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Exergaming for dementia and mild cognitive impairment

Editorial group: Cochrane Dementia and Cognitive Improvement Group

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Exergaming for dementia and mild cognitive impairment

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This is a protocol for a Cochrane Review (intervention). The objectives are as follows:

To assess the effects of exergame applications on physical and cognitive outcomes, and activities of daily living (ADL), in people with dementia and mild cognitive impairment (MCI).

This is a protocol.

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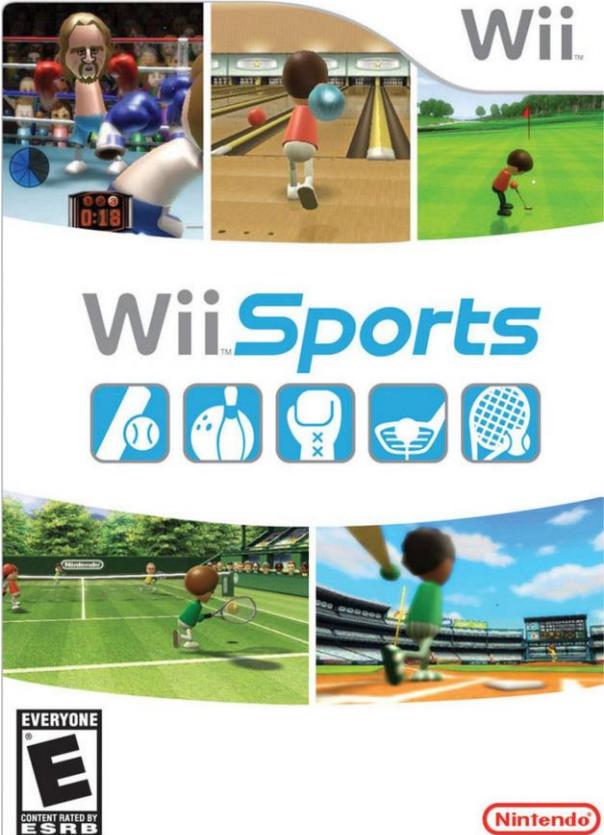
Summary

Background
Objectives
Methods

Background

- **Description of the condition:** dementia and MCI; impairments and difficulties in the following domains: physical, cognitive, and ADL
- **Description of the intervention:** combining physical and cognitive training/exercise

Exergaming



Wii™

WiiSports

EVERYONE
E
CONTENT RATED BY
ESRB

Nintendo

The image shows the cover art for the video game 'Wii Sports'. It features a collage of five sports: boxing, bowling, golf, tennis, and baseball. The 'Wii' logo is at the top right, and the 'WiiSports' title is in the center. Below the title are five icons representing the sports. At the bottom left is the ESRB rating 'EVERYONE E', and at the bottom right is the Nintendo logo.



STAY
HEALTHY AND
WEIGHTLESS.

EXERGAME

The image is an advertisement for 'ExerGame'. It features a woman in a red shirt rowing a boat on a water rowing machine. Below this, a circular inset shows two people on treadmills in a gym. The text 'STAY HEALTHY AND WEIGHTLESS.' is written in green and white on a dark background. The 'EXERGAME' logo is at the bottom.



How the intervention might work

Combines principles and effects of physical activity/exercise and cognitive training and rehabilitation

Physical exercise:

- Reduction of risk factors associated with cardiovascular disease, insulin resistance, obesity, hypertension, and inflammation

AND/OR

- Neural growth and brain plasticity

Cognitive stimulation, rehabilitation, and training:

- Brain plasticity, i.e. to the brain's capacity to modify its structure and function, even at an older age, through several mechanisms: neurogenesis, synaptogenesis, and angiogenesis
- Evidence for MCI and dementia and brain plasticity

How the intervention might work

- **Realistic experiences:** accommodates principles of rehabilitation: meaningful, specific, repetitive, increased task difficulty over time, real time strategic and goal-directed feedback
- **Environmental enrichment:** improve motor and cognitive performance
- **Gaming elements:** can increase motivation

Background

- Why it is important to do this review?
- Objectives:

Assess the effects of exergame applications on **physical and cognitive outcomes, and activities of daily living (ADL)**, in people with dementia and mild cognitive impairment (MCI).

Methods

- Criteria for considering studies for this review
- **Types of studies:** RCTs
- **Types of participants:** diagnosis based on established criteria for both dementia and MCI
- **Type of interventions:** physical activity of at least moderate intensity, with or without an additional cognitive element, using an interactive, immersive or non-immersive virtual reality platform

Methods

- **Type of interventions**

Exergaming: physical activity of at least moderate intensity, with or without an additional cognitive element, using an interactive, immersive or non-immersive virtual reality platform

Comparators:

- Inactive control (no intervention or TAU)
- Active control (equivalent contact with researchers, but no specific effect such as music, relaxation, documentaries)
- Alternative treatment control (specific effect on outcomes such as physical activity, cognitive training, multimodal training, reminiscence therapy)

Methods

- **Types of outcome measures**
- Primary outcomes: Global physical, cognitive functioning and global ADL
- Secondary outcomes: lower and upper limb, balance and postural control, motor function; general cognition, attention processing speed and working memory; perception, memory, executive functioning; ADL and IADL; Quality of life, physical activity, frailty, adverse effects, falls, enjoyment and satisfaction, feasibility, caregiver outcomes (e.g., burden)

Methods

- **Search methods for identification of studies**
- ALOIS (the Cochrane Dementia and Cognitive Improvement Group's (CDCIG) specialized register) (MEDLINE, Embase, CINAHL, PsycINFO, trial registers & grey literature)

Methods

- **Data collection and analysis:** selection of studies, data extraction and management, assessment of risk of bias in included studies, measures of treatment effect, unit of analysis issues, dealing with missing data, assessment of heterogeneity, assessment of reporting biases

Methods: Data synthesis

DEMENTIA

MCI

- Exergaming versus control (i.e. no treatment, standard treatment, waiting list, or non-specific active control) at the end of therapy (i.e. immediately post-intervention, post-test)
- Exergaming versus control (i.e. no treatment, standard treatment, waiting list, or non-specific active control) at follow-up (i.e. up to 12 months following the end of intervention)
- Exergaming versus alternative treatment at the end of therapy (i.e. immediately post-intervention, post-test)
- Exergaming versus alternative treatment at follow-up (i.e. up to 12 months following the end of intervention)

Methods: Subgroup analysis and investigation of heterogeneity

- Severity of dementia: mild versus moderate versus severe
- Intervention characteristics: physical activity with or without the addition of specific cognitive training or rehabilitative tasks (beyond the basic performance of the game);
- Type of control intervention (for the comparisons of exergaming versus control): inactive control (no intervention or TAU) versus active control (intervention involving equivalent contact with the researchers but not hypothesised to have any specific effect on the study outcomes);
- Type of exergame platform used: commercial versus customised;
- Type of technology: VR-based (e.g. head mounted display headsets such as Oculus) versus monitor display (e.g. Wii Fit, Sports);
- Length of intervention: the total time of the intervention in minutes: 0 to 360 minutes (6 hours) versus 361 to 720 minutes (12 hours) versus more than 720 minutes;
- Length of follow-up period: 0 to one month versus one to three months versus four to six months versus longer than six months.

Methods: Sensitivity analysis

- Higher and lower risk of bias
- Dose-matched studies (intervention and control interventions have an equal dose of time and frequency) versus non-dose-matched studies
- Strict criteria for MCI (e.g. criteria proposed by Petersen 2009) versus
- studies that relied on cut-off scores
- Meta-analyses with change scores and those with post-intervention scores only
- High statistical power and studies with low statistical power

Methods: Summary of findings and assessment of the certainty of the evidence

- GRADE using GRADEpro GDT software
- Five domains: **risk of bias, inconsistency (of results), indirectness (of evidence), imprecision of results, publication bias**
- Four ratings are possible and describe the levels of the certainty associated with an outcome
- **High certainty of evidence** implies that further research is very unlikely to change our confidence in the estimate of effect
- **Moderate certainty** indicates that further research is likely to have an important impact and may change the estimate
- **Low certainty indicates** that further research is very likely and is likely to change
- **Very low certainty** implies uncertainty about the estimate

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