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Electrical brain stimulation could benefit children with cerebral palsy, study finds

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Every so often, Hadley Lucca will spend hours in front of her bedroom mirror, struggling to put on earrings or pull her long, golden locks back into ponytails.

For Hadley, 11, activities that other girls her age take for granted can sometimes seem insurmountable. As an infant, she survived a stroke that resulted in hemiplegia, a type of cerebral palsy in which one side of the body is significantly weaker than the other.

"Hadley is a real trouper," said her mother, Sarah Lucca, a schoolteacher from Elko New Market. "She wants to be independent just like the other kids, and that means not having to count on others to do things like put up her hair."

Now, neuroscientists at the University of Minnesota are experimenting with technology that could one day help Hadley achieve her dream of living independently.

In a first-of-its-kind study, researchers found that stimulating targeted areas of the brain with a mild electrical current can enhance the motor skills of children with cerebral palsy, which is the most common motor disability in childhood. The findings, published last month, mark the first time that the exploratory procedure known as "transcranial direct current stimulation," or tDCS, which involves passing an electrical current through the skull and into the brain, was found to be safe with children with cerebral palsy.

"This has the potential to transform lives," said Bernadette Gillick, principal investigator of the study and director of a pediatric research lab at the University of Minnesota Medical School.

As part of the study, researchers enrolled 20 people, ages 7 to 21, who had experienced a stroke around or before birth on one side of the brain, resulting in cerebral palsy and limited hand function. The children came from as far away as Florida, Montana and New York, and underwent direct stimulation sessions for 10 consecutive days, combining 20 minutes of electrical stimulation each day with hours of hand exercises.

The technology deployed is surprisingly low-tech.

Researchers attached a rubber headband with sponges and electrodes to the scalp, and then delivered mild currents powered by two 9-volt batteries. The currents were delivered to the part of the brain that controls hand movement, known as the motor cortex, in the hope that the injured neurons—cells that transmit information—would become more active and exert more control over the affected limb.

The results were overwhelmingly positive: All the children who participated showed some improvement in hand function when the study period ended. Even more significant, the children showed no serious side effects either during the study or during six months of follow-up visits, which suggests that brain stimulation could be a feasible intervention for improving coordination in children with cerebral palsy, researchers said.

Neuroscientists have been experimenting with transcranial direct brain stimulation in adults for more than 20 years. A multitude of studies have suggested that delivering a low electrical current to the brain may have therapeutic benefits for treating depression, sleep disorders, and even enhancing the libido. To the alarm of some in the medical community, the technology has become so popular that brain-stimulating kits are now

being marketed and sold online, replete with diagrams and video tutorials.

Yet researchers had not explored the use of the technology with children, largely because of safety concerns and government regulation. Even now, the U researchers cautioned against drawing sweeping conclusions from the study. While children who participated showed gains, the study's sample size was not large enough to produce statistically significant results, researchers said.

Gillick, the neuroscientist who led the study, said she occasionally gets phone calls and emails from parents of children with cerebral palsy who are seeking advice on how to attempt brain stimulation on their children at home. She cautions against using the devices outside of a clinical setting, noting that researchers are still not sure of the long-term effects of administering even low-level currents to a child's brain.

"This is not ready for prime time," said Gillick, who spoke recently via Skype from Auckland, New Zealand, where she presented details of her studies. "As much as I'd like to say that we've found something that's going to help early and have durable, long-lasting effects across a person's entire life span, we don't know that yet."

Even so, Gillick's study has already garnered international attention and has fueled hope that researchers can dampen the effects of cerebral palsy by intervening earlier, while a child's motor skills are still developing. Even modest gains can have a lasting impact for someone with cerebral palsy, she said.

"A 5 percent reduction in a disability can be the difference between someone being able to feed themselves and attend school and live independently," she said.

As one of the participants in the study, Hadley Lucca was asked to describe her goals and ambitions. The girl, who has muscle weakness and limited mobility in her right arm, quickly drew up a list of activities that she has long struggled to conquer on her own. Her list included tying her hair into ponytails, putting on earrings and baking cookies.

By the end of the two-week study, Hadley showed progress in all her goals, and had finally succeeded in putting on earrings without her mother's help. On a recent afternoon, Hadley gleamed with excitement as she described her accomplishment. "I kept trying it this way, and that way, until I finally got it," she said, grinning widely. Her next big goal, she said, is mastering the art of making ponytails.

Looking out further, Hadley said she dreams of one day attending the University of Minnesota and becoming a dog trainer.

"I keep telling Hadley there is nothing she can't do," her mother said. "There are only those things that she can't do—yet."