The Effect of Selected Exercise Program on the Learning of Fundamental Motor Skills in Children with Intellectual Disabilities

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ABSTRACT

Children with intellectual disabilities suffer from many problems in the cognitive and motor abilities areas. Despite this, the amount of motor activities was still clearly low and needs more research. Our aim in this study was to investigate the effect of a set designed exercise program on the learning of fundamental motor skills in children with intellectual disabilities. After diagnosing children as intellectual disabilities (aged ۱۰-۱۵) by experts, participants (۳۰ girls and ۳۰ boys) were divided into experimental (۱۵ girls and ۱۵ boys) and control groups (۱۵ girls and ۱۵ boys). The design of the study was semi-experimental including an independent variable, a pretest and a posttest. Having considered the research hypotheses using descriptive statistics and one-way analysis of covariance, the results of one-way analysis of covariance show a significant difference in posttest scores between the two groups. The results of the study show this our designed exercise program increases the score of fundamental motor skills and facilitates the learning of fundamental motor skills in children with intellectual disabilities, because it was designed scientifically verified criteria by us that can be effective in motor learning of fundamental motor skills.

Keywords: *Children, Intellectual disabilities, Selected exercise program, Fundamental motor skills, Learning, School*

۱. *INTRODUCTION*

Intellectual disability affects areas of functioning in children with intellectual disability, which include: cognitive, language, movements, psychosocial, and specific activities of daily living (Capio & Eguia, ۲۰۲۱; Schalock et al., ۲۰۰۷). Exercises that focus at the school ages should emphasize the development of mature forms of various loco-motor, non-locomotor and manipulative skills often referred to as fundamental motor skills (Lubans et al., ۲۰۱۰; Lucas et al., ۲۰۱٦; Piletic & Davis, ۲۰۱۰). The fundamental motor skills are seen as the building parts for more advanced physical activities and sport skills (Gabbard, Carl, ۱۹٤۸). Nevertheless, it is important to understand that children do not learn these skills as a result of the growth process, but rather they learn most of fundamental motor skills through training and practice. (Payne & Isaacs, ۲۰۲۰; van Rossum, ۱۹۸۷). As a result, the challenge for teachers is to find ways to provide instruction that speedup students' achievement to fundamental motor skills.

Although most investigations have been given to the cognitive functioning of children with intellectual disabilities, it has been shown that deficiency in motor skills are common in this population (Frey & Chow, ۲۰۰٦; Piek et al., ۲۰۰۸; Vascelli et al., ۲۰۲۳). Gross motor skills are important, because these skills are taught to facilitate children's cognitive development (Piek et al., ۲۰۰۸; Son & Meisels, ۲۰۰٦), contribute positively to activities of daily living (Lee & Jin, ۲۰۲۳; Watkinson et al., ۲۰۰۱), and are commonly considered as the building blocks for the development of more compound motor skills and sport-specific skills (Stodden et al., ۲۰۰۸; Wall, ۲۰۰٤).

A key developmental aim for children is the development of proficiency in fundamental motor skills because they are momentous for future complex motor skills (e.g., sport-specific and habitual physical activities) in which greater focus can be placed on the health outcomes of physical activity (Robinson et al., ۲۰۲۳; Temple et al., ۲۰۰۶, ۲۰۰۹). fundamental motor skills are comprised of locomotor and object control skills, locomotor skills require the movement of the body through space (Stodden et al., ۲۰۰۸) and, object control skills are those that require the manipulation of tangible objects (McDonough et al., ۲۰۲۰).

Physical activity has been widely recognized as an effective strategy for enhancing physical capability and preventing disease; and regular physical activity and participation in exercise programs have been shown to enhance physical capability (Darroch et al., ۲۰۲۳; O'Connor et al., ۲۰۰۰; Pourtois et al., ۲۰۰۸). As well, Physical activity is extensively reported to have beneficial effects on mental health of the general population (Hamer et al., ۲۰۲۳; Penedo & Dahn, ۲۰۰۵), but for individuals with intellectual disabilities it is likely that physical activity patterns go unnoticed or are not studied because these individuals are generally not included in large-scale population studies (Hansen et al., ۲۰۲۳; Penedo & Dahn, ۲۰۰۵). Nevertheless, the published literature suggests that the majority of subjects with intellectual disabilities are unfit, engage in low levels of daily physical activity and adopt sedentary behaviors (Fernhall & Pitetti, ۲۰۰۱; Graham & Reid, ۲۰۰۰). The consequence of this is that high rates of morbidity and mortality related to hypoactivity associated diseases are found in this population (Sutherland et al., ۲۰۰۲).

Exercise is more effective than other strategies at enhancing physical capability it is slightly more effective than stretching, yoga, group therapy, relaxation or meditation, and as effective cognitive behavioral therapy. Only pharmacological therapy has a greater effect than exercise (Carraro & Gobbi, ۲۰۱۲).

Despite the low participation rate of subjects with intellectual disabilities regularly engaging in physical activity, the positive effects of participating in physical activity, exercise programs and sport have been reported in this population (Bartlo & Klein, ۲۰۱۱; Guidetti et al., ۲۰۱۰; Yu et al., ۲۰۲۲).

Although a number of studies have examined the fundamental motor skills (i.e., locomotor skills and object control skills) of children with borderline and mild (Borland et al., ۲۰۲۲; Frey & Chow, ۲۰۰۶; Hartman et al., ۲۰۱۰), none of these studies focused on the effect of a specific selected exercise program on acquisition fundamental motor skills. Therefore, the question remains, whether or not any specific selected exercise program affects the learning of fundamental motor skills in children with intellectual disabilities, more specific information about the fundamental motor skills by children with intellectual disabilities may provide useful knowledge for physical education teachers and could be utilized in the development of motor interventions for this population.

Although this issue is very important, it has been forgotten in recent researches, but children with intellectual disabilities with a high percentage, still do not participate in regular physical activities. The importance of studying exercises that lead to an increase in the level of learning in fundamental motor skills in children with intellectual disabilities and, the lack of recent research in this field led us to design a set of movement program with the help of previous research and examine its effect on learning of fundamental motor skills in children with intellectual disabilities. Therefore, in this study, we will assume that a redesigned selected exercise program can increase the learning of fundamental motor skills in children with intellectual disabilities

۱.۱ **Subtitle ۱** *In present study, the experimental group attained higher scores at posttest than the control group, and the difference was significant. These results indicate that our training program achieves the goals associated with gross motor activity training that includes achieving Balance, Posture, Coordination, Proprioception, Bilateral integration and coordination, Spatial awareness, Floor based activities, Initiate movements, Stabilizing muscle movements, Motor planning and timing, Motor execution, Midline orientation, Temporal awareness, Form consistency, Vestibular regulation, Memorizing and recalling muscle movement patterns (Muscle memory), and Listening and understanding then responding to instruction (otforkids, ۲۰۲۳). These goals can be seen based on the results scores of posttest.*

۱.۱.۱ *Subtitle ۲ Since any effective exercise program enhances the functions of the neuromuscular, nervous systems, and cognitive performance through facilitating neural plasticity, leading to a reduction in cognitive disorders and improve motor abilities (Clutterbuck et al., ۲۰۱۹; Daniela et al., ۲۰۲۲; Ellemberg & St-Louis-Deschênes, ۲۰۱۰; Gomez-Pinilla, ۲۰۱۱; Radak et al., ۲۰۰۷; Sorgente et al., ۲۰۲۱), therefore, our*

selected exercise program leads to more learning of fundamental motor skills. The findings of this study indicate that the selected exercise program increased the learning of fundamental motor skills in children with intellectual disabilities. Thus, children with intellectual disabilities can be helped to improve their fundamental motor skills with using of selected exercise program in training programs that designed for them to achieve objectives related to learning movement skills (perception of environment) which not only helps to improve movement skills but also affects growth, learning throughout life span, increases the quality of life and, reduces costs related to the health of children with intellectual disabilities. The findings of this study will be useful for the psychologists, teachers and therapists of children with intellectual disabilities for improving the quality of their learning and perception of environment.

Table ١. Selected Exercise Programs

Order	Selected exercises	Execution environment and equipment	Number of repetitions and time in each section
١	Walking on a line	Band with a width of ٢٠ cm and a length of ١٠ meters on the playground	٣ repetitions in ٥ minutes
٢	Running between two parallel lines	Two parallel lines with a width of ٥ cm with a distance of half a meter from each other and a length of ٣٠ meters on the playground	٣ repetitions in ٥ minutes
٣	Hit the ball	Kicking a futsal ball with the preferred foot	٥ repetitions in ٥ minutes
٤	Two hand strike	Hitting a baseball suspended by a string with a baseball bat	١٠ repetitions in ٥ minutes
٥	Catch a ball	Catching a futsal ball that is thrown at a child from a distance of three meters	١٠ repetitions in ٥ minutes
٦	Overhand throw	Throwing a tennis ball from above the shoulder to a designated point at a distance of ١٥ meters	١٠ repetitions in ٥ minutes
٧	Standing on one leg	Standing on one leg in the middle of a plus that is on the playground with a ٣٠ cm tape	١٠ repetitions in ٥ minutes each part ٣٠ seconds
٨	Obstacle courses	Passing ٣ obstacles including: passing under the net, passing between ٥ signs, passing over three obstacles at a height of ٢٠-٣٠-٤٠-٥٠-٦٠- cm	٣ repetitions in ١٥ minutes each part ٣٠ seconds
٩	Rolling over	Rolling on a mat in ١٠ meters long	٣ repetitions in ٥ minutes
١٠	Bringing the hands to the middle of the body	Bringing two hands at three points of body centers, including the bottom, middle and top of the head	٩ repetitions in ٥ minutes

The data was analyzed with IBM SPSS statistic version ٢٦.
After checking the normality of the data by the One-Sample Kolmogorov-Smirnov Test, one-way Analysis of Covariance was used to find the differences between control and experimental groups in posttest scores. The results of the One-Sample Kolmogorov-Smirnov Test confirmed the normality of the data (P<٠.٠٥, pre=٠.٥٠٨, post=٠.٢٥٦).
Table ٢ shows the descriptive data for the two groups in pretest and posttest

Table ٢. The mean and standard deviation of fundamental motor skills score of control and experimental groups

Group	Time of Measurement			
	Before training		After training	
	Mean	SD	Mean	SD

Control	٤١.٣٦	٣.٦٩	٤٣.٢٣	٣.٩٩
Experimental	٤٢.٧٦	٥.٥٢	٥٧.١٣	٦.٥٦

In the Table ٣ results of the one-way analysis of covariance test shows there was a significant difference between the control and experimental groups at posttest scores.

Table ٣. Summary of Analysis of Covariance

Source	d.f.	Sum of squares	Mean square	F	Sig.	η٢
Pretest	١	١٦٠.٥٣٧	١٦٠.٥٣٧	٠٥.٨٨٧	٠.٠١٨*	٠.٠٩٤
Group	١	٢٦٣٤.٦١٤	٢٦٣٤.٦١٤	٩٦.٦١٨	٠.٠٠٠*	٠.٦٢٩
Error	٥٧	١٥٥٤.٢٩٦	٢٧.٢٦٨			

*Significant differences (P <٠.٠٥)

The significance of the difference indicates the effect of applying the selected exercise program on the fundamental motor skills variable with pretest control. Table ٢ show that the experimental group at posttest had higher scores than at pretest scores. Also, as we can see in Table ٣, η٢ (٠.٦٢) suggests that ٦٢٪ of the changes in the dependent variable were due to the applying independent variable.

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