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# EEG Signal Quality Analysis of Resting States Using the MUSE 2 Headband for Brain-Computer Interface

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## Abstract

Recent advances in brain-computer interface (BCI) technology have enabled a growing range of real-world applications. Due to its non-invasive nature, affordability, portability, and ease of use, electroencephalography (EEG) remains a widely adopted neuroimaging method for BCI. However, because EEG signals are inherently delicate, and consumer-grade devices are particularly susceptible to noise, inexperienced operators are at heightened risk of recording poor quality data. This study aims to analyze EEG data collected by inexperienced novice operators using the MUSE 2 headband. The primary objectives are: (1) to evaluate the reliability of MUSE 2 for capturing EEG signals, and (2) to determine whether operators with no prior EEG experience can acquire data of acceptable quality.

To assess EEG signal quality during resting-state recordings, several quality metrics are employed, including signal shape statistics (mean, standard deviation, skewness, and kurtosis), artifact rate, signal-to-noise ratio (SNR), and line noise power. The results demonstrate that Muse 2 can yield usable EEG data, even when operated by novices. © 2025 IEEE.

## Author keywords

brain-computer interface; EEG signal quality; MUSE 2; resting states

## Indexed keywords

### Engineering controlled terms

Biomedical signal processing; Data reliability; Electroencephalography; Electrophysiology; Higher order statistics; Interface states; Interfaces (computer); Neuroimaging; Quality control; Signal analysis; Signal to noise ratio

### Engineering uncontrolled terms

Ease-of-use; Electroencephalography signal quality; Interface technology; MUSE 2; Primary objective; Quality metrics; Real-world; Resting state; Signal quality; Signal shapes

### Engineering main heading

Brain computer interface

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