

Thermoelectric Blanket for Aiding the Treatment of Cerebral Hypoxia and Other Related Conditions

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Abstract : Cerebral hypoxia refers to a condition in which there is a decrease in oxygen supply to the brain. Patients suffering from this condition experience a decrease in their body temperature. While there isn't any cure to treat cerebral hypoxia as of date, certain procedures are utilized to help aid in the treatment of the condition. Regulating the body temperature is an example of one of those procedures. Hypoxia is well known to reduce the body temperature of mammals, although the neural origins of this response remain uncertain. In order to speed recovery from this condition, it is necessary to maintain a stable body temperature. In this study, we present an approach to regulating body temperature for patients who suffer from cerebral hypoxia or other similar conditions. After a thorough literature study, we propose the use of thermoelectric blankets, which are temperature-controlled thermal blankets based on thermoelectric devices. These blankets are capable of heating up and cooling down the patient to stabilize body temperature. This feature is possible through the reversible effect that thermoelectric devices offer while behaving as a thermal sensor, and it is an effective way to stabilize temperature. Thermoelectricity is the direct conversion of thermal to electrical energy and vice versa. This effect is now known as the Seebeck effect, and it is characterized by the Seebeck coefficient. In such a configuration, the device has cooling and heating sides with temperatures that can be interchanged by simply switching the direction of the current input in the system. This design integrates various aspects, including a humidifier, ventilation machine, IV-administered medication, air conditioning, circulation device, and a body temperature regulation system. The proposed design includes thermocouples that will trigger the blanket to increase or decrease a set temperature through a medical temperature sensor. Additionally, the proposed design allows an efficient way to control fluctuations in body temperature while being cost-friendly, with an expected cost of 150 dollars. We are currently working on developing a prototype of the design to collect thermal and electrical data under different conditions and also intend to perform an optimization analysis to improve the design even further. While this proposal was developed for treating cerebral hypoxia, it can also aid in the treatment of other related conditions, as fluctuations in body temperature appear to be a common symptom that patients have for many illnesses.

Keywords : body temperature regulation, cerebral hypoxia, thermoelectric, blanket design

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