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A crossover randomised and controlled trial of the impact of active video games on motor coordination and perceptions of physical ability in children at risk of Developmental Coordination Disorder

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ABSTRACT

Background: Impaired motor development can significantly affect a child's life and may result in an increased risk of a range of physical and psychological disorders. Active video game (AVG) interventions have been demonstrated to enhance motor skills in children with Developmental Coordination Disorder (DCD); however a home-based intervention has not been assessed.
Objectives: The primary aim of this study was to compare the changes in motor coordination between a 16 week period of AVG use, with 16 weeks of normal activities (NAG). The secondary aim was to compare the child and parent perceptions of their physical performance between the AVG and NAG conditions.
Methods: Twenty-one 9–12 year olds (10 males) were confirmed to be at risk of DCD (⩽16th percentile Movement Assessment Battery for Children-2nd edition (MABC-2) and ⩽15th percentile Developmental Coordination Disorder Questionnaire (DCDQ)) and participated in this crossover randomised and controlled trial. Data was collected at study entry, after the first 16 week condition and following the final 16 week condition, including; (1) the MABC-2, (2) three-dimensional motion analysis of single leg balance and finger–nose tasks, and (3) parent perception of physical

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skills. Participant perception of physical skills was collected only after the first and second conditions.
Results: There was no significant difference between AVG and NAG for any of the primary variables including the MABC-2, balance centre-of-mass path distance and finger–nose path distance. There was no significant intervention effect for secondary measures of motor coordination; however the children perceived their motor skills to be significantly enhanced as a result of the AVG intervention in comparison to the period of no intervention.
Conclusion: A 16 week home based AVG intervention did not enhance motor skills in children with DCD, although they perceived their physical skills to be significantly improved.
Trial Registration: Australia and New Zealand Clinical trials Registry (ACTRN 12611000400965).

1. Introduction

Video games are a pervasive part of modern society. Widely available on a range of systems, from consoles connected to the television to hand held devices and mobile phones, they offer diverse games that appear to be engaging most children in affluent countries. For example, 87% of Australian 5–14 year olds were reported to play some form of electronic game (Australian Bureau of Statistics, 2012). There is also increasing evidence that the amount of time children spend playing video games can be substantial, and can constitute the majority of non-television screen time for children up to the age of 11 (Commonwealth Scientific Industrial Research Organisation, 2008; Rideout, Foehr, & Roberts, 2010). In the USA, 8–18 year olds were reported to spend an average of 73 min/day playing some form of video game (Rideout et al., 2010), while similarly aged Australian children (9–16 years old) played video games for around 38 min per day (Commonwealth Scientific Industrial Research Organisation, 2008). This pervasive use may have health risks as video games are historically sedentary in nature and may displace physical activity (Straker & Abbott, 2007; Straker, Abbott, Collins, & Campbell, 2014).

Physical activity is critical for children's health and development (Janz et al., 2010; McKenzie, Alcaraz, & Sallis, 1998). There are known links between physical activity participation and improved psychological health, cardiovascular function, bone mineral density (Janz et al., 2010), reduced risk of obesity, and enhanced motor skill development (McKenzie et al., 1998). The association with motor skill development may be particularly important given the potential cyclical nature of this relationship; where poor motor skills can lead to reduced motivation to participate in physical activity and reduced physical activity diminishes opportunities to improve motor skill (McKenzie et al., 1998). Given that poor motor skills in childhood have been demonstrated to perpetuate into physical inactivity in adulthood (Lloyd, Saunders, Bremer, & Tremblay, 2014), addressing motor impairment in children is critical.

Reducing the pervasiveness of video games seems unlikely. Therefore, recent research has examined new forms of video games which may potentially have more positive health benefits. Video game systems including the Nintendo Wii (Kyoto, Japan), Microsoft Xbox Kinect (Redmond, USA), and Sony PlayStation Eye and Move (Tokyo, Japan) now offer a range of active video games (AVG). These games include an on screen avatar that mimics players' movements, input through a hand held motion monitor (Wii/Move), pressure mat/force platform (dance mat/Wii Fit) or motion monitor camera (Kinect/Sony Eye). There is evidence to suggest that these games are able to increase energy expenditure and movement above rest and sedentary game play in a laboratory setting (Straker & Abbott 2007; Straker et al. 2009). However, four randomised and controlled field trials have shown that home access to AVG does not substantially increase children's daily physical activity (Maddison et al., 2011;