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Research Paper

The role of physical activity in improving physical fitness in children with intellectual and developmental disabilities

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ABSTRACT

Background: One in three children in North America are considered overweight or obese. Children with intellectual and developmental disabilities (IDD) are at an increased risk for obesity than their typically developing peers. Decreased physical activity (PA) and low physical fitness may be contributing factors to this rise in obesity.

Aim: Because children with IDD are at an increased risk of diseases related to inactivity, it is important to improve health-related physical fitness to complete activities of daily living and improve health.

Methods and procedures: The focus of this research is on improving the performance of physical fitness components through physical activity programming among a group of children with IDD, ages 7–12 years. The *Brockport Physical Fitness Test* was used assess levels of physical fitness of 35 children with IDD (25 boys, 10 girls) before and after participation in a 10-week program.

Outcomes and results: The results of paired sampled *t*-tests showed participation in 15-h PA program can significantly increase aerobic capacity and muscular strength and endurance in children with IDD.

Conclusions and implications: This study is aimed at understanding the role of PA in helping children with IDD to develop the fitness capacities essential to participation in a wide variety of activities.

What this paper adds?

In addition to being less physically active than their peers, children with intellectual and developmental disabilities (IDD) also have lower levels of physical fitness and have greater difficulty performing fundamental movement skills. Physical literacy places emphasis on the variety of components that are integral to physical activity (PA) participation. This paper examines how participation in 15 h of structured PA that focused on the development of motor competence can improve levels of physical fitness among children with IDD. Although not targeted directly, boys and girls with IDD did demonstrate significant improvements in aerobic capacity as well as muscular strength and endurance following participation in this program. In addition to increased levels of physical fitness, having the competence and confidence to perform a variety of fundamental movement skills are important factors to promoting lifelong participation in PA and maintenance of a healthy weight. In order for children with IDD to improve, they must be afforded the opportunity to participate in programs that provide individualized instruction to promote fun and successful learning experiences.

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1. Introduction

With one in three North American children being overweight or obese (Ogden, Carroll, Kit, & Flegal, 2014; Roberts, Shields, de Groh, & Gilbert, 2012) and the majority of children not achieving the recommended 60 min of daily moderate to vigorous physical activity (MVPA) (Dentro et al., 2014; Gray et al., 2014), inactivity may be one of the largest contributors to the increased prevalence of obesity. Perhaps of greater concern is that children with intellectual or developmental disabilities (IDD) have substantially higher levels of obesity (Must et al., 2014) and lower levels of physical activity (PA; Foley, Bryan & McCubbin, 2008; Hinckson & Curtis, 2013) compared to their peers without disabilities. Although few studies have looked at IDD as a collective group with respect to obesity and PA, specific diagnoses such as Down syndrome and autism spectrum disorder (ASD) have been examined. The majority of these studies have compared children with IDD to their same aged peers. From an overall health standpoint, the focus on BMI percentiles relative to obesity-related health risks and time spent engaged in MVPA may provide more important reference points.

More specifically, children with Down syndrome between the ages of 3 and 10 years engaged in less PA than their typically developing peers (Whitt-Glover, O'Neill, & Stettler, 2006). Children with ASD are also less likely to reach the recommended MVPA levels compared to their typically developing peers (Bandini et al., 2013). With increasing age and the transition to adolescence, the amount and intensity of PA they participate in is further reduced (Esposito, MacDonald, Hornyak, & Ulrich, 2012; Lin et al., 2010; MacDonald, Esposito, & Ulrich, 2011; Pan et al., 2011; Shields, Dodd, & Abblitt, 2009). Participation in low levels and intensities of PA can exacerbate problems of obesity and poor physical health, highlighting the importance of promoting lifelong participation (Whitehead, 2010). For children of all abilities, participation in sustained bouts of PA contributes to the promotion and maintenance of health and physical fitness (Hartman, Smith, Westendorp, & Visscher, 2015).

Instead of focusing on fitness as a single contributor to health, physical literacy places emphasis on the variety of components that are integral to being physically active throughout the life course (Whitehead, 2010). For a child to become physically literate, they need sufficient opportunities to develop the competence to perform a repertoire of movement skills; however, repeated practice of individual skills in isolation is not sufficient. A child also needs to have the confidence to perform those skills in a variety of activities and contexts. For example, a child must be able to strike, throw, catch, and run the bases in order to participate successfully in all aspects of a softball game with their peers. However, being able to throw a ball a distance of 20 feet and hit a stationary target or catch a ball when it is thrown directly to them will only afford limited participation. Learning to throw a ball from different distances and to a variety of targets, including fielding the ball and then throwing it to a teammate to beat a runner, will help to generalize “throwing” to more aspects of a softball game. Being able to perform a variety of fundamental movement skills in a variety of contexts will afford a child more opportunities to participate with increased independence, to further develop their knowledge of a game or activity, and to understand the variety of ways in which their skills can be used (Whitehead, 2010).

The developmental model proposed by Stodden et al. (2008) describes how the relationships between motor competence and levels of physical activity change with development (Fig. 1). During early childhood, participation in PA provides opportunities for children to develop basic motor skills. With increasing age and structured opportunities to practice those skills, motor competence will continue to improve. By middle to late childhood when the majority of children are equipped with a repertoire of fundamental movement skills, they can actively participate in a wider range of activities, which should increase participation and levels of PA.

This model is centered around levels of motor competence that are often associated with age among children with typical development (i.e., early, mid-, and late childhood). Many children with IDD have greater difficulty than children with typical development performing fundamental movement skills (Schott & Holfelder, 2015; Staples & Reid, 2010; Westendorp, Hartman, Houwen, Smith, & Visscher, 2011) and progress towards mastery of these skills at later ages. As such, the relationships among constructs should be considered age-related and based more so on the levels of motor competence demonstrated by children with IDD. The relationship between motor competence and PA is expected to strengthen as competence improves. The focus of instruction for children with IDD should be on making progress towards the mastery of a variety of movement skills, particularly those with components that generalize across movement skills (e.g., taking a step with the non-throwing or –striking side to transfer weight forward). Movement is essential to participation, which in turn benefits health and levels of physical fitness (Stodden et al., 2008). However, a reciprocal relationship also exists where improved levels of musculoskeletal fitness contribute to the proficiency in which movements are performed and aerobic capacity influences the intensity and duration of PA participation (Stodden et al., 2008).

A strong relationship exists between the development of motor competence and levels of physical fitness during childhood and adolescence (Cattuzzo et al., 2016). Although levels of physical fitness and obesity are expected to have a greater influence on the relationship between motor competence and levels of PA during adolescence (Rodrigues, Leitão, & Lopes, 2013; Stodden et al., 2008), levels of PA and physical fitness are not mutually exclusive (Lloyd, Colley, & Tremblay, 2010). Participation in sustained bouts of MVPA should have a positive influence on levels of physical fitness, but it is also likely that an adequate level of physical fitness is required to engage in sustained bouts of MVPA. Because levels of obesity are high and levels of PA are low among children with IDD, a better understanding of how levels of physical fitness can be improved is warranted. Given the reciprocal relationship among these constructs, providing opportunities for children with IDD to develop motor competence and improve levels of physical fitness during childhood would seem to have the greatest contributions collectively towards PA participation and long-term health outcomes (Cattuzzo et al., 2016).

1.1. Health related physical fitness

Physical fitness can be broken down into sport-specific and health-related physical fitness (Plowman & Smith, 2014), where the latter includes body composition as well as aerobic and musculoskeletal functioning. Because children and adolescents with IDD are

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