



Contents lists available at ScienceDirect

Research in Developmental Disabilities

journal homepage: www.elsevier.com/locate/redevdis

Body mass index and fitness in high-functioning children and adolescents with cerebral palsy: What happened over a decade?



Maremka Zwinkels^{a,*}, Tim Takken^b, Thijs Ruyten^a, Anne Visser-Meily^{a,c},
Olaf Verschuren^{a,*}, on behalf of the Sport-2-Stay-Fit study group¹

^a Center of Excellence for Rehabilitation Medicine and Brain Center Rudolf Magnus, De Hoogstraat Rehabilitation and University Medical Center Utrecht, Utrecht, The Netherlands

^b Child Development and Exercise Center, University Medical Center Utrecht, Utrecht, The Netherlands

^c Department of Rehabilitation, Physical Therapy Science and Sports, University Medical Center Utrecht, Utrecht University, Utrecht, The Netherlands

ARTICLE INFO

Keywords:

Cerebral palsy
Children
Adolescents
Physical fitness
Health
Rehabilitation

ABSTRACT

Background: In recent decades, improving fitness has become an important goal in rehabilitation medicine in children and adolescents with cerebral palsy (CP).

Aims: To compare body mass index (BMI), performance-related fitness, and cardiorespiratory fitness of children with CP measured in 2014 with a comparable sample from 2004.

Methods and procedures: In total, 25 high-functioning children with CP (i.e., GMFCS I–II) measured in 2004 (13 boys; mean age 13.2 (2.6) years) were matched to 25 children measured in 2014. Outcomes included body mass and BMI, muscle power sprint test (MPST), 10 × 5 m sprint test, and a shuttle run test (SRT). Data of 15 participants from 2004 (10 boys; mean age 12.6 (2.5) years) were matched and analysed for VO_{2peak}.

Outcomes and results: Body mass and BMI were higher (both: $p < 0.05$) in the 2014 cohort compared to the 2004 cohort. Further, performance-related fitness was better for the 2014 cohort on the MPST ($p = 0.004$), the 10 × 5 m sprint test ($p = 0.001$), and the SRT ($p < 0.001$). However, there were no differences for VO_{2peak}.

Conclusions and implications: In high-functioning children with CP, there are positive ecological time trends in performance-related fitness, but not in VO_{2peak} between 2004 and 2014. The substantial higher body mass and BMI is alarming and requires further investigation.

* Corresponding authors at: De Hoogstraat Rehabilitaion, Center of excellence for Rehabilitation Medicine, Rembrandtkade 10, 3583 TM Utrecht, the Netherlands.
E-mail addresses: m.zwinkels@dehoogstraat.nl (M. Zwinkels), o.verschuren@dehoogstraat.nl (O. Verschuren).

¹ Sport-2-Stay-Fit study group: FJG Backx (Department of Rehabilitation, Nursing Science and Sports, and Brain Center Rudolf Magnus, University Medical Center Utrecht, Utrecht, the Netherlands), JF de Groot (University of Applied Sciences, Utrecht, the Netherlands), T Takken (Child Development and Exercise Center, University Medical Center Utrecht, Utrecht, the Netherlands), DW Smits (Department of Rehabilitation, Nursing Science and Sports, and Brain Center Rudolf Magnus, University Medical Center Utrecht, Utrecht, the Netherlands), O Verschuren (Center of Excellence for Rehabilitation Medicine and Brain Center Rudolf Magnus and, De Hoogstraat Rehabilitation and University Medical Center Utrecht, Utrecht, the Netherlands), JMA Visser-Meily (Department of Rehabilitation, Nursing Science and Sports, and Center of Excellence for Rehabilitation Medicine and Brain Center Rudolf Magnus, De Hoogstraat Rehabilitation and University Medical Center Utrecht, Utrecht, the Netherlands), MJ Volman (Faculty of Social Sciences, Department of General and Special Education, Utrecht University, Utrecht, the Netherlands), HW Wittink (University of Applied Sciences, Utrecht, the Netherlands), M Zwinkels (Center of Excellence for Rehabilitation Medicine and Brain Center Rudolf Magnus and, De Hoogstraat Rehabilitation and University Medical Center Utrecht, Utrecht, the Netherlands), T Nijboer (Department of Rehabilitation, Nursing Science and Sports, and Center of Excellence for Rehabilitation Medicine and Brain Center Rudolf Magnus, De Hoogstraat Rehabilitation and University Medical Center Utrecht, Utrecht, the Netherlands), R van de Schoof (University of Applied Sciences, Arnhem and Nijmegen, the Netherlands), G Steenweg (Windesheim University of Applied Sciences, Zwolle, the Netherlands)

<http://dx.doi.org/10.1016/j.ridd.2017.09.021>

Received 18 April 2017; Received in revised form 15 September 2017; Accepted 28 September 2017

0891-4222/© 2017 Elsevier Ltd. All rights reserved.

What this paper adds

In recent decades, improving fitness levels of children and adolescents with cerebral palsy (CP) has become an important goal in rehabilitation medicine. Published studies related to exercise training programs for children and adolescents with CP have shown positive effects. However, it usually takes time for scientific results to be implemented in clinical practice. This study has the unique opportunity to study, with a timeframe of 10 years, if body mass, BMI and fitness levels of children with CP has been changed. We were able to compare two datasets collected in a similar way in the same country (and regions) in children and adolescents with CP. These datasets have the same outcomes on body mass and BMI, performance-related fitness and VO_2 peak. The present study shows positive ecological time trends in performance-related fitness in children and adolescents with CP between 2004 and 2014. However, the higher body mass and BMI, and the unchanged VO_2 peak requires further investigation.

1. Introduction

Improving physical fitness has become an important aspect during rehabilitation. Over the last decades, the number of studies on physical fitness in children and adolescents with cerebral palsy (CP) has grown exponentially. It is recommended that all children with CP should engage, to the extent they are able, in aerobic, anaerobic and muscle strengthening activities. (Maltais, Wiart, Fowler, Verschuren, & Damiano, 2014; Verschuren, Peterson, Balemans, & Hurvitz, 2016) It is generally acknowledged that children and adolescents with CP can be trained according to general exercise physiological training principles, without exacerbating spasticity. (Darrah, Fan, Chen, Nunweiler, & Watkins, 1997)

Physical fitness can be divided into subcomponents including performance-related fitness and cardiorespiratory fitness. Performance-related fitness is the combined result of coordinated exertion with a variety of physiological functions. (Åstrand, 2003) Coordination, speed, agility, and short-term muscle power are often described as outcome measures related to performance. Cardiorespiratory fitness, generally expressed as peak oxygen uptake (VO_2 peak), is a strong predictor for cardiovascular disease later in life. (Ruiz et al., 2009)

In the typically developing population, previous ecological time trend studies showed that both performance-related fitness and cardiorespiratory fitness has declined in children and adolescents over recent decades. (Boddy, Fairclough, Atkinson, & Stratton, 2012; Dos Santos et al., 2015; Dyrstad, Aandstad, & Hallén, 2005; Huotari, Nupponen, Laakso, & Kujala, 2010) Performance on both 20-m Shuttle Run Test (SRT) (Boddy et al., 2012) and 10 × 5 m sprint test have decreased. (Dos Santos et al., 2015) In addition, running performance on a time trial decreased by 10% and 6% for boys and girls, respectively, in Finnish adolescents between the 1980s and 2000s. (Huotari et al., 2010) Moreover, VO_2 peak decreased by 8% in Norwegian adolescents from 1985 to 2002. (Dyrstad et al., 2005)

Weight gain and the rising obesity prevalence among children and adolescents is becoming a serious health problem worldwide. (Ng et al., 2014) Physical fitness levels are negatively associated with overweight. (Ruiz et al., 2009) Body weight and body mass index (BMI) increased by 7% and 6%, respectively, in Norwegian adolescents from 1985 to 2002. (Dyrstad et al., 2005) Moreover, BMI has been shown to be inversely associated with running performance, indicating higher BMIs over time may lead to poorer fitness and running capacities. (Huotari et al., 2010) Since children and adolescents with CP have lower performance-related fitness and cardiorespiratory fitness compared to children who are typically developing, (Balemans et al., 2013; Verschuren & Takken, 2010) they are thought to be at increased risk for overweight.

A large number of studies have shown positive effects of exercise training in children with CP on performance-related fitness (Verschuren, Takken et al., 2007 Verschuren, Ketelaar et al., 2007) and cardiorespiratory fitness. (Butler, Scianni, & Ada, 2010) These insights in the positive effects of exercise training should ideally lead to implementation in clinical practice. The aim of the current study is to compare body mass and BMI, performance-related fitness, and cardiorespiratory fitness in a convenience sample of children with CP measured in 2014 with a comparable sample from 2004.

2. Methods

For the current study, data collected in 2014 (Zwinkels et al., 2015) were compared to two datasets from two different studies performed in 2004. (Verschuren, Takken, Ketelaar, Gorter, & Helders, 2006; Verschuren, Takken et al., 2007; Verschuren, Ketelaar et al., 2007) Data collection was administered similarly, since two researchers (OV, TT) involved in the 2004-studies supervised data collection in 2014.

2.1. Setting and participants

All participants from both 2004 and 2014 samples were recruited from several schools for special education in the Netherlands. Children and adolescents were included if they were diagnosed with spastic CP, classified at GMFCS level I or II, and between the age of 7–18 years. Data of the 2014 study were used and matched with the data collected in 2004 according to sex, GMFCS-level and height up to three centimetre difference. These characteristics are most related to both performance-related fitness and cardiorespiratory fitness. (Verschuren & Takken, 2010) Height was used instead of age, because its more discriminative value for physical fitness in this population. Matching was done for the two different datasets from 2004 to compose separate databases containing either body mass, BMI and performance-related fitness, (Verschuren, Takken et al., 2007 Verschuren, Ketelaar et al., 2007) and cardiorespiratory fitness. (Verschuren et al., 2006)

Download English Version:

<https://daneshyari.com/en/article/4940969>

Download Persian Version:

<https://daneshyari.com/article/4940969>

[Daneshyari.com](https://daneshyari.com)