



## Improving Hand Function through Accessible Gaming

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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 causes 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.



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.

### Trial Results

*OrbIT* has been successfully trialled with *children with CP* (n=18) and *adults post-stroke* (n=10) (Figure 2). In both pilot trials, *statistically significant improvements in hand motor function* (CP & stroke) and *sensation* (stroke only) were recorded. Additionally:

- ✓ Children & families loved *OrbIT*;
- ✓ Parents commented that it increased sibling interaction;
- ✓ Therapists recognised the benefits of using *OrbIT*;
- ✓ Post-stroke participants agreed it was easy & beneficial to use.



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

### 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.

### 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.



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.

### 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.

### Contact Point for Global Liaison

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### References

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- [2] Cerebral Palsy Alliance, Australia, [www.cerebralpalsy.org.au](http://www.cerebralpalsy.org.au)
- [3] World Stroke Organisation, <http://www.worldstrokecampaign.org/learn/facts-and-figures.html>