ABSRACT

An optimal inpatient room environment plays a pivotal role in promoting patient recovery, where both subjective comfort and physiological responses serve as key indicators of well-being. Environmental factors such as room temperature, lighting, and noise levels can significantly influence psychological state and physiological functions, including muscle tension and cardiac activity. To complement subjective assessments, an objective biosignal-based measurement approach is essential. This study investigates the effects of varying environmental conditions on subjective comfort and physiological responses by acquiring surface electromyography (sEMG) and electrocardiography (ECG) signals.

Experiments were conducted under 18 distinct conditions derived from combinations of three main variables: air conditioner (AC) status, lighting mode (off, on, dim), and noise level (silent, conversational, medical equipment). Subjective comfort was assessed using a 7-point Likert scale (1 = very comfortable, 7 = very uncomfortable), while objective data were analyzed using RMS, MDF, HR, and HRV parameters. Results revealed that the combination of AC on, dim lighting, and silent environment yielded the highest comfort ratings and more stable physiological responses The MDF and HR parameters showed a significant correlation with subjective scores ($\rho = 0.2142$, $p = 0.0211$). HR exhibited a moderate negative correlation ($\rho = –0.3051$, $p = 0.0035$), whereas other parameters such as RMS and HRV demonstrated weak and non-significant relationships. These findings indicate that MDF can serve as an objective indicator of comfort and support the development of an adaptive environmental monitoring system based on human physiological responses.

***Keywords**: Subjective Comfort, Surface Electromyography (sEMG), Electrocardiography (ECG), Trapezius Muscle, Heart Rate (HR), Heart Rate Variability (HRV), Median Frequency (MDF), Root Mean Square (RMS).*