World Academy of Science, Engineering and Technology
International Journal of Biomedical and Biological Engineering
Vol:15, No:09, 2021

Developing Wearable EMG Sensor Designed for Parkinson's Disease (PD) Monitoring, and Treatment

Authors : Bulcha Belay Etana

Abstract : Electromyography is used to measure the electrical activity of muscles for various health monitoring applications using surface electrodes or needle electrodes. Recent developments in electromyogram signal acquisition using textile electrodes open the door for wearable health monitoring which enables patients to monitor and control their health issues outside of traditional healthcare facilities. The aim of this research is therefore to develop and analyze wearable textile electrodes for the acquisition of electromyography signals for Parkinson's patients and apply an appropriate thermal stimulus to relieve muscle cramping. In order to achieve this, textile electrodes are sewn with a silver-coated thread in an overlapping zigzag pattern into an inextensible fabric, and stainless steel knitted textile electrodes attached to a sleeve were prepared and its electrical characteristics including signal to noise ratio were compared with traditional electrodes. To relieve muscle cramping, a heating element using stainless steel conductive yarn Sewn onto a cotton fabric, coupled with a vibration system were developed. The system was integrated using a microcontroller and a Myoware muscle sensor so that when muscle cramping occurs, measured by the system activates the heating elements and vibration motors. The optimum temperature considered for treatment was 35.50c, so a Temperature measurement system was incorporated to deactivate the heating system when the temperature reaches this threshold, and the signals indicating muscle cramping have subsided. The textile electrode exhibited a signal to noise ratio of 6.38dB while the signal to noise ratio of the traditional electrode was 7.05dB. The rise time of the developed heating element was about 6 minutes to reach the optimum temperature using a 9volt power supply. The treatment of muscle cramping in Parkinson's patients using heat and muscle vibration simultaneously with a wearable electromyography signal acquisition system will improve patients' livelihoods and enable better chronic pain management.

Keywords : electromyography, heating textile, vibration therapy, parkinson's disease, wearable electronic textile
Conference Title : ICHWWST 2021 : International Conference on Health Wearables and Wearable Sensor Technologies
Conference Location : San Francisco, United States
Conference Dates : September 27-28, 2021