

# Cortical Morphometry Differences Between Combat Crewmen and Special Operators

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## Introduction

- Combat crewmen (CC) engage in high-speed boat operations and training which exposes them to repetitive wave impacts, triplanar accelerations, vibration, and acoustic energy across a spectrum of magnitudes.<sup>1</sup>
- One third of a CC sample endorsed at least one loss of consciousness event while underway.<sup>2</sup>
- Other special operators (SO) sustain repetitive small arms fire, blast, and blunt neurotrauma, with less frequent high-speed boat exposure.<sup>3</sup>
- The neurostructural consequences of high-speed boat exposure remain understudied.

**Purpose:** To compare cortical thickness between combat crewmen and special operators

## Methods

### Retrospective Cohort from NICoE

- Combat crewmen (n=86; age = 40.1±5.89) and special operators (n=450; age = 40.1±5.95) assessed between 2011-2024.

### Neuroimaging

- 3T MRI: T1- and T2-weighted structural brain scans

### Freesurfer 7.4.1 Group Analysis

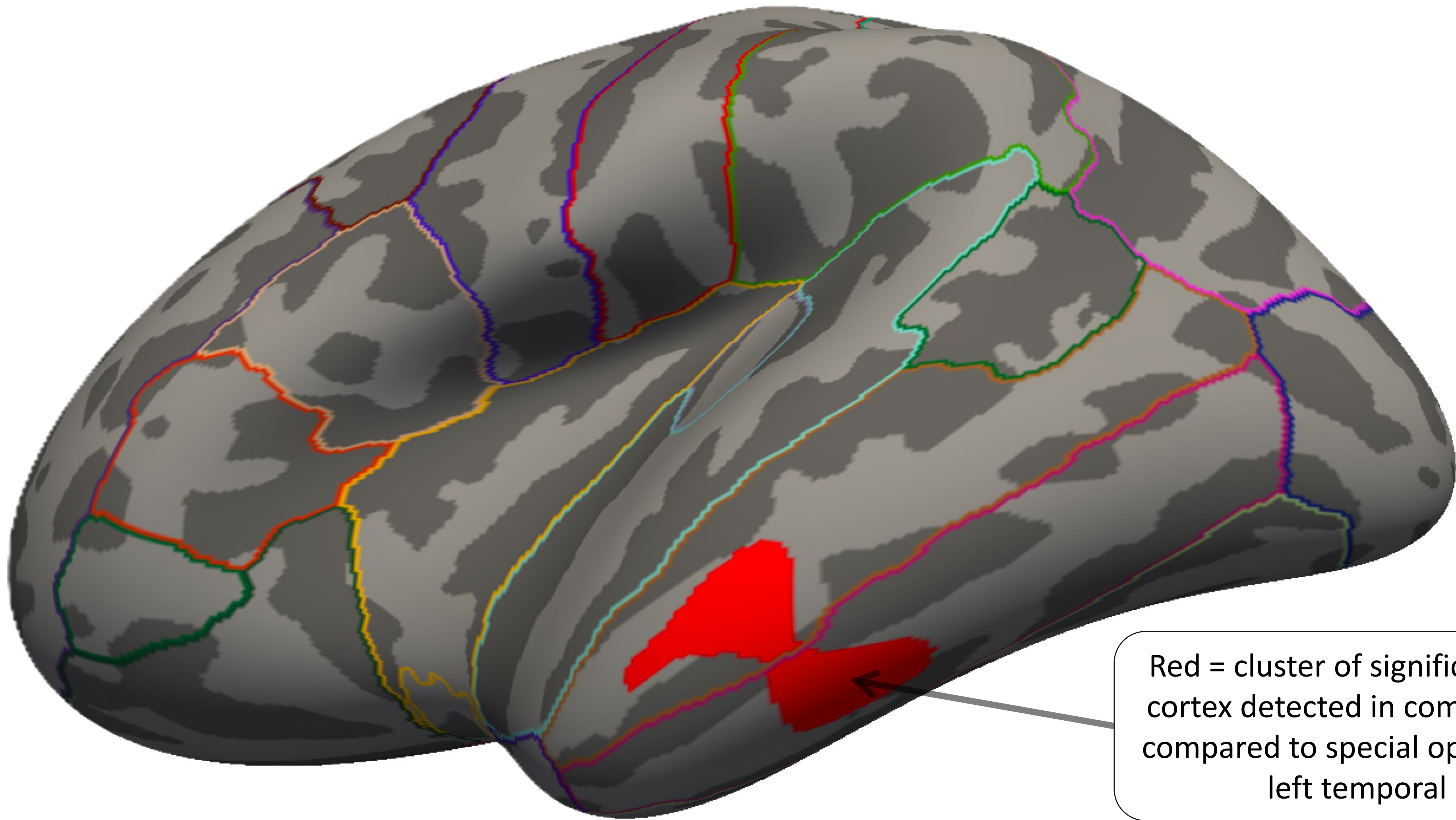
- Preprocessing and cortical reconstruction.
- Cortical thickness smoothed at 10mm FWHM

### Design Matrix

- Group differences were modeled allowing a different offset, same slope, with age as a covariate.
- A two-sided vertex-wise cluster-forming threshold of  $p < .001$  was applied across the cortex between groups.

### Cluster-wise Correction

- Permutation simulation (1000 iterations) was performed at a cluster-wise p-value (CWP) threshold of  $<0.05$  with Bonferroni adjustment between left and right hemispheres. Post-hoc effect sizes were calculated at significant clusters.



## Results

### Significant Cluster Summary

| Regions                                | Cluster Size          | CWP    | Cluster Mean Thickness |             |         | Cohen's <i>d</i> |
|----------------------------------------|-----------------------|--------|------------------------|-------------|---------|------------------|
|                                        |                       |        | CC                     | SO          | % Diff. |                  |
| Left middle and inferior temporal gyri | 504.17mm <sup>2</sup> | p=.006 | 2.63±0.37mm            | 2.81±0.31mm | -6.3%   | -0.56            |

## Conclusions

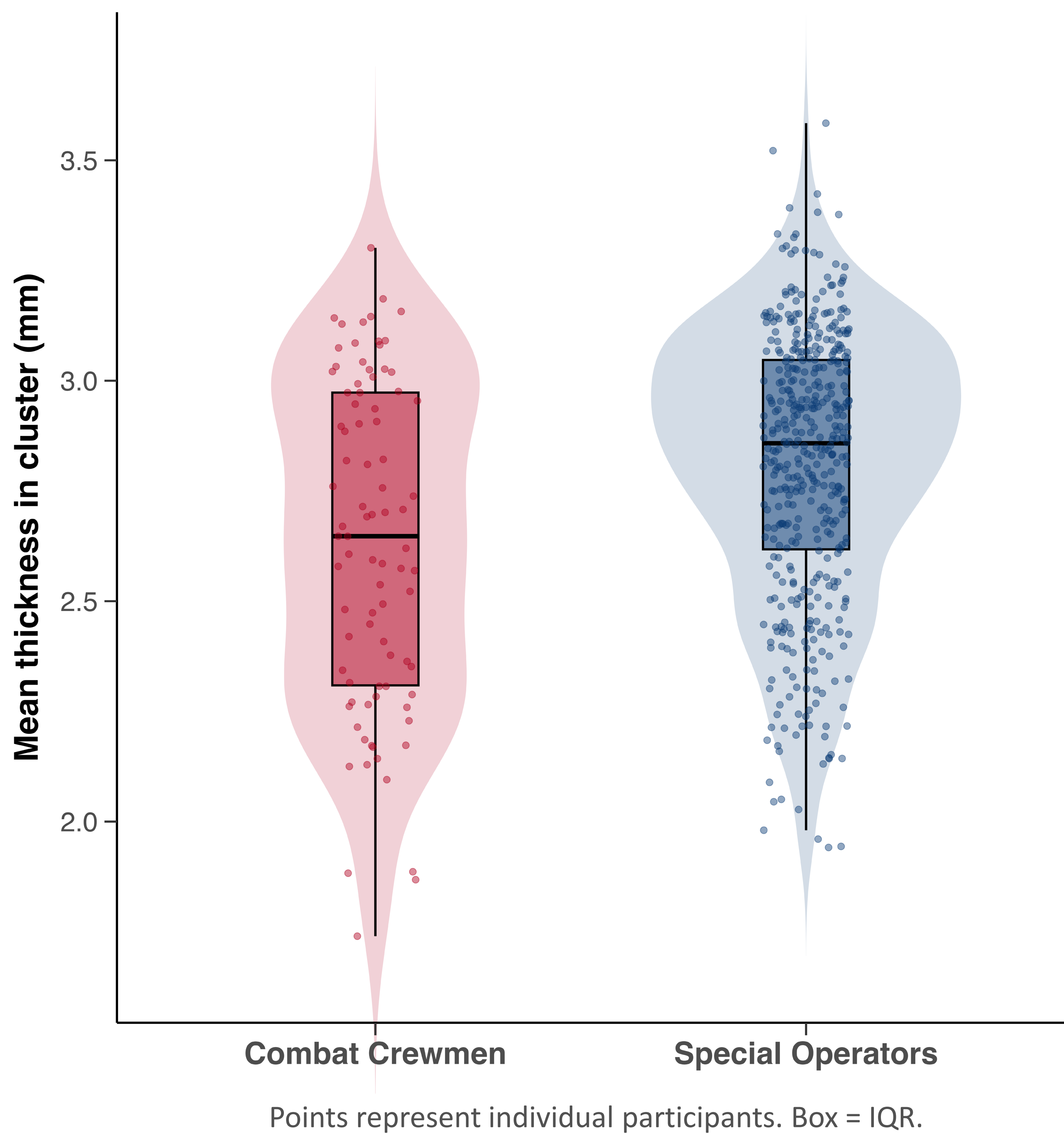
Combat crewmen had thinner left temporal cortex than special operators.

We observed a single focal, left-lateralized group difference in temporal lobe cortical thickness with a moderate effect size.

These findings may reflect specific biomechanical occupational susceptibilities and warrant longitudinal investigations of exposure.

Given the left middle and inferior temporal gyri's roles in semantic memory, visual motion perception, language processing, and vestibular processing, clinical studies are warranted.

### Mean Cortical Thickness in Significant Left Temporal Cluster Extracted from the region surviving whole-brain correction



## Results Cont.

- Combat crewmen demonstrated significantly thinner cerebral cortex than special operators at a 504.17mm<sup>2</sup> cluster spanning the left middle and inferior temporal gyrus (CWP=.006).
- Mean thickness within this cluster was 2.63±0.37mm (CC) vs 2.81±0.31mm (SO), a 6.3% difference (Cohen's  $d=-0.56$ ).