**Do virtual reality or video game based interventions improve motor outcomes in children with developmental coordination disorder? A systematic review using the ICF framework**

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**Citation**


**Review question(s)**

In children with developmental coordination disorder, does virtual reality or video game based rehabilitation improve motor outcomes related to the ICF-CY framework (International Classification of Functioning, Disability and Healthy, children and youth version)?

Are virtual reality or video game based interventions feasible and enjoyable for children with developmental coordination disorder?

**Searches**

Systematic searches conducted in seven online databases (AMED, CINAHL, Cochrane Library, Embase, MEDLINE, Scopus, Web of Science).

No restrictions placed on searches for publication date, with non-English articles excluded. Targeted searching of reference lists of included articles also performed. Searches include terms related to paediatrics, neurodevelopmental conditions, virtual reality/video games and motor/balance/mobility/physical activity/fitness outcomes. Medical Subject Headings (MeSH) also used for relevant databases.

**Types of study to be included**

Any studies that incorporate an intervention (e.g. randomised controlled trials (RCTs), pseudo RCTs, comparative studies, case series and case studies).

**Condition or domain being studied**

Virtual reality or video game interventions for children with developmental coordination disorder.

**Participants/ population**

Children with developmental co-ordination disorder. Only participants under the age of 18 included.

**Intervention(s), exposure(s)**

Any interventions that utilise virtual reality or video gaming equipment. Combined interventions are excluded that do not assess the effect of virtual reality or video game equipment in isolation (e.g. video gaming plus transcranial magnetic stimulation).

**Comparator(s)/ control**

Pre and post intervention outcome measures, comparison to a control group with no intervention or comparison group with another intervention.

**Context**

Intervention based studies that include any form of virtual reality or video gaming to improve motor outcomes. Exclusion criteria involve any studies that only examine upper limb outcomes or non-motor related measures (e.g. cognitive benefits).
cognitive functioning), interventions that include robotics or assisted movement, combined interventions, participants over the age of 18, grey literature such as conference abstracts or book chapters, review articles and non-English articles.

**Outcome(s)**

**Primary outcomes**
Only studies with motor outcomes are included. Outcomes relating to the ICF-CY framework domains of body structure and function, activity, and participation.

**Secondary outcomes**
Secondary outcomes to be assessed involve safety, adherence, enjoyment and acceptability of the interventions of included studies.

**Data extraction, (selection and coding)**
Study selection will involve two reviewers, with the titles and abstracts of the initial yield assessed for eligibility by both reviewers independently. The next step will include screening the full text of relevant articles. Disagreements will be resolved through discussion and mutual consensus. If consensus cannot be reached, a third independent reviewer will be consulted.

Data extraction will also involve two independent reviewers using a pre-determined data extraction form. Again, disagreement between reviewers will be resolved by mutual consensus with a third independent reviewer consulted if consensus cannot be reached. The data to be extracted includes (but is not limited to): study design, participant selection criteria, participant characteristics, description of intervention and outcome measures as well as the results and conclusion of each study. Additional data extraction will involve reported safety and acceptability of the prescribed interventions.

**Risk of bias (quality) assessment**
Included studies will be rated for methodological quality using the Downs and Black rating scale. This scale has 27 questions with higher scores indicating higher methodological quality. Two independent reviewers will assess quality with disagreements resolved as per study selection and data extraction procedures.

**Strategy for data synthesis**
Included studies are anticipated to include a range of interventions and outcome measures. As such, data will be presented with a narrative synthesis provided. Depending on the consistency of intervention, outcome measures and sample sizes, a meta-analysis may be included.

**Analysis of subgroups or subsets**
No subgroup analysis is planned.

**Dissemination plans**
The review will be published in a relevant paediatric journal.

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None known

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Stage of review
Ongoing

Date of registration in PROSPERO
24 April 2017

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Stage of review at time of this submission
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<th>Started</th>
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<tbody>
<tr>
<td>Preliminary searches</td>
<td>Yes</td>
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<td>Piloting of the study selection process</td>
<td>Yes</td>
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<td>Formal screening of search results against eligibility criteria</td>
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<td>Data extraction</td>
<td>Yes</td>
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<td>Risk of bias (quality) assessment</td>
<td>Yes</td>
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<td>Data analysis</td>
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