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Multiscale Entropy Increases at Short Time Scales Across Time in a 10-minute Psychomotor Vigilance Test

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Abstract

Multiscale entropy, a measure of brain signal regularity and complexity across multiple time scales, reliably increases at the lower time scales influenced by relatively high frequency brain activity as individuals experience task fatigue, typically across long time-on-task intervals. We compare multiscale entropy across the first 2 minutes versus the 7th and 8th minutes of a brief (10-minute) Psychomotor Vigilance Test, exploring entropic change over a brief interval. We observed significantly increased multiscale entropy at lower time scales later relative to earlier in the task, providing evidence that multiscale entropy is a strong marker of time-on-task fatigue onset across a brief vigil. Brain-behavior linkage results were mixed, with significant relationships limited to those between reaction times later in the task and multiscale entropy assays from midline central and occipital sensors, and at relatively long time scales.