association between WLR and regional brain volume stratified by active vs. retired status.**

**Figure 3 – Association between WLR and NPS/Cognition stratified by active vs. retired status.**

Variable	Active	Retired	p-value
n (%)	155 (73%)	57 (27%)	
Age, median (IQR)	30.00 (27.00, 34.00)	47.00 (42.00, 52.00)	<0.001**
Completed high school, n (%)	89 (57%)	23 (40%)	0.027*
Male, n (%)	137 (88%)	55 (96%)	0.073
Caucasian, n (%)	96 (62%)	30 (53%)	0.22
Hispanic, n (%)	42 (27%)	16 (28%)	0.89
Professional fights, median (IQR)	13.00 (4.00, 26.00)	34.00 (22.00, 50.00)	<0.001**
Fighter type, n (%)			<0.001**
Boxing	61 (39%)	47 (83%)	
MMA	88 (57%)	7 (12%)	
Both	6 (4%)	3 (5%)	
Win-Loss Ratio, median (IQR)	76.92 (59.49, 92.58)	79.41 (64.29, 86.17)	0.60

**Table 1. Study population characteristics.**

## Conclusions

- Our findings suggest that winning fights does not prevent adverse brain health outcomes
- For retired fighters, a better fight record was associated with:
  - Greater impulsiveness
  - Slower processing speed
  - Smaller brain volumes in certain areas including the subcortical gray matter, anterior corpus callosum, bilateral hippocampi, bilateral amygdalae, and left thalamus
- Active fighters with a better fighting record demonstrated smaller left amygdala volumes
- There were no brain regions that were larger for participants with a better fighting record
- There were no neuropsychiatric measures or cognitive domains with better scores for participants with a better fighting record
- Clinically, this study helps inform both physicians and fighting sport participants that the risk of brain injury is not mitigated for successful fighters
- Adverse effects on brain health may not become fully apparent until years later in retirement
- Further research is needed in other contact sports

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