Soldier Readiness: Multiscale Entropy Analysis on Physiological Signals

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Abstract: This study demonstrates how Multiscale Entropy (MSE) analysis on physiological signals can detect patterns of abnormality within physiological states. The use of wearable technology on soldiers during the conduct of military operations can collect data on physiological signals that highlight indications of health degradation. MSE analysis is performed on Electrocardiogram (ECG) data, RR intervals, and respiratory levels. In this context, MSE analysis is a method that analyzes the complexity for a physiological measure. To detect patterns within MSE analysis, the study utilizes data extracted from Physio.net. After studying and analyzing data from unhealthy and healthy populations, the results indicate there is a significant difference of entropy between the readings. While the healthy data displays a positive entropy curve, the unhealthy data populates a decreasing curve indicating irregular patterns. MSE analysis on respiratory and ECG data provides insights into the overall health of a soldier during military operations, which can be used to maximize mission success rates.

Keywords: Human Performance Modeling, Human-System Integration, System Design and Analysis