

# Video game technology helps measure upper extremity movement

February 6 2015

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Researchers at Nationwide Children's Hospital have developed a way to measure upper extremity movement in patients with muscular dystrophy using interactive video game technology. Their hope is to expand inclusion criteria for clinical trials to incorporate patients using wheelchairs.

In a recent study published online in *Muscle and Nerve*, researchers found that scores in the game were highly correlated with parent reports of daily activities, mobility and social and cognitive skills. Currently, patients with diseases like muscular dystrophy who have lost mobility and use wheelchairs are excluded from [clinical trials](#) because there is not an easy, affordable or comprehensive way to measure their muscular function. The standard measurement to demonstrate mobility is having the patient walk for a six minute test. The researchers hope the video game, designed with input from their patients, will demonstrate to the Food and Drug Administration that repeating the game with a patient accurately yields the same results, and results will change according to the progress of the patient.

"We were thrilled with the results," says Linda Lowes, clinical therapies research coordinator for the neuromuscular program at Nationwide Children's. "It's very reliable day to day because it's just fun. The scores are related to function, and really reflect what the boys could do in their life."

Ability Captured Through Interactive Video Evaluation, or ACTIVE-

seated technology, utilizes a Kinect gaming camera, found in Xbox consoles. With a patient-requested zombie theme, the game requires the boys to reach with their arms in various directions to push forward a force field. The Kinect camera and ACTIVE-seated software measures how far and how long the boys reach. Measuring change over time is a primary goal. The development of the game relied almost entirely on the patients.

"The game allows them to disintegrate aliens, which they love," says Lindsay Alfano, a physical therapist at Nationwide Children's. "In clinical trials we need to see that they're getting better with all of their activities. They have to spend hours with us doing nothing that's easy, only hard things. Looking at their faces after they play this game where they get to just play and be kids is a lot of fun to see."

Alfano and Lowes both speak to the importance of motivation when it comes to the success of the game's results. If a patient is not motivated to do something day after day, their performance will be different, making the assessment tool useless because it would not be measuring true function. Finding what is motivating yields the best outcome measure.

Sixty-one patients, recruited from the Nationwide Children's Hospital Muscular Dystrophy Association Clinic, participated in the study. The reachable area, which was visually represented as a series of boxes that appeared on a screen, was converted into a scaled score based on arm length. This allowed for the standardization of comparisons between patients of different sizes and the accommodation of growth in patients. The placement of the boxes is based on the size of the patient.

"We developed this game because there was not an accepted outcome measure for boys with muscular dystrophy who couldn't walk. So we needed an outcome measure that would be reliable, valid, and also give discrete quantitative measurements so they could measure small change

or big change over time," says Lowes.

The study focused on patients with Duchenne Muscular Dystrophy, a type of [muscular dystrophy](#) that is most common in children, specifically young boys. The condition does not show itself at birth. Boys are born appearing healthy, but over time, parents notice that their children are no longer keeping up with their peers. Children with Duchenne become weaker over time, slowly becoming unable to feed themselves, move normally and do various other tasks. Children receive wheelchairs around the age of 12, and later in life they begin to lose respiratory and cardiovascular function. However, they hope that the technology can also be proven to be effective for patients with other conditions that result in lack of mobility, such as cerebral palsy.

"As a clinical trial outcome measure, we really wanted this to be as universal as possible. We want to be able to use this across sites, both in the U.S. and internationally, because most of the clinical trials are international at this point," says Alfano. "Having something that's commercially available, low cost and easy to implement was really a huge goal for us."

Provided by Nationwide Children's Hospital

Citation: Video game technology helps measure upper extremity movement (2015, February 6) retrieved 2 May 2024 from

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