

Virtual Reality Sports and Gamification as Tools to Advance Motor and Cognitive Rehabilitation in Children and Adults with Disabilities

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Abstract:

Motivation is often a key limiting factor in rehabilitation recovery, going beyond any limitations due to physical capacity. For example, children with ADHD lose interest in repetitive drills; adults with intellectual disability disengage from conventional fitness routines; stroke survivors stop attending treatment sessions once therapy stops feeling meaningful. Virtual reality (VR) and gamification address these issues directly by embedding feedback, reward, and graded challenges into therapeutic tasks, and increasingly by framing the tasks as sport. Boxing, bowling, tennis, and soccer delivered through today's headset-based platforms (e.g., Meta Quest-driven rehabilitation applications, XRHealth, Neuro Rehab VR) give patients activities to play rather than exercises to endure.

Our own line of research, spanning 20 years, illustrates both the promise and the limits of this approach. A study of chronic stroke patients, for example, using 3D video-capture VR, improved on the Wolf Motor Function Test compared to those in conventional therapy, with gains appearing earlier and holding at follow-up. In a matched-groups study of 60 adults with intellectual and developmental disability (IDD), a 5- to 6-week program of game-based exercise produced significant improvements on the Modified Cooper walk test and Total Heart Beat Index, though not on the Energy Expenditure Index. A separate study found that IDD caregivers with no clinical background, after brief training, could run VR sessions independently and achieve fitness gains comparable to therapist-led delivery.

Across pediatric applications, similar dynamics appear with ADHD, autism spectrum disorder, and cerebral palsy: engagement rises, and in several cases motor or attentional outcomes improve, even though sample sizes remain small and control groups inconsistent.

This talk will present these findings alongside predictions for where VR sport-based rehabilitation is headed: not as a replacement for therapist-directed intervention, but as a tool that widens who delivers care and how long patients stick with it.

Keywords:

Virtual reality, sports rehabilitation, gamification, adapted sport, occupational therapy, motor learning, disability.