People with hand impairments typically avoid using their non-dominant hand, leading to limb neglect. Through a user-centred co-design process, we conceptualised, developed and trialled a novel accessible computer gaming system that requires bimanual use to function. Our system was popular, improved hand function for adults and children, increased children’s social participation, is scalable, and can be translated to other conditions.

Understanding the Problem

Hand impairments can result from conditions such as cerebral palsy (CP) and stroke. CP is the most common motor disability in childhood [1], affecting more than 17 million people globally [2]. Stroke is the leading cause of disability worldwide [3]. Both conditions cause motor and sensory disturbances that lead to limb neglect, especially the hands. Hence, most interventions target the neglected hand to improve overall functional independence.

Our aim was to encourage active use of the neglected hand through fun and meaningful play, capitalising on the inherent desire and motivation people have to play computer games, particularly children and young adults.

Addressing the Problem

Most commercial gaming systems are inaccessible to people with a disability. Our multi-disciplinary team used a co-design process and Universal Design principles to design, develop and trial an accessible computer gaming system that people with hand impairments can use independently.

The Solution

The OrbIT Gaming System (Figure 1) is an intuitive, fun, home-based, standalone, accessible, haptic computer gaming system. It features:

• A novel controller that facilitates independent use;
• 15 different games that randomise and vary;
• Sensors that detect hand position; and
• Isolated haptic feedback to increase game realism.

Implications for the WHO Global Priority Research Agenda

OrbIT addresses the WHO Global Priority Research Theme area 3, ‘high-quality and affordable assistive technology’. Following positive trial results and significant end-user interest, we’re focussing our efforts on commercialising the latest innovative version of OrbIT – we call this i-boll.

i-boll (Figure 3) has the same functionality as OrbIT but addresses issues relating to design for manufacture, the ability to interact with commercial games, cost and scalability.

Strategies to Share and Build Global Capacity Based on this Work

Our team welcomes interest from international colleagues keen to partner and collaborate with us.

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References


Figure 1 – The OrbIT Gaming System
OrbIT engages the player in a cognitive activity, removes the need for grip and fine motor control, incorporates forced bimanual upper limb coupling, and uses haptics to provide afferent cutaneous stimulation to the neglected hand during use.

Figure 2 – Trial subjects using OrbIT, a young boy (L); an adult post-stroke (R)

Figure 3 – i-boll
i-boll integrates high aesthetic appeal with ubiquitous smartphone or tablet technology, wireless streaming and multiple platform compatibility. i-boll is easier to set up and offers greater flexibility during use.

Implications for Products, Provision, Personnel or Policy

Products: OrbIT proved that an independently accessible, self-managed gaming system could engage people with a hand impairment and provide a novel form of hand therapy. With children, it also facilitated participation amongst siblings.

Personnel: After initial set-up and orientation, OrbIT was largely unsupported on trial.