

Title: Home-based technology for children with impaired upper extremity

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Abstract:

Cerebral palsy (CP) is one of the leading causes of childhood disability. Children with CP have impaired motor and/or sensory function in one limb, one side of the body or all limbs, depending on the size and location of the lesion in the brain. Children with one side of the body involved are categorized as hemiplegic CP. A child with hemiplegic CP often uses the unimpaired arm for daily activities and disregards his/her affected arm, which is potentially valuable. This observed developmental disregard is similar to the learned non-use seen in adults with stroke. Decreasing usage of the impaired hand leads to further reduction in excitability of the injured brain. This connection sets off a deleterious circle of decreasing brain excitability and hand mobility. Massed-practice of the impaired hand is thought to facilitate use-dependent neuroplasticity and promote functional recovery of hand use. However, solely relying on the conventional rehabilitation is not practical to reach the effective intensity of massed-practice because of limited clinic visits due to health care cost, time commitment, travel inconvenience, etc. To overcome the limitation, a low-cost home-based therapy system was developed, which could deliver and monitor Massed-practice AT Home (MATH) beyond the clinical setting. The system, consisting of a standard computer, a small hand-held controller, an arm rest, a camera and various video games, capitalizes on cheaper electronics, advanced software programming and using video games as motivators. In the presentation, findings and experiences were shared based on the earlier home-based approach and the currently evolved approach. Preliminary data on how children responded to the new system was also presented. The system can potentially have a great impact on the neurorehabilitation for both children and adults with movement disorders.