

# ACUTE EFFECT OF PERIPHERAL NERVE STIMULATION ON COGNITIVE PERFORMANCE FOLLOWING HIGH-INTENSITY INTERVAL EXERCISE IN TACTICAL PERSONNEL WITH CONCUSSION HISTORY

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## INTRODUCTION

Military personnel face unique physical and mental stressors that can compromise cognitive performance.

Interventions aimed at reducing the impact of these stressors are needed.

**Transcutaneous vibroacoustic stimulation (TVAS):** Uses sound tones transmitted through a tactile transducer to create vibration.

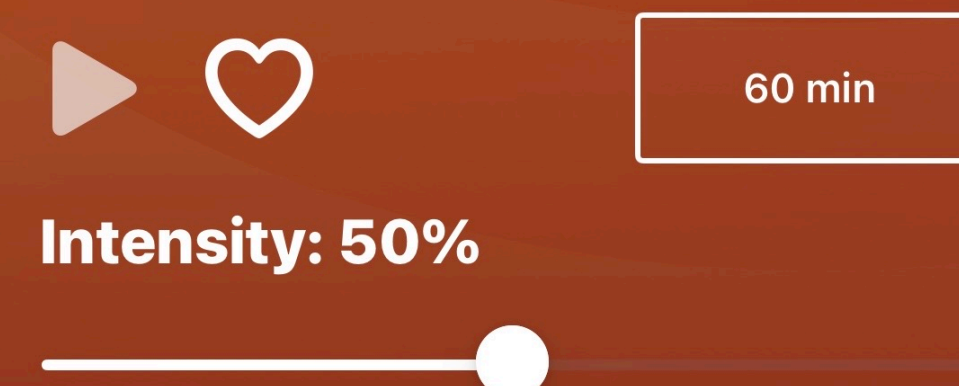
- A wrist-worn vibration device has been found to improve recovery in athletes.
- Low-frequency vibrations have been observed to modulate the autonomic nervous system with some frequencies associated with increased parasympathetic activity.

## PURPOSE

Evaluate acute effects of TVAS on cognitive performance following high-intensity interval exercise in asymptomatic tactical personnel with a history of concussion.

### Focus

Filters out distraction and settles your nerves for clear, calm focus. Other uses: Pre-athletic performance, presentations, productivity, to relieve headache or mild nausea.



## MAIN FINDINGS

- Acute TVAS improves cognitive task performance following fatiguing exercise
  - Enhanced cognitive control
  - Reduced lapses in attention
  - Quicker whole-body reaction time

## PRACTICAL APPLICATIONS

- TVAS may enhance cognitive resilience and rapid decision-making following 20-min of high-intensity interval exercise in tactical personnel

## METHODS

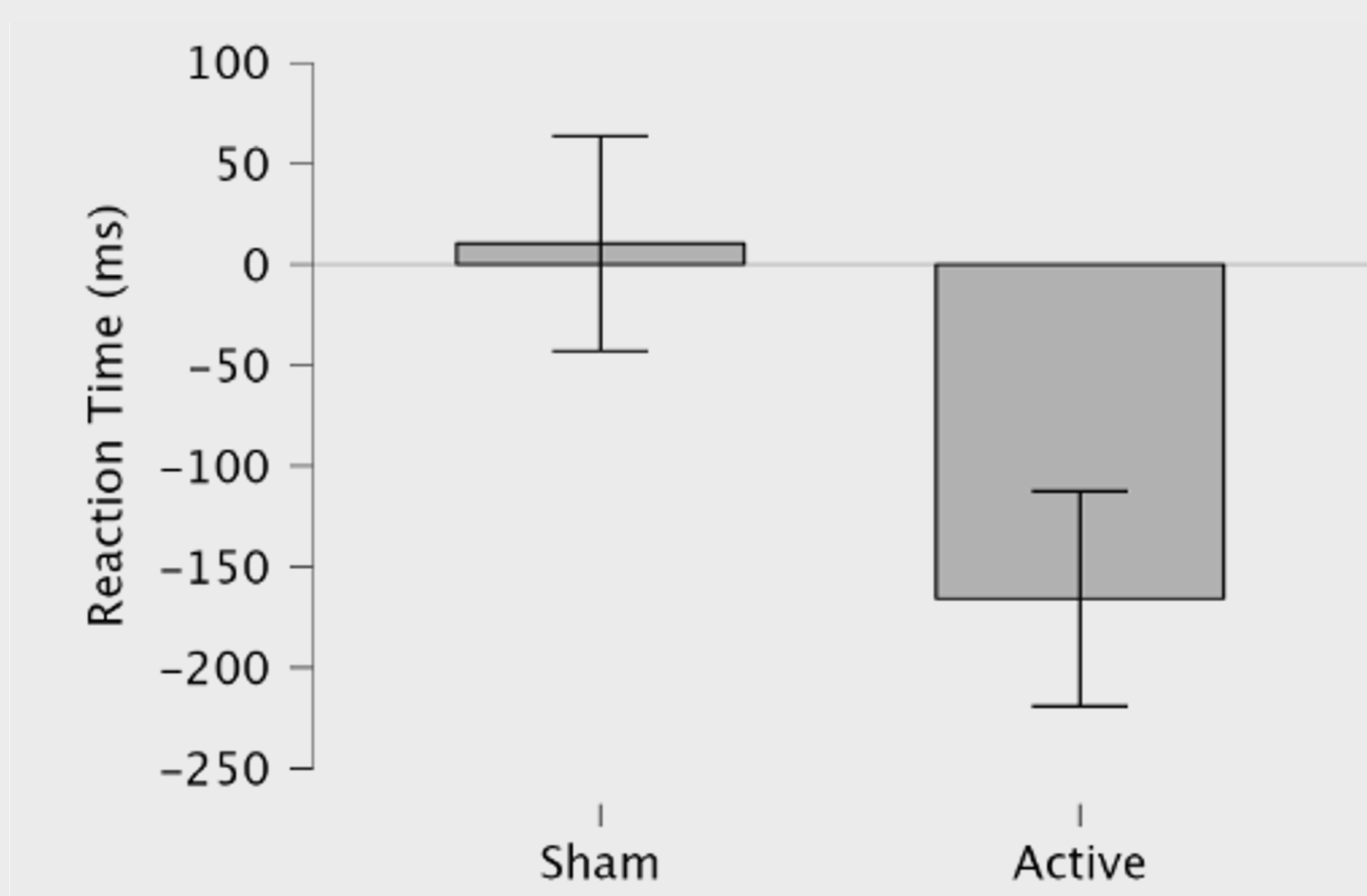


### Outcome Measures:

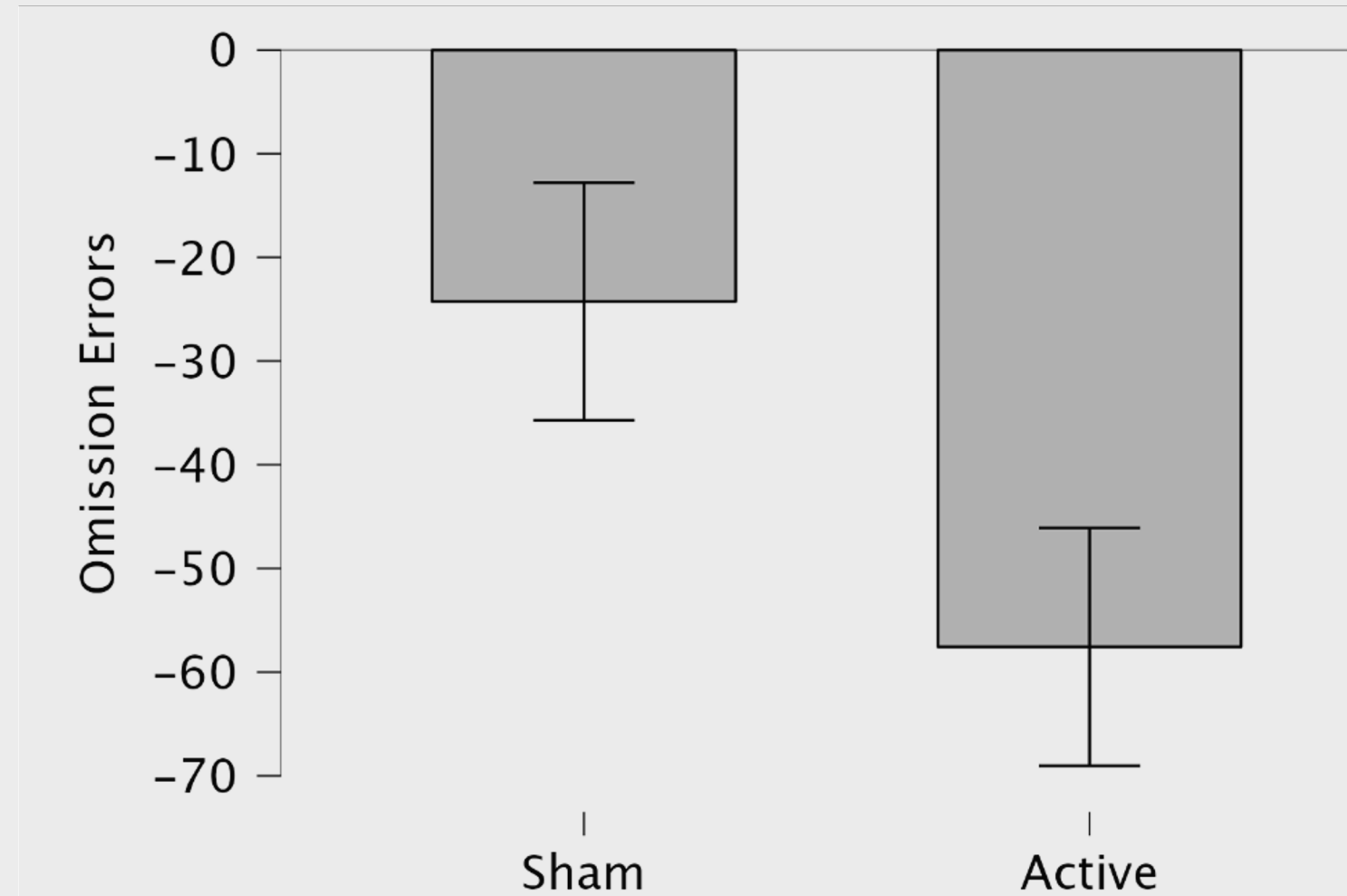
- **HVLT:** Tests working and short-term memory. Participants attempted to memorize a list of 12 nouns and then recall them immediately, post-exercise, and post-recovery. They then identified words from a new 24-word list, half of which were in the original list with the other half being distractor nouns.
- **Go/No-Go Task:** Assesses behavioral inhibitions. In the first of two 60-sec rounds, participants hit infrequent stimuli and avoid frequent stimuli, then rules were reversed for the second round.
- **Color-Shape Switch Task:** Assesses working memory and mental flexibility. Participants complete a task involving two single rule-sets (color or shape) and one mixed rule-set. In the color condition, they responded to stimulus color. In the shape condition, they responded to stimulus shape. In the mixed condition, responses depended on the outline – solid for color and dashed for shape.

**Statistical Analysis:** Omnibus analyses were performed to evaluate pre- to post-exercise change scores for all go/no-go and color-shape switch tasks and pre- to post-recovery for HVLT tasks within and between conditions ( $\alpha=0.05$ ).

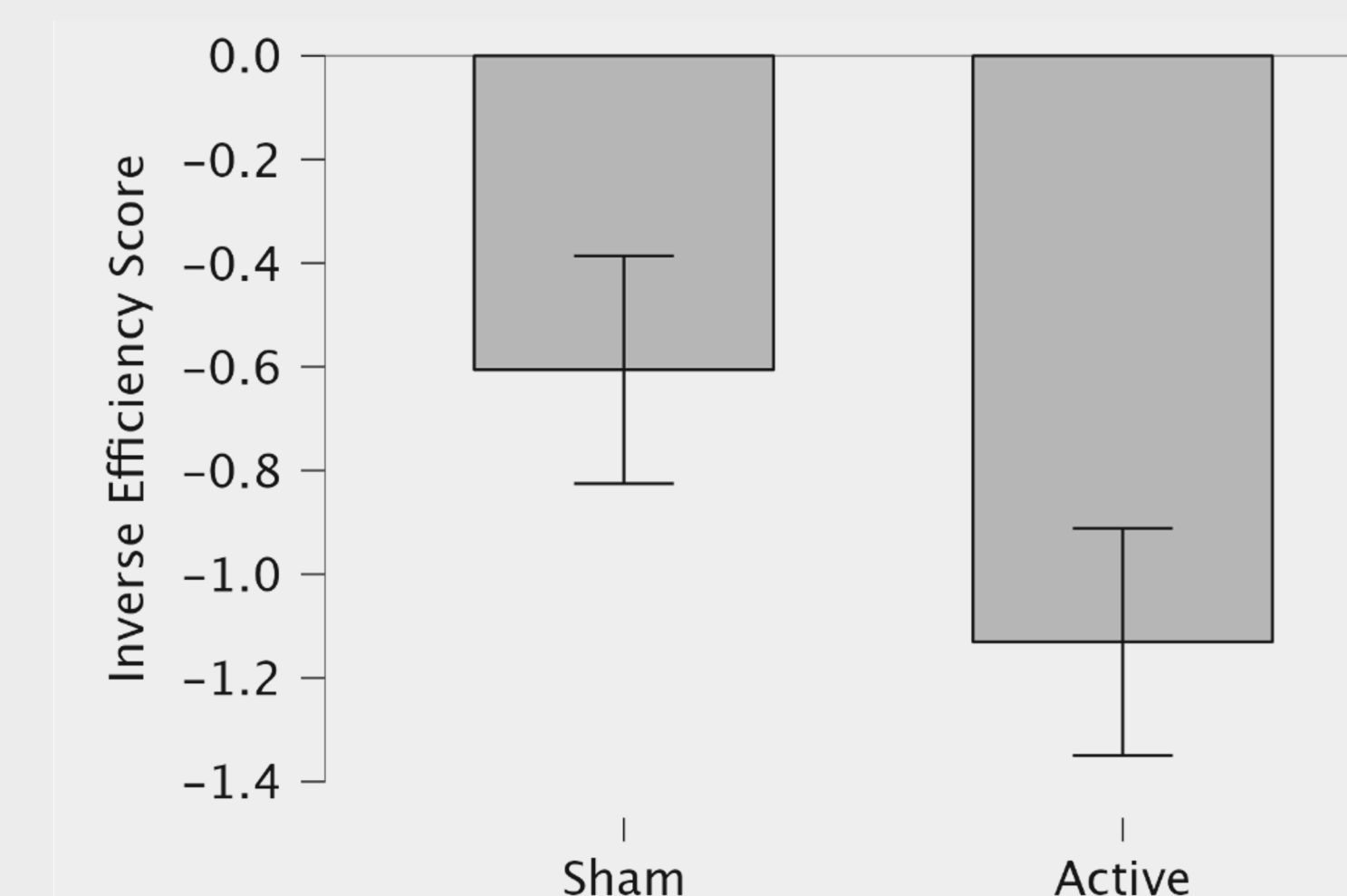
## RESULTS



**Figure 1:** Change score of RT cost of the Go/No-go task ( $p = 0.02$ ).



**Figure 2:** Change score of the omission errors for the global switch cost of the color-shape switch task ( $p = 0.02$ ).



**Figure 3:** Change score of the IES of the mixed rule set of the color-shape switch task ( $p = 0.03$ ).

## ACKNOWLEDGEMENTS

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Participants: Tactical personnel with a history of remote concussion (M = 24, F = 10)

Age (y)	BMI (kg/m <sup>2</sup> )	VO <sub>2max</sub> (ml/kg/min)	Number of Concussions	Time Since Concussion (y)
21.6 ± 4.0	24.1 ± 2.9	48.9 ± 5.9	1.2 ± 0.9	5.4 ± 4.9

Table 1: Demographics mean ± SD.

**Study Design:** Randomized, counterbalanced, within-subject, sham-controlled.

### Visit 1: Familiarization & Max Testing

- Hopkins Verbal Learning Task (HVLT)
- Color-shape Switch Task
- Go/No-Go Task
- VO<sub>2</sub>max test (Bruce Protocol)

### Visit 2 & 3: Experimental Visits

- **Sham Condition:** ramped-up to 50% intensity over 2.5 minutes, then down to 0% over the next 2.5 minutes.
- **Active Condition:** set to the “Focused” setting and was ramped up to 50% over 5 minutes.