

What's the Evidence?

Active computer games for children with motor impairments

Key findings

- There is some evidence to suggest that active computer games may have therapeutic and social benefits for children with motor impairments.
- However, the evidence isn't very strong. Most studies have involved small numbers of children and haven't involved control groups.
- Despite this, most studies reported that the computer games were enjoyed by the children, helped them to feel more confident about their abilities, and provided them with an opportunity to engage with their peers.

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What were we asked?

A parent suggested that a 'Dance Mat' computer game had helped her son. Would this be a useful therapy for children with different conditions?

What did we do?

We worked with several parents and professionals to develop the research question: do active computer games have therapeutic and/or social benefits for children with motor impairments?

Active computer games are those which physically involve the player and require them to move their body to control the game.

Children with a motor impairment are likely to receive, or be on a waiting list to receive, physiotherapy and/or occupational therapy. As part of their therapy, children are often given exercises to complete at home, and parents tell us that this can be difficult to enforce due to a child's reluctance to do 'boring' exercises. If active computer games were able to provide health benefits, then children might be more engaged with this method of exercise and be motivated to 'do their exercises' more regularly.

Once the research question was formulated, we searched a range of academic databases for evidence to answer the question. Databases searched include NHS evidence, the Cochrane library, TRIP database, NICE

guidelines and Pubmed. The search was carried out in October 2012 and updated in April 2013.

What did we find?

What kinds of computer games have been investigated?

A range of computer games, or 'virtual reality' systems, have been evaluated in research studies. Some games are commercially available and designed for general use, such as Wii Sports on the Nintendo Wii or Dance Dance Revolution, which can be played on a Wii, Playstation or Xbox. Other systems have been specifically designed for rehabilitation purposes. Some of these are commercially available, such as IREX Gesture Xtreme,¹ and others are not commercially available, such as the Paediatric Intensive Therapy System (PITS).²

Researchers Galvin and Levac have classified six different virtual reality systems used in rehabilitation.³

What evidence was found for therapeutic benefits?

Several studies have aimed to answer this question. Most studies that we found involved very small groups of children in uncontrolled trials or single case studies.

We found three systematic reviews that collated evidence about the effectiveness of virtual reality interventions, and one randomised controlled trial.^{4,5,7}

Movement ability and quality of movement are the most commonly assessed outcomes, but some studies also looked at social outcomes.

Some studies just included children with cerebral palsy, and others included children

with any neurological impairment or sensorimotor disorder.

Review papers:

- A review article published in 2009 looked at the effects of 'interactive computer play' on the rehabilitation of children with sensorimotor disorders.⁴ Nine studies that investigated the effects of the computer games on movement 'quality' were identified.
- The most common treatment period was four weeks, and the average number of playing sessions was three per week. Sessions lasted from 15 to 90 minutes.
- Although the majority of these studies found that interactive computer games improved quality of movement, most of the studies were small and didn't involve a control group. The type of intervention varied, and different outcome measures were used so it was not possible to bring the results together. Therefore, although these results are encouraging, the evidence emerging from this review is weak.
- Another review, from 2011, looked at active computer games specifically to improve upper limb function in children with neurological impairments.⁵ Six studies were included, and one of these was a randomised controlled trial.
- This review suggested evidence of small improvements in upper limb function following an active computer game intervention. However, again, the studies were limited by small sample sizes, lack of control group, and differences in the way outcomes were measured.
- A second review from 2011 reviewed studies that used virtual reality to assess and/or treat children aged 2-18 with physical disabilities as a result of sensorimotor disorders.⁶
- Six studies were found that aimed to improve upper extremity performance;

one was a randomised controlled trial (RCT).

- Sessions with the virtual reality game lasted 45-90 minutes, ranging from 1-5 sessions per week, over 3-8 weeks.
- All of these studies demonstrated an improvement in upper extremity function except the RCT.
- However, the quality of this evidence is low.
- A further review, published 2012, looked at whether active computer game interventions increase the amount of physical activity undertaken by children with cerebral palsy.⁷ Four studies were included.
- Although there was evidence that active computer games have a positive effect on physical activity in children with cerebral palsy, these studies are also limited by small number of participants, uncontrolled designs and variation in the intervention and outcomes measures used.

Randomised controlled trial:

- The randomised controlled trial identified in this review investigated the effects of virtual reality on 'quality of movement' for children with cerebral palsy.⁸ This trial also assessed the social effects of the virtual reality intervention. The trial involved 31 children; 19 were randomised to receive the computer game intervention, and 12 children received 'standard care'.
- Children in the intervention group received a 1.5h session with the IREX Gesture Xtreme technology once a week for eight weeks. The Quality of Upper-Extremity Skills Test was used to compare improvements in movement quality between the two groups.
- The study found that the computer game intervention did not result in greater improvements in motor function than usual care. The authors suggested that

this might be because the game was not played frequently enough to have a significant impact. An alternative interpretation could be that the study did not have enough participants to detect small beneficial effects.

What evidence was found for social benefits?

Miller and Reid interviewed 19 children with cerebral palsy who had participated in an active computer game intervention.⁹ Several children mentioned that they discovered new skills and that they could do things better than they thought they could before. The active computer game gave the children an opportunity to do things they may not be able to do in real life, and meant that they could engage with their peers on an 'equal' level; they were not excluded due to their physical limitations.

The randomised controlled trial of the effects of virtual reality on movement quality of children with cerebral palsy also looked at the social benefits of this intervention.⁸ The study found a significant improvement in the social acceptance subscale of the Self-Perception Profile for Children. This suggests that the children felt they had more friends and were more liked. Playing an active computer game provided an opportunity for the children to socialise with their non-disabled peers in a situation where they could all participate equally.

What do we think?

The evidence suggests that active computer games may improve movement ability and/or quality of movement. However, the evidence for a substantive beneficial therapeutic effect is weak. Most of the evidence we found comes from studies with small numbers of children and without a separate comparison group. This is a typical situation when evaluating new and emerging treatments in health.

The state of the evidence means that it is not yet possible to say whether active computer games improve either ability or quality of movement. A randomised controlled trial with a large number of children would be required to evaluate whether active computer games have health benefits, and whether the benefits are better than other therapies.

Although there is not very strong evidence that these computer games have a

therapeutic benefit, many studies reported that children enjoyed playing active computer games, and that successfully completing the computer games made them feel good about their abilities.

Furthermore, these types of computer games provide an opportunity for children with motor impairments to engage and participate with their peers, unhindered by their physical limitations. This is an important social benefit.

We would like to hear your feedback on this summary – please email us at pen cru@exeter.ac.uk if you have any comments or questions.

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Note: This information is produced by PenCRU researchers and reviewed by external experts. The views expressed are those of PenCRU at the University of Exeter Medical School and do not represent the views of the Cerebra charity, or any other parties mentioned. We strongly recommend seeking medical advice before undertaking any treatments/therapies.