Executive Summary

Neuromuscular disorders are among the most common medical disorders worldwide, affecting over 14,000,000 people [1]. One of the most indicative symptoms of neuromuscular disorders is tremors in the hand or arm, which can make many daily activities more challenging and even dangerous. [2]. Neuromuscular disorders that deteriorate nerves, such as multiple sclerosis, can involve agonizing muscle spasms that worsen as the condition progresses [3].

Patients with neuromuscular disorders must adjust to physical limitations as well as deal with other psychological factors that are indirectly caused by their condition. Studies have shown a positive correlation between patients suffering from neuromuscular disorders and depressive symptoms [4]. In addition, epilepsy patients often experience a decrease in their quality of life after diagnosis [5]. Also, the decrease in mobility seen in elderly neuromuscular disorder patients has been shown to cause strain on their families [6]. Essentially, the main problems associated with neuromuscular disorders are pain, symptom management, and quality of life.

Our team designed a wearable personal monitoring device to help individuals achieve more transparency and autonomy regarding their disorder and medical treatment. Our customer demographic would be individuals in the early stages of neuromuscular disorder symptom development, characterized by arm and hand tremors/spasms. Studies have found that the average onset age for neuromuscular disorders such as multiple sclerosis is early 30s, meaning most users of our device are expected to be well into adulthood [7].

The finalized design consists of a glove-sleeve combination with embedded electrodes connected to two EMG muscle sensors on the surface – one on the forearm and one on the bicep. To help individuals assess the severity of their tremors/spasms without an overly intrusive alert, we placed coloured LEDs on top of the battery box on the back of the arm, with high, cautionary, or mild muscle activity turning on a red, yellow, or green LED, respectively. This data is also stored for later reference. In addition, the device has a therapeutic function in the form of heating wiring sewn throughout the sleeve and glove. When more severe or quickly escalating tremors/spasms are detected, this would activate the heating elements, warming the sleeve to help ease muscle activity [8].

This product is unique in its versatility, combining key features of symptom tracking and symptom management for a variety of neuromuscular disorders. It has a user-friendly design, and its predictive function can help prevent potentially life-threatening accidents. This product would not only be marketed directly to consumers, but we would also direct it towards medical practitioners who work closely with neuromuscular disorder patients. Since doctors are the ones who will be referring patients to specific wearable devices, it is important they understand the improvements in patient autonomy and lifestyle that this device would facilitate.

Overall, our wearable device will help individuals with neuromuscular disorders gain more insight into their symptoms and disease progression, while also offering relief from abnormal muscle activity, thereby improving quality of life.

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