Develop an upper extremity interactive rehabilitation device to aid children with cerebral palsy

Abstract

From the name “cerebral palsy” itself, “cerebral” is related to the brain which makes it a neurological disorder whereas “palsy” relates to the lack of muscle control. Therefore, a person with cerebral palsy has muscle coordination complication. It is one of the most occurring physical disabilities in childhood. This is usually caused by damage to a developing brain of a pre-born or shortly after birth baby. This condition affects people in many ways such as muscle control, body movement and body posture. It is usually by the age of 2 or 3 when cerebral palsy’s symptoms can be seen in a baby. While the baby’s brain is still developing, the occurrence of abnormal development, brain malformation or brain impairment cause brain damage and eventually lead to cerebral palsy. One of the significant consequences is for the baby to grow up with weak upper limbs. This causes inconvenience and difficulties to them in carrying out their daily activities and also to enjoy certain sports.

In fact, according to a journal titled “Upper Extremity Interventions”, it is stated that it is more difficult to regain mobility in the upper extremities than the lower extremities. Therefore, it will be a good idea to focus this project on the upper extremities. This flaw does not only weaken them physically but also mentally. The fact of not being able to carry out daily routines like the others may also cause them to possess lower self-esteem. Unhealthy mentalities will affect them negatively in the future.

However, this brain disorder is non-progressive which means that the brain damage situation will not continue to aggravate throughout the victims’ lives. We can carry out different courses of action to improve the strength of the upper limbs. This shortcoming can be overcome with many rehabilitation devices that have been invented. These devices play the role of strengthening their upper limbs and consequently boosting their self-confidence in being able to carry out activities alike with the others.

The main objective of this project is to help cerebral palsy victims since young so they will be able to have a better grasp and understanding in cerebral palsy. Then, they can carry out activities in their lives as easy as possible.

In order to help overcome this problem, a handcycle device with an interactive feedback were proposed to develop. A handcycle is a device which looks similar to the bicycle pedals. It requires the user to cycle it with their hands in a circular motion instead of legs in order to strengthen their upper limbs. However, since this device is meant for the children, it will be pretty boring and unattractive if they have to keep cycling it with their hands only. Besides, many of the handcycle devices in spastic center cater to the adults. The size of the handcycle might not be suitable for children.

Therefore, the interactive feedback plays another important role in motivating or act as an incentive for the children to put effort into utilizing this device. The handcycle will be

connected to an android device where the children can play a game with the handcycle. There will be buttons on both pedals to manipulate movements in the game. Both cycling and buttons pressing will help to strengthen their upper limb and also hand grip strength.

Besides, the interactive feedback should be able to record certain data from the handcycle such as the distance cycled. This data is meant for remote monitoring where the data may be sent online to a doctor or physician for rehabilitation exercises analysis. On the sideline, although this project is targeting the children, this device is also able to help adults who have suffered a stroke and are looking to recover from difficulty in using their arms.

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