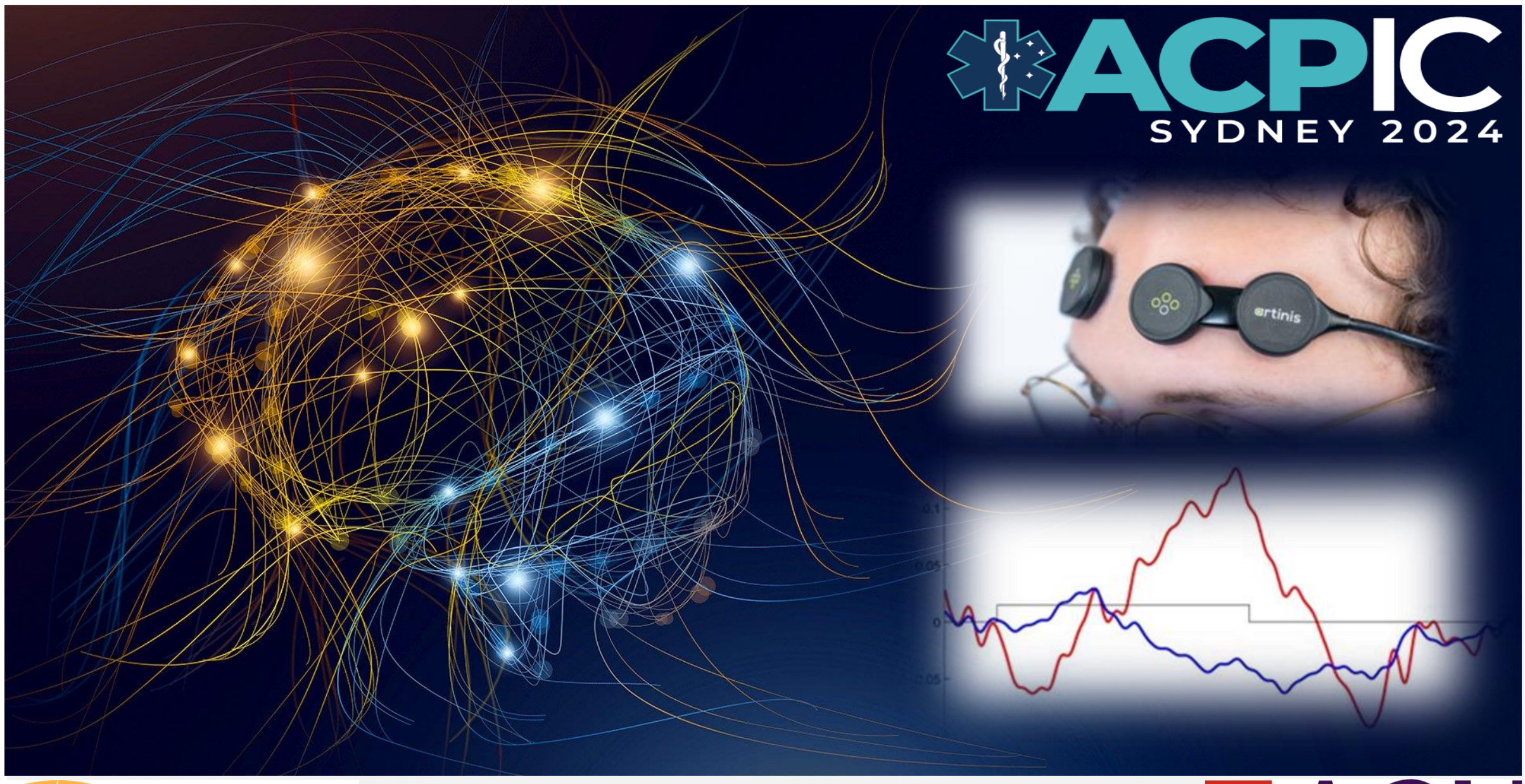

University of Southern Queensland

Exploring the Utility of Functional Near-Infrared Spectroscopy (fNIRS) in Assessing Stress Response amongst Undergraduate Paramedicine Students

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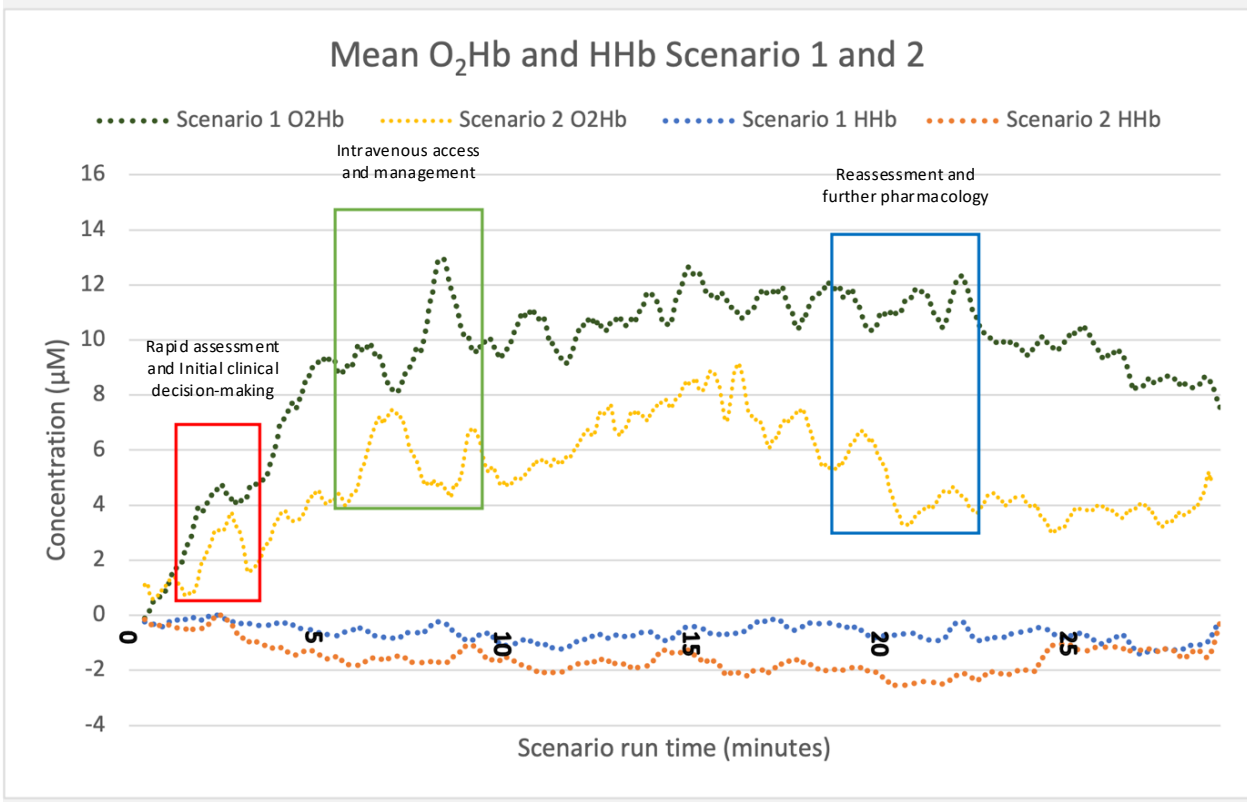
What is fNIRS:

The basic principle behind Functional Near-Infrared Spectroscopy (fNIRS) involves the use of light to penetrate the skull and reach the brain tissue. By measuring the changes in light absorption, fNIRS can provide information about the concentration of oxygenated and deoxygenated Hb (O2Hb and HHb respectively) in the brain[1]. An increase in O2Hb concentration is associated with increased blood flow and oxygen delivery to active brain regions. This is consistent with the idea that when neurons are active, they require more oxygen to support their metabolic demands, whereas an increase in HHb concentration is typically associated with increased oxygen consumption in active brain regions[2].

Aims:

Our study aimed to assess fNIRS as a non-invasive neural monitoring modality for final year undergraduate paramedicine students undertaking simulated high-acuity scenario-based assessments.



Conclusion:

By utilising novel technologies such as fNIRS, educators can provide real-time non-invasive neural feedback to students as they practice simulation-based learning. This allows students to gain an appreciation of their own individual cognitive stress points and develop plans to mitigate overload. The addition of stress mitigation strategies to their clinical and technical knowledge can only assist graduate paramedics to be better clinicians in real world medical situations.

Methods:

Eight paramedicine students underwent fNIRS scans during simulated high-acuity patient care. The first scenario (Scenario 1) involved assessment and management of a critically unwell anaphylaxis patient. The second scenario (Scenario 2) centred around an unconscious respiratory arrest secondary to a narcotic overdose and was completed seven days after Scenario 1.

Results:

Preliminary results suggest fNIRS can detect increased cognitive load during the case cycle where highly technical skills such as intravenous cannulation are employed. Additionally, a subsequent later attempt at a high-acuity scenario significantly reduces neural oxygen demand suggesting decreased cognitive workload.

Scan the QR codes below to watch fNIRS in action

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2. Sevcenko, N., Schopp, B., Dresler, T., Ehlis, A.-C., Ninaus, M., Moeller, K., & Gerjets, P. (2022). Neural Correlates of Cognitive Load While Playing an Emergency Simulation Game: A Functional Near-Infrared Spectroscopy (fNIRS) Study. IEEE Transactions on Games, 14(4), 696-705. https://doi.org/10.1109/tg.2022.3142954

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