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Effects of a trampoline exercise intervention on motor performance and balance ability of children with intellectual disabilities



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ABSTRACT

Balance and motor impairments are most evident among inactive individuals with ID that might be particularly susceptible to a loss of basic functioning and further limit the person's autonomy in activities of daily living. The aim of the study was to assess the effect of a 12-week trampoline exercise intervention program on motor and balance ability of school aged children with intellectual disability (ID). Eighteen healthy schools aged children (mean age = 10.3 ± 1.6 years) with moderate ID were assigned either to an experimental group (n = 9) or a control group (n = 9). The experiment group attended a 12 weeks trampoline training intervention program consisting of daily individualized 20-min sessions, while the control group followed the regular school schedule. Balance was assessed using three tasks of increased difficulty (double-leg stance with eyes opened or closed, and one-leg stance with eyes opened) performed while standing on an electronic pressure platform (EPS). Motor performance of all participants was tested using sit and reach test and long and vertical jump tests all derived from the Eurofit Test Battery of physical fitness. Trampoline intervention resulted in significant improvements of participants' performance in all motor and balance tests. In conclusion, trampoline training can be an effective intervention for improving functional outcomes and can be recommended as an alternative mode of physical activity programming for improving balance and motor performance. Furthermore, it also supports the idea that individuals with ID require enjoyable and interesting intervention programs such as the trampoline program used in this study so as to remain active and consequently to facilitate their overall development and promote a more active and healthier way of life.

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1. Introduction

Motor problems have been reported as common in persons with intellectual disabilities (ID) since ID is a condition, which affects cognitive and motor functions (Cleaver, Hunter, & Ouellette-Kuntz, 2009; Hartman, Houwen, Scherder, & Visscher, 2010; Vuijk, Hartman, Scherder, & Visscher, 2010). Alongside impairments in cognitive and motor function, individuals with ID also account lower levels of physical fitness at all stages of life due to inactive (sedentary) way of life, less opportunities for

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physical exercise and the ID condition itself (Frey, Stanish, & Temple, 2008; Lotan, Isakov, Kessel, & Merrick, 2004; Skowronski, Horvat, Nocera, Roswal, & Croce, 2009) which might be particularly susceptible to a loss of basic functioning (Carmeli, Barchad, Lenger, & Coleman, 2002). There are many reasons and explanations for the low levels of physical fitness in individuals with ID, including an inactive lifestyle (Hall & Thomas, 2008; Temple, Frey, & Stanish, 2006) or low motivation (Halle, Gabler-Halle, & Chung, 1999).

Falls resulting in injury, are very common in individuals with ID (Cox, Clemson, Stancliffe, Durvasula, & Sherrington, 2010; Hsieh, Heller, & Miller, 2001) due to poor balance ability that may be interpreted as an indicator for incomplete development (Enkelaar, Smulders, van Schrojenstein Lantman-de Valk, Geurts, & Weerdesteyn, 2012). Balance and motor impairments are most evident among inactive individuals with ID (Carmeli, Bar-Yossef, Ariav, Levy, & Liebermann, 2008) that further limit the person's autonomy in activities of daily living (Piek, Dawson, Smith, & Gasson, 2008).

However, maturation of balance ability does occur in persons with ID although it may not reach the same level of maturation as persons without ID (Agiovlasitis, McCubbin, Yun, Mpitsos, & Pavol, 2009; Dellavia, Pallavera, Orlando, & Sforza, 2009; Webber, Virji-Babul, Edwards, & Lesperance, 2004). In fact, previous studies demonstrated that balance performance in persons with ID could be significantly improved following various intervention programs (Fotiadou et al., 2009; Giagazoglou, Arabatzi, Dipla, Liga, & Kellis, 2012; Tsimaras & Fotiadou, 2004; Wang & Ju, 2002). Thus, there is an urgent need to identify effective physical activity interventions for individuals with ID.

Involvement in exercise is a key strategy in the secondary prevention of health problems arising from inactivity (Rimmer & Braddock, 2002) and a sedentary lifestyle often adopted by ID individuals (Graham & Reid, 2000). However, despite the advantages of physical activity most individuals with ID tend to avoid participation in physical activities (Lotan, Yalon-Chmovitz, & Weiss, 2010) or lack sufficient stimuli to complete physical activity programs (Graham & Reid, 2000; Lotan et al., 2004). This in turn leads to low scores on physical fitness and balance tests suggesting that engagement in physical activity for ID population must increase.

Additional research is needed to develop and test interventions that encourage individuals with ID to initiate and maintain physical activity and become willing participants in an activity that will most likely improve the outcome of an intervention program (Rimmer & Braddock, 2002). The most difficult part for children with ID is to find an appropriate exercise program to keep their interest in taking part and continue participation for a long time. In this regard, trampoline training is a popular activity for ID children with its main characteristic and benefit related to the avoidance of monotonous physical exercise. Provision of trampoline exercise with a particular focus on safety issues and supervision due to the increased risk potential for injuries, constitutes an effective type of training that enhances children's motivation (Hurson et al., 2007).

During trampoline training, participants are "forced" to continuously respond to a constant change of gravity which provides deep proprioception as well as other sensory inputs. It has been suggested that mini-trampoline exercises consist of a multi component approach which are likely to affect many physical factors such as strength, body stability, muscle coordinative responses, joint movement amplitudes and spatial integration (Aragao, Karamanidis, Vaz, & Arampatzis, 2011).

Reviewing the literature, it seems that no previous studies have investigated the effect of an individualized trampoline activity program on motor performance and static balance ability of school aged children with ID. In addition, it was hypothesized that the use of a trampoline as an equipment promoting fun and enjoyment would keep children's interest throughout the whole duration of the activity program. The knowledge of the possible effects of a trampoline intervention program on these variables in children with ID should be of great interest to adapted physical educators and could be essential for planning and designing appropriate exercise programs based on children's unique abilities and preferences. Therefore, the purpose of the present study was to assess the effect of a 12-week trampoline exercise intervention program on motor and balance ability of school aged children with ID.

2. Methods

2.1. Participants

The sample consisted of 18 healthy school aged children (mean age = 10.3 ± 1.6 years) with moderate intellectual disability (ID) recruited randomly from a special primary school unit of 32 Greek students. Participants were randomly assigned into two equal groups of 7 boys and 2 girls each one, divided in terms of four criteria, that is, gender, age, school placement (residential school for children with disabilities) and moderate IQ level accompanied with deficits in adaptive behavior. The evaluation phase included information derived from the files of the official developmental team assigned by the Greek State regarding the IQ of each individual as it was measured in previous years using the Wechsler Intelligence Scale – IV. The team administrating and scoring the motor and balance performance of participants throughout intervention consisted of physical education instructors with many years of research experience and teaching in ID populations. Participants with moderate ID were chosen since this population represents the majority of school aged children with ID in Greek primary school settings who are educable, they are in position to follow the safety rules adopted in this study and they lack gross motor skills and coordination that trampoline exercise mostly develops.

The first-experiment-group attended a 12 week trampoline training program while children of the second-control-group followed the regular school schedule. All parents or legal guardians provided written informed consent prior participation, which was approved by an Institutional Review Board for use of Human subjects, allowing the children's involvement in the

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