

Virtual Reality and Computer Games: New Tools for Addressing Childhood Disorders

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Advancements in computing power, virtual reality and video game technology are creating new opportunities for addressing childhood disorders in ways that were undreamed of back in the bygone days of the 20th Century! While the vision of a “digital generation” of children, more comfortable with a mouse and gamepad, than with a book or a bicycle raises many serious concerns, there is no denying the attractive and compelling nature of these new forms of information technology. In fact, a reasonable case can be made that such technology, if harnessed thoughtfully, could be used to engage children in a wide range of therapeutic activities. For example, Virtual Reality (VR) has now emerged as an efficacious tool in many areas of assessment, therapy and rehabilitation.

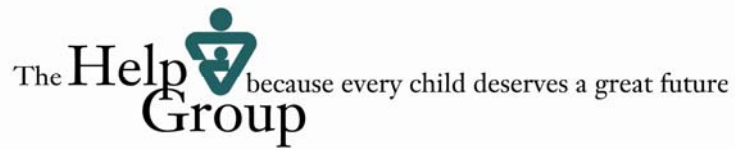
VR combines computers, real-time graphics, visual displays, body tracking sensors, and specialized interface devices to immerse a participant in a computer-generated simulated world that changes in a natural way with head and body motion. The capacity of VR technology to create controllable, multisensory, interactive 3D stimulus environments, within which human performance can be recorded and measured, offers clinical assessment and intervention options that are not possible using traditional methods. Much like an aircraft simulator serves to test and train piloting ability under a variety of controlled conditions, VR can be used to create relevant simulated environments where assessment and treatment of cognitive, emotional and motor impairments can take place. Over the last 10 years VR has been used with adults for phobias, posttraumatic stress disorder, addictive behaviors, acute pain reduction and for cognitive and motor impairments following stroke, brain injury and other forms of neurological disorders. To do this, scientists have constructed virtual airplanes, skyscrapers, spiders, battlefields, social events populated with virtual humans, fantasy worlds and the ordinary environments of the schoolroom, office, home, street and supermarket.

As the discipline of clinical VR has evolved from the success of adult-targeted “proofs of concept”, more interest has been directed towards how this technology could be usefully applied to childhood disorders. For example, our research group at USC has developed a virtual classroom that has been used for testing attention processes in children with Attention Deficit Hyperactivity Disorder (ADHD) and pediatric brain injury. Children don a VR headset and are whisked away into a simulation of a typical

classroom where they can look ahead at the blackboard and follow the virtual teacher's instructions, or choose to turn their head to look out the window at a passing car. Within this controlled stimulus environment we can measure precisely how well a child can pay attention to the directed activities at the front of the class, while we systematically deliver audio and visual distractions (i.e., cars driving by the window, hall sounds, and yes, even a paper plane flying across the room). In this manner, we can begin to understand how susceptible a child is to different forms of distraction. Such information can be used to document performance for diagnostic purposes, inform treatment planning, or to help in determining the impact of medications on performance in a virtual classroom test setting. Other researchers have followed the aircraft simulator metaphor in the creation of virtual homes used to teach children with Autism Spectrum Disorders (ASD) fire safety skills; virtual streets and traffic for teaching safe crossing skills in children with Down's Syndrome; and virtual obstacle courses for determining if a child is capable of using a motorized wheelchair safely and effectively (and to support training if they're not quite ready yet).

One of the more recent developments in this area though, is seen with the intersection of computer games and technology with virtual reality. This merging of technologies and concepts has resulted in what has been termed the "Games for Health" movement. Basically the idea is that you may have more success engaging a child in a testing, treatment or training VR simulation if he is motivated by some form of embedded video gameplay. This view makes intuitive sense and hits close to home when parents notice their children exhibiting Herculean focus when playing a video game on their X-Box, while teacher reports indicate chronic inattention and distractibility in the classroom. I noticed this dramatically in my clinical work with young adults following traumatic brain injury. Clients who had significant difficulty maintaining their concentration on traditional cognitive rehabilitation tasks for more than 15 minutes, would easily spend hours at a time playing the cognitively challenging computer game "SimCity".

The key challenge now for the Games for Health community is to find ways that important testing, treatment and training activities can be translated into game activities that are engaging to children that have grown up digital, while still being able to make the case that a relevant therapeutic or learning objective is being addressed. This creative scientific and clinical challenge has no shortage of researchers willing to take up the call. Game based VR simulations are now showing efficacy in engaging children with Cerebral Palsy to better perform tedious motor rehabilitation exercises for ankle dorsoflexion and other important motor actions. Games are also being used successfully to promote health behaviors in children undergoing chemotherapy and for distracting children's attention away from common, yet anxiety provoking medical procedures (e.g., IV insertions, spinal taps) to reduce pain perception and discomfort. A number of groups have also begun work with game applications for children with ASD that are designed to promote eye contact, interactive story telling, turn-taking and social



awareness. These initiatives represent early and encouraging first steps in using new simulation and game-based technologies to make a positive difference for children with special needs. As the technology continues to advance, the boundaries for its application will only be governed by the limits of our imagination!

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