



Review Article

Motor skills intervention research of children with disabilities

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ABSTRACT

Background: Physical inactivity and obesity among children with physical and cognitive disabilities is an emerging public health issue. Children's motor skill development is a determinant of lifelong physical activity and obesity.

Aims: The purpose of this article is to critically evaluate motor skill intervention literature among children with physical and cognitive disabilities.

Methods and procedures: Electronic searches were completed to identify research articles published from 1984 to 2014. Major findings were categorized among subtopics including characteristics of intervention studies, research designs, diagnostic method, motor skill interventions and motor skill outcome.

Outcomes and results: 21 studies were found and included participants with developmental delay (42.8%), autism (19.0%), cross-disability (19.0%), intellectual disability (4.8%), cerebral palsy (4.8%), developmental coordination disorder (4.8%), and learning disabilities (4.8%). Only one study was a randomized controlled trial.

Conclusions: and implications: The current literature on motor skill intervention research is broad in scope and has limited generalizability within and across disability groups. Future research is needed to develop cross-disability intervention methods adaptable to disability and function-specific needs, including the utilization of rapidly developing technology. Researchers are encouraged to utilize sound methodology with robust theoretical foundations. Family and community engagement is encouraged in intervention delivery.

What this paper adds?

This paper presents a critical review of the literature on fundamental motor skill intervention research on children with physical and cognitive disabilities. The review provides a summary of studies found, a quantitative rating of each study based on its robust study design and methodology, and recommendations for future motor skill research. The article provides researchers with a snapshot of the current research landscape of motor skill interventions to inform future studies.

1. Introduction

Recent trends of increasing childhood sedentary behavior and obesity are recognized as significant public health issues (USDHHS, 2001; PAGAC, 2008). Sedentary behaviors and obesity are more prevalent among children with disabilities (Altman & Bernstein, 2008; Burns, Brusseau and Fu et al., 2016; Burns, Brusseau and Hannon et al., 2016; Centers for Disease Control and Prevention (CDC), 2014) and this population is less active than comparison peers (Rimmer, Rowland, & Yamaki, 2007). Thus, childhood

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interventions are needed to address the low levels of physical activity and rise of obesity. Proper nutrition, sleep, and adequate amounts of physical activity are protective factors against children's sedentary behaviors and obesity (PAGAC, 2008). A mediating factor associated with children's physical activity levels is their ability to proficiently perform fundamental motor skills (FMS) (USDHHS, 2016). FMS are the building blocks of more complex movement skills developed during childhood (Payne & Issacs, 2016). These skills are needed for children and adults to participate in sports (e.g., basketball), recreational games (e.g., pick-up basketball), and backyard games (e.g., cornhole). FMS are commonly categorized into locomotor (e.g., running, hopping, jumping) or object control skills (e.g., the overhand throw, catch, soccer kick) (Ulrich, 2000, 2013). Several studies have linked performance of FMS to current and future physical activity and/or health-related fitness. For example, Williams et al. (2008) found that children with advanced levels of FMS are more likely to engage in physical activities throughout their lifespan. Lloyd, Saunders, Bremer, and Tremblay (2014) found a positive association between children's FMS proficiency in youth and their physical activity participation as adults 20 years later. Other studies indicate a positive relationship between FMS proficiency and health-related fitness (Okely, Booth, & Chey, 2004; Stodden, Langendorfer, & Robertson, 2009). Moreover, motor proficiency during childhood (age 8) predicted obesity, physical activity, and cardiorespiratory fitness at age 16 in a large cohort study ($n = 8061$) (Kantomaa et al., 2013). Thus, the appropriate development of FMS as a protective factor to physical activity and all-cause morbidity and mortality (PAGAC, 2008) is a contemporary issue.

While proficiency in some FMS (e.g., walking, running) appear to develop naturally, other skills (e.g., the overhand throw, kick) are more likely to be learned by increased skill instruction, skill-specific feedback, and practice (Lubans, Morgan, Cliff, Branett, & Okely, 2010). Children who do not receive adequate FMS instruction or practice opportunities are likely to experience developmental delays in acquiring FMS proficiency. For example, one study found that only half their sample of children 9–12 years old demonstrated competence in the basketball throw and dribble (Erwin & Castelli, 2008). FMS has been reported to be lower in children with autism (Pan, Tsai, & Chu, 2009; Staples & Reid, 2010), ADHD (Beyer, 1999; Harvey & Reid 1997; Pan et al., 2009), learning disabilities (Westendorp, Hartman, Houwen, Smith, & Visscher, 2011), and Down syndrome (Volman, Visser, & Lensvelt-Mulders, 2007). Thus, without opportunities to learn and practice skills, children with disabilities are at an increased risk of developing preventable health conditions (e.g., cardiovascular disease) and sedentary behaviors across the lifespan.

From a public health viewpoint, FMS interventions among children with disabilities have the potential to (a) increase competency of completing FMS, (b) increase self-efficacy of participating in recreational and competitive sports and games, (c) increase habitual physical activity, (d) increase function, (e) decrease unhealthy body composition, and (f) decrease secondary conditions. Therefore, the purpose of this paper is to critically review and appraise the existing literature on the effectiveness of FMS interventions among children with physical and cognitive disabilities. We further aim to establish a guiding platform for future research and identify research limitations and future considerations of FMS interventions among this population

2. Method

A scoping review strategy was utilized to evaluate motor skill interventions of children with disabilities. Scoping reviews are appropriate for understanding narrowly drawn research questions within an established field (National Health Service, 2001). They are valuable to understand the broader “research landscape” in a field of inquiry and to provide a preliminary assessment of the research as reported in a rapid evidence review (Petticrew & Roberts, 2008). Scoping reviews use specific protocols to increase impartiality of the review such as study identification, appraisal, and synthesis (see Kable, Pich, & Maslin-Prothero, 2012 for protocol details). In this way, scoping reviews tend to reduce bias, which sometimes surface in a non-protocol literature review. Scoping reviews are particularly important as a “stand-alone” project when a research area has not yet identified uniformity in study design, measurement (Hempel, Norman, Golder, Aguiar-Ibáñez, & Eastwood, 2008), or data analysis or to determine the feasibility or value of conducting a full systematic review (Rimmer, Chen, McCubbin, Drum, & Peterson, 2010).

2.1. Selection criteria

2.1.1. Inclusion criteria

Studies evaluating the effects of a motor skill intervention on FMS proficiency among children with physical and cognitive disabilities were assessed for eligibility. English-language peer-reviewed primary literature and review articles examining intervention effects on FMS acquisition among children ages 3–18 with disabilities were included. Only studies that included (a) an intervention, (b), outcomes with motor skills, and (c) programs that could be implemented or replicated in a community or school were included. Disability was defined as someone with a physical or cognitive impairment, including the umbrella term of developmental disabilities. Mental health disabilities, such as emotional disturbance or depression, although an important public health concern, were not included in the review.

2.1.2. Exclusive criteria

Articles were excluded at the abstract level if they were non-English language, published prior to 1984 or after December 31st, 2014, included participants outside the targeted age-range of 3–18 years old, did not include children with disabilities, lacked FMS outcomes, and were not peer reviewed (i.e., dissertations, book chapters, non-peer-reviewed articles, and conference presentations). Remaining citations were excluded at the full review level if they failed to meet the inclusion criteria or if they met the exclusion criteria. Studies involving therapeutic exercises such as body weight-supported treadmill training, functional electrical stimulation, or constraint-induced movement therapy were excluded. Studies investigating effects of orthopedic devices were also excluded. Age

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