

Development of a virtual upper extremity assessment tool for individuals with DMD across the lifespan

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Clinical trials are being conducted for DMD using timed walking as a primary outcome measure due to the ease of administration, ability to quantify distance, and established validity. Unfortunately, participation in clinical trials is not equally accessible to all individuals due to the lack of a reliable, valid and sensitive upper extremity measure for the non-ambulatory population. It is essential that this gap in knowledge be filled, as upper body movement is required for many activities of daily living impacting quality of life across the lifespan and abilities in individuals with DMD. The purpose of this project was to develop a reliable and engaging upper extremity measure to quantify workspace volume, reaching velocity, and rate of arm fatigue using the Kinect system to capture data during a video virtual reality game across the spectrum of abilities.

The Microsoft Kinect Windows 7 used for this project is a controller-free gaming device that projects an infrared reference matrix that is reflected off of the person and generates a high-resolution depth map of each pixel allowing for tracking of movement. Software is available to track 20 joints and provide positional data which can be used to calculate measurements such as workspace volume, reaching velocity, and rate of arm fatigue.

Virtual gaming was developed as a motivational tool to be used during assessment. Workspace volume gaming uses bubble popping game while velocity and fatigue use a disappearing image to encourage rapid movement.

A prototype assessment system is being validated against a marker based motion capture system and traditional upper extremity assessments such as the Jebsen Hand Function Test, 9-hole peg test, and the Brooke Upper Extremity Rating Scale. Preliminary data suggests that this may be an engaging, reliable and valid upper extremity assessment measure for individuals with DMD across the lifespan.