

# Investigating Tauopathy in Military Occupational Blast: A [<sup>18</sup>F]flortaucipir Positron Emission Tomography Study in Canadian Armed Forces Members



Shamantha J. Lora<sup>1,2,5</sup>, Sarah E. Watling<sup>1,2,5</sup>, Jerry Warsh<sup>1-5</sup>, Carmela Tartaglia<sup>6</sup>, Oshin Vartanian<sup>7</sup>, Isabelle Vallée<sup>8</sup>, Iian Vergie<sup>8</sup>, Tina McCluskey<sup>1,2</sup>, Neil Vasdev<sup>1,5,9</sup>, Shawn G. Rhind<sup>7</sup>, Isabelle Boileau<sup>1-3</sup>

<sup>1</sup>Brain Health Imaging Centre and <sup>2</sup>Campbell Mental Health Research Institute, Centre for Addiction and Mental Health, Toronto, Ontario, Canada; <sup>3</sup>Department of Psychiatry, <sup>4</sup>Pharmacology and Toxicology and <sup>5</sup>Institute of Medical Sciences; <sup>6</sup>Tanz Centre for Research in Neurodegenerative Diseases, University of Toronto, Toronto, Ontario, Canada; <sup>7</sup>Defence Research and Development Canada, Toronto Research Centre, Toronto, Ontario, Canada; <sup>8</sup>Canadian Special Operations Forces Command, Ottawa, ON, Canada; <sup>9</sup>Azrieli Centre for Neuro-Radiochemistry, Centre for Addiction and Mental Health, Toronto, Ontario, Canada.



## BACKGROUND



- 27% of Canadian Armed Forces (CAF) members report persistent post-concussive symptoms (e.g.: headaches, auditory/visual, cognitive impairment, sleep disturbances, poorer job performance)<sup>1</sup>.

- Studies have suggested that Chronic traumatic encephalopathy (CTE), a tauopathy, could occur as a result of repetitive exposure to low-intensity occupational blast.

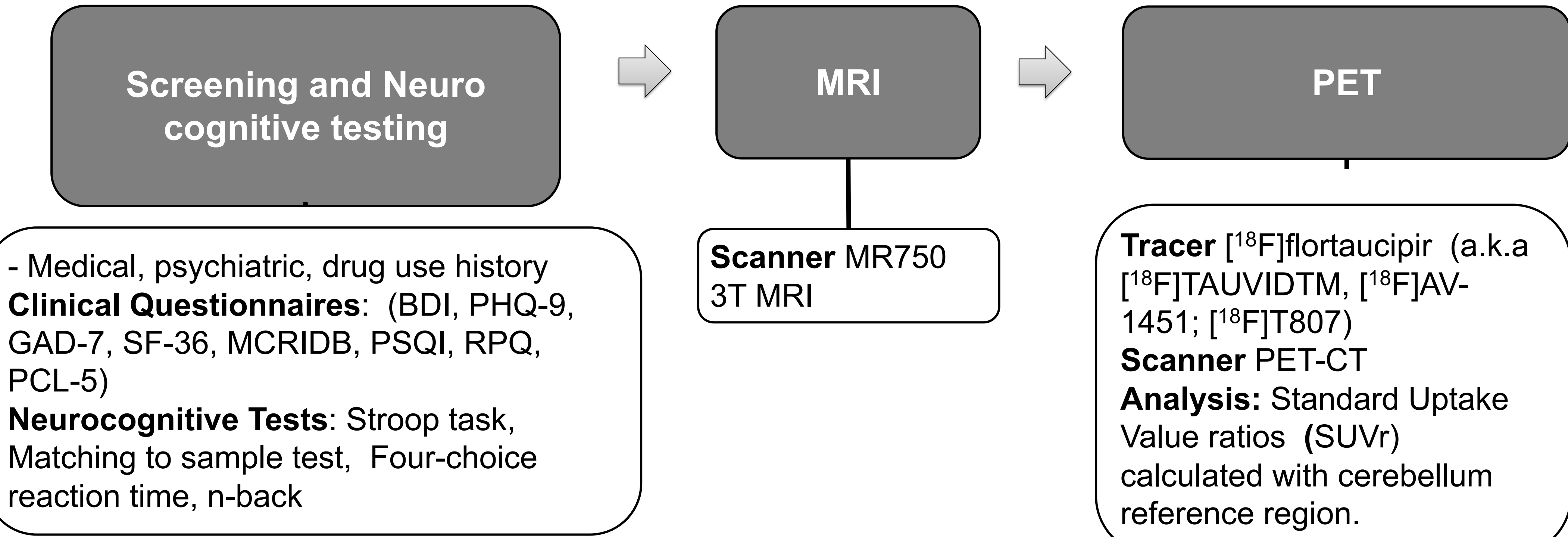
- While preclinical models and post-mortem studies have demonstrated increases in tau pathology following blast exposure, studies in humans exposed to blast are limited to one.<sup>2</sup>

## OBJECTIVE

**Objective:** To investigate tau accumulation in brain using PET imaging of the radioatracer [<sup>18</sup>F]florataucipir in military personnel (Canadian Armed Forces) exposed to low intensity level blast.

**Hypothesis:** Greater regional [<sup>18</sup>F]florataucipir uptake will be associated with greater exposure to low-level military blast.

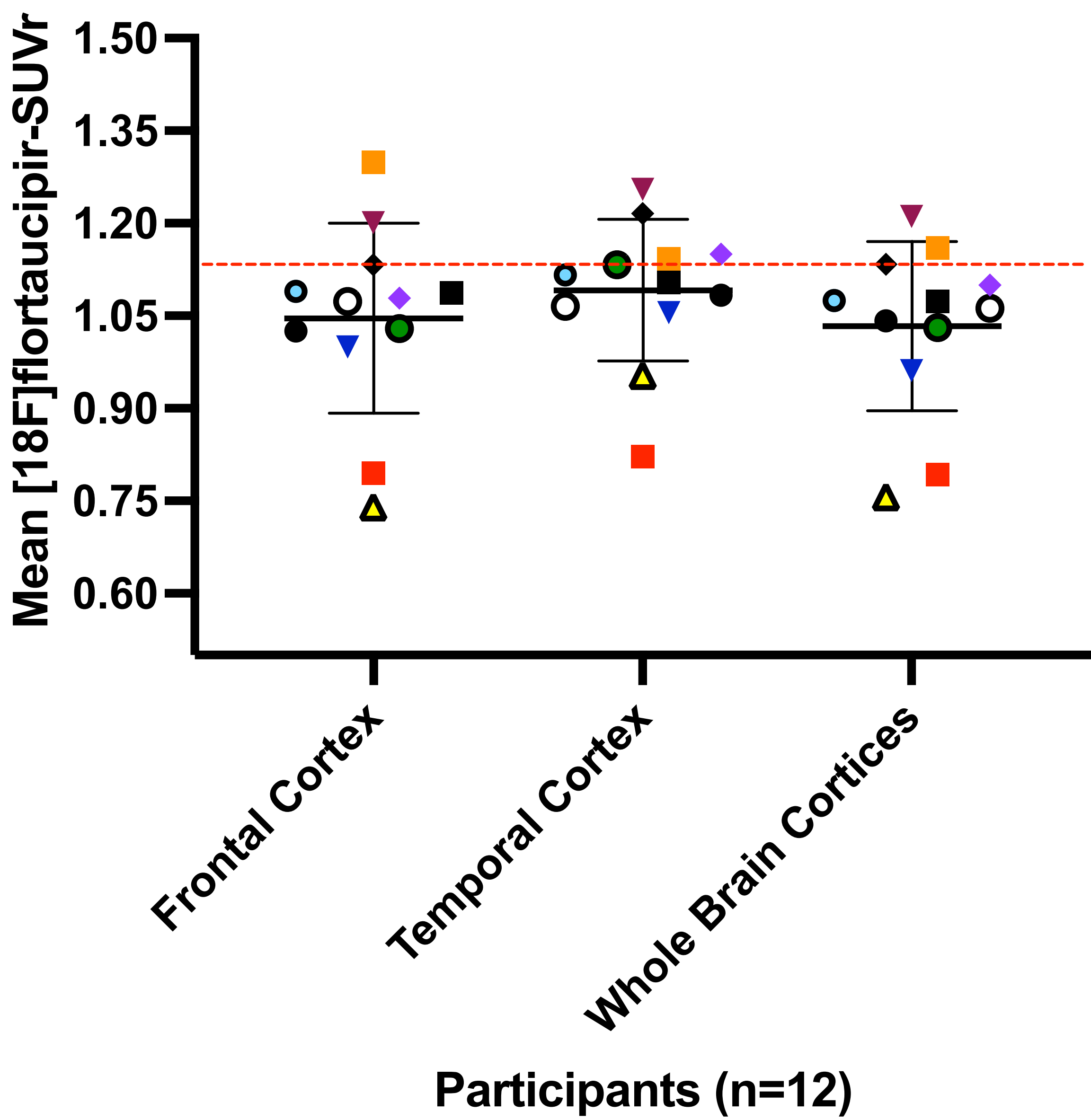
## METHODS



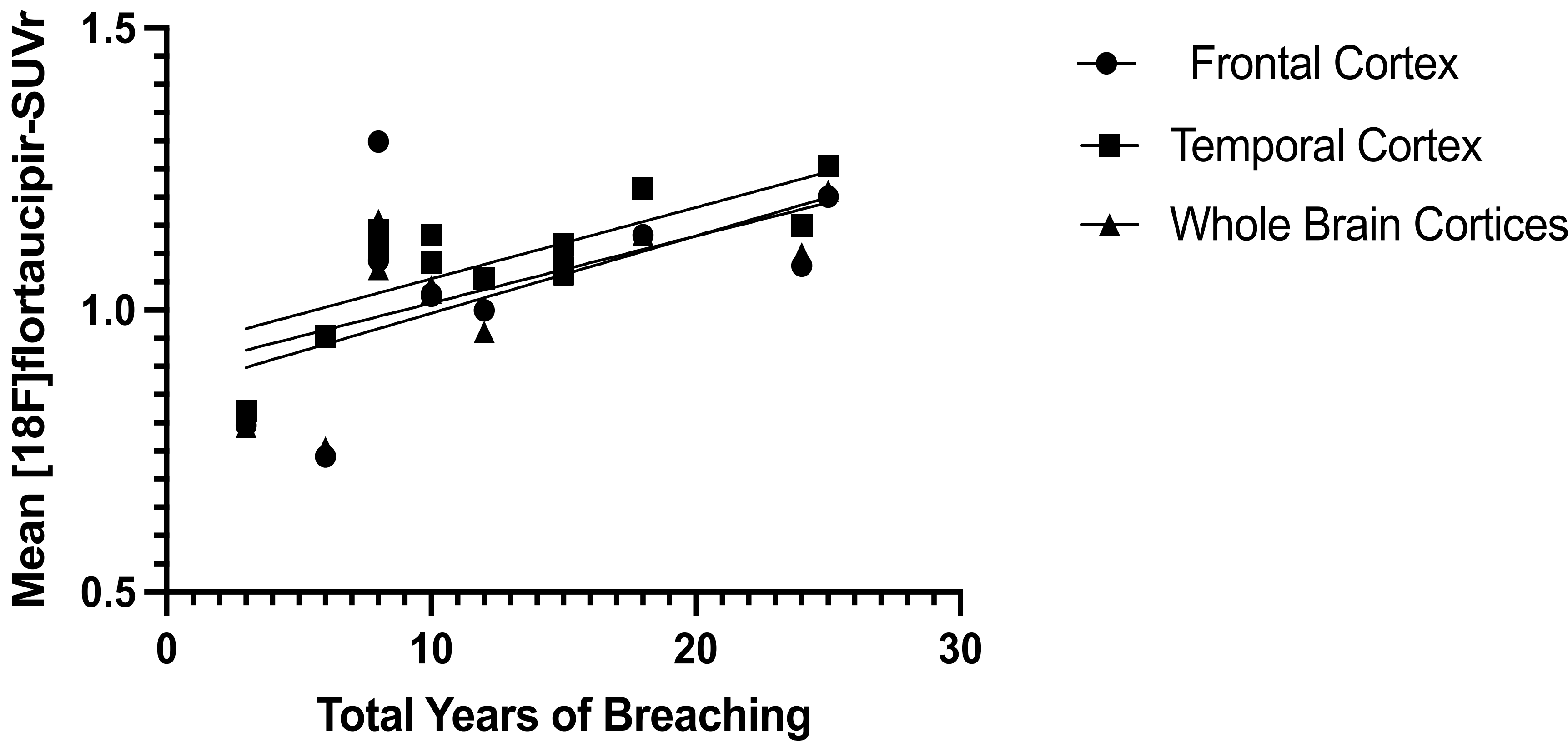
**Table 1. Participant Demographics**

Demographics LLMB-Blast	(n=12)	Range (min-max)
Age, mean	45.3 ± 6.7	34-50
Sex, male, n (%)	12 (100%)	-
NIH race, Caucasian, n (%)	10 (83.3)	-
BMI	29.1 ± 3.4	25.4-37.9
Years of education	13 ± 2.54	11-13
Smoking status, No, n(%)	2 [1 former smoker]	-
Alcohol drinks per week	7.16 ± 9.9	0-35
Positive THC on PET Day n (%)	2 (17)	
No. of years of service in CAF	26.2 (5.8)	16-34
Years of exposure to explosives	20.9 (5.3)	15-33
Years of exposure to breaching	12.8 (6.8)	3-25
Years of exposure to sniping	13.9 (10.2)	0-33

## RESULTS



**Figure 1.** Regional [<sup>18</sup>F]flortaucipir SUVr in CAF exposed to Low-level Military Blast



**Figure 2.** Pearson correlation revealed significant positive associations ( $r > 0.88$ ) between mean [<sup>18</sup>F]flortaucipir SUVr in ROIs and total years of breaching in the CAF.

## CONCLUSIONS

In line with an earlier PET study linking tau deposition with dose exposure to blast<sup>3</sup>, our study finds a positive correlation between blast exposure and tau deposition further suggesting that greater exposure could potentially increase tau. Studies in a larger cohort should aim to model tau in order to understand what constitutes safe exposure to blast.

## REFERENCES

1. Garber, B.G., C. Rusu, and M.A. Zamorski, *Deployment-related mild traumatic brain injury, mental health problems, and post-concussive symptoms in Canadian Armed Forces personnel*. BMC Psychiatry, 2014. 14: p. 325.
2. Ahlers ST, Vasserman-Stokes E, Shaughness MC, Hall AA, Shear DA, Chavko M, McCarron RM, Stone JR. *Assessment of the effects of acute and repeated exposure to blast overpressure in rodents: toward a greater understanding of blast and the potential ramifications for injury in humans exposed to blast*. Front Neurol. 2012 Mar 5;3:32. doi: 10.3389/fneur.2012.00032.
3. Robinson, M.E., et al., *Positron emission tomography of tau in Iraq and Afghanistan veterans with blast neurotrauma*. NeuroImage: Clinical, 2019(Brain Connect 5 2014): p. 101651.