A virtual muscle machine for kids with disabilities

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This is the virtual tabletop used by Dr. Dido Green in her therapy with children. Credit: AFTAU

It was her love of ballet that led her to work with children who have motor disabilities. The retired dancer, now an occupational therapist, is pioneering a new "virtual" method to analyze movement patterns in children — and more effectively treat those with debilitating motor disorders.

Dr. Dido Green of Tel Aviv University's Department of Occupational Therapy in the School of Health Professionals is using a "virtual

tabletop" called the ELEMENTS SYSTEM, developed by her partners at Australia's Royal Melbourne Institute of Technology, to "move" kids with disabilities and provide home-based treatments using virtual reality tools. Combining new three-dimensional exercises with two-dimensional graphical movement games already programmed into the tabletop (which resembles an early video game), she reports not only success but also enthusiasm among her young patients.

"I've been working with children with movement disorders for the last 20 years," says Dr. Green. "By the time I meet these children, they're sick of us. They've been 'over-therapied,' and it's difficult to get them to practice their exercises and prescribed treatment regimes."

Fun for kids from three to fifteen

"The virtual tabletop appealed to children as young as three and as old as 15," Dr. Green reports. "The movement-oriented games allowed them to 'make music' and reach targets in ways that are normally neither comfortable nor fun in the therapeutic setting," she explains.

Dr. Green determined that children with partial paralysis and motor dysfunction resulting from disorders such as cerebral palsy may be helped by giving them a new interface to explore. Building upon earlier research she conducted at the Evelina Children's Hospital in London, Dr. Green found that virtual reality applications enhance the skill sets learned by her patients.

Coupled with new technology involving 3D Movement Analysis, a technique she is now integrating into research at Tel Aviv University, Dr. Green hopes to develop this virtual tabletop-type game into new and effective therapy treatment regimes.

"Traditional approaches are labor-intensive and their results limited," Dr.

Green says. "Our research aims to create a complete system for therapist, parent and child. It could bring daily treatments into the home and provides therapists with a complete solution to track and analyze improvements or setbacks in the most accurate way to date."

From the virtual to the real world

In children who attended sessions with her interface for three days a week over a period of about one month, Dr. Green found some impressive results. One child with a paralyzed hand was able to perform more complicated movements, culminating in a "eureka!" moment when she opened a door for the first time in her life. The girl was also able to gain control over some motor movements essential for basic life tasks, such as buttoning sweaters, opening doors, or going to the washroom. These are skills some children never develop with current therapy regimes.

In the near future, Dr. Green hopes to develop the technique for remote rehabilitation, enabling children to practice movements at home with parental supervision. Therapists located elsewhere could "log in" with a webcam and computer to coach the students or monitor their progress.

The researcher also plans to analyze brain function using trans-cranial magnetic brain stimulation. Currently, brain function relating to motor activities is analyzed with magnetic resonance imaging (MRI). But many children are too impatient to sit in an MRI machine, so clinicians need a more accurate means of analyzing movement in children with disabilities to develop individualized therapy regimes.

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