Exergame Efficacy in Clinical and Non-clinical Populations
A Systematic Review and Meta-analysis

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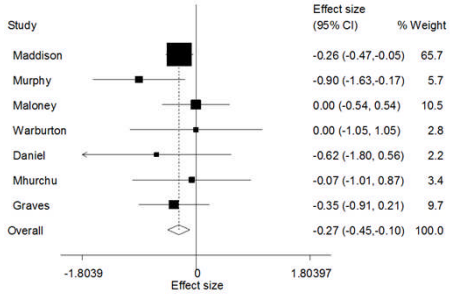
Introduction

Obesity is a major health challenge in the developed world, with a high economic impact. Exergames (video games that involve exercise) have been suggested as a method for increasing exercise. Metabolic studies confirm exergames can produce exertion equivalent to at least moderate exercise. They have been increasingly used to promote fitness and facilitate physical rehabilitation in clinical contexts, but it has been unclear whether exergames can deliver real improvements in health.

Methods

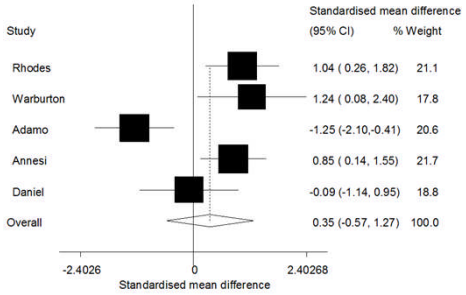
Systematic review using PubMed and Web of Science. No date range imposed. Additional studies were identified by searching bibliographies and authors' own knowledge. Only studies with a sample size >5 included. Short term, lab only studies excluded. Before/after studies and randomised control trials (RCTs) included in the discursive analysis, only RCTs in the meta-analyses.

BMI/weight



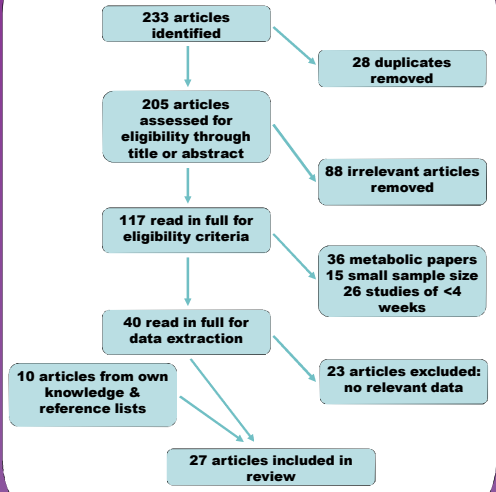
There is a significant reduction: $z = 3.06$, $p = 0.002$. No significant heterogeneity ($I^2 = 0\%$). Two RCTs could not be included in the meta-analysis: one did not find a significant difference; the other found those in a cooperative gaming condition lost significantly more weight than a control condition, with a competitive condition intermediate. Two out of six before/after studies found a significant improvement.

Adherence



There is no significant difference: $z = 0.74$, $p = 0.5$. However, there is marked heterogeneity ($p < 0.001$, $I^2 = 82\%$). Adamo *et al.* stands out; excluding that paper, the overall effect is significant: $z = 3.14$, $p = 0.002$; and heterogeneity much reduced ($p = 0.3$, $I^2 = 20\%$). Two RCTs could not be included in the meta-analysis, but found significantly higher adherence.

Study Selection



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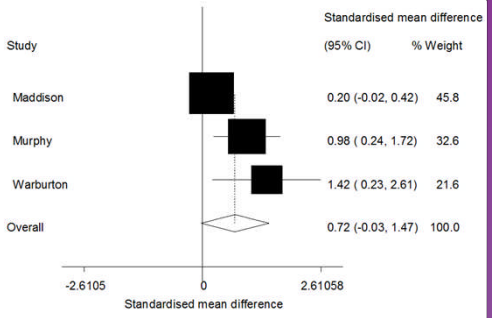

There is an improvement that does not quite reach significance: $z = 1.88$, $p = 0.060$. There is significant heterogeneity ($p = 0.024$, $I^2 = 73\%$): Maddison *et al.* appears not consistent with the two smaller studies. Three before/after studies mostly showed small improvements.

Discussion

The review covered a broad range of games (including DDR, Wii Fit and bespoke) and populations (overweight children to pre-frail older adults). There is evidence that exergames can improve fitness and may improve adherence and balance (details not given here). The review found minimal discussion on *how* exergames work. Enjoyment is suggested as one method (leading to improved adherence), but specific factors making exergames enjoyable are generally not discussed. Adherence to exercise programs often fell after 6 weeks. Many studies were methodologically poor.

While these results are promising, there is a need for larger and better trials. Future work should explore mechanisms present in games that make them more appealing than traditional exercise to inform game design. Research should also examine long term effects of exergame use, and unpack how long term behaviour change can be encouraged once the novelty of a game has worn off.

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