Fact Sheet: Efficacy of active video game to improve outcomes for children with Cerebral Palsy

The TRIPSCY’s Evidence-based Journal Club is a means for Vermont Pediatric Physical and Occupational Therapy Practitioners and others to stay abreast of the research literature and develop strategies to apply this knowledge to benefit children and their parents.

Introduction:
Virtual reality systems, commercially available or not, have been used as a treatment modality with individuals with and without disability for some time. The price and wide availability of commercially available system such as the Wii™ have increased the interest of therapists in Vermont to better understand its applicability with children with cerebral palsy.

A review of the literature found a systematic review (Snider, Majnemer & Darsaklis, 2010) and two recent studies not included in this review (Golomb, et al., 2010; Shih, Shih, & Chu, 2010). In this brief factsheet, these three articles are reviewed and critically appraised. This is followed by a summary of the journal club discussion on the clinical implications of these articles.

 ARTICLE 1

This study investigated the use of Virtual Reality Videogame Telerehabilitation in adolescents with hemiplegia. There were three students 13-15 years of age who had severe right hemiplegic cerebral palsy affecting the arm and hand more than the leg. The study was a three-month ‘proof of concept’ pilot study. Measurements were taken before, during (i.e., fMRI and play logs) and after the video exercises began. They included clinical measurements in addition to forearm bone health and fMRI. The virtual reality videogame rehabilitation systems were installed in each of the student's homes and were networked to the collaborating engineering school and children's hospital. The authors reported improvements in grip testing and qualitative improvement in hand use in the 2 students that practiced the most (i.e., 22 hours). There were no changes on the Bruininks-Oseretsky Test of Motor Proficiency. The fMRI showed more active cortical areas after treatment in all 3 subjects. This study used a high tech sensor glove to monitor finger movement during a virtual reality videogame that was developed by a supporter of the research. It was unclear how the three participants were selected.
This study used a single-subject, multiple baseline design (ABAB) to examine the ability of two children with multiple disabilities to correct their posture while on the Wii® balance board. During the intervention phase, the children stood on the Wii® balance board that played their favorite cartoon on the TV when they maintained ‘corrected standing posture’. The set up was exactly the same for the baseline phase except no cartoon TV feedback was given. Both visual and statistical results revealed significant differences between each intervention and baseline phases for both children. However, the authors did not address reliability and validity of the tool they created to measure ‘correct standing posture’ nor did they operationally define standing posture.

This systematic review sought to know whether play-based virtual reality (VR) intervention improve outcomes in children with cerebral palsy (CP). The authors conducted a thorough literature search and found 13 studies including children with CP. The estimated the quality of the studies using the PEDro scale and modified Sackett score. The authors concluded that there is conflicting evidence about the efficacy of this intervention in children with CP. Virtual reality intervention resulted in modest improvement on specific areas of body structures and functions. The outcomes for activity and participation were also varied with a level 1b study finding a positive effect. Case studies found improved self-care skills in one subject and increased “playfulness” in children. In the area of personal factors there is emerging level 1b evidence showing benefits of VR therapy on factors including motivation and self-perception.

Implications for practice:
Commercially available active video gaming console such as the Nintendo’s Wii system, the Xbox Kinect or the Sony Move are relatively inexpensive technology, which are increasingly popular and available in children’s homes. They might be an effective mean for children with and without disabilities to improve their fitness. They might also be used as a therapeutic strategy to improve functional outcomes such as balance or coordination. So far, the research literature on the benefit of active video game consol to improve outcomes in children with CP is inconclusive although it shows promise in improving balance, activity participation and perceptions of self-advocacy. Gains in the personal factors, as defined by the ICF, have the strongest empirical support. Further research is needed which use optimal outcome measures with strong methodological design to determine efficacy.

Clinicians who choose to use active video games as an intervention may want to use the ICF framework to define the areas of function or factors they are targeting for improvements for given children. As with any other intervention with limited empirical evidence, clinicians are encourage to clearly define their intended goal and collect/analyze data when choosing to use active video game consol as part of their intervention plan. Family and child’s preference must also be considered. Finally, characteristics of the active gaming consoles should be investigated by the clinician to identify the one that best meet the child's needs.

References: