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The Effect of a Psychomotor Education Program on School Behavior of Children with Intellectual Disability

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Abstract **– Children with Intellectual Disability (ID) demonstrate cognitive and behavior difficulties which affect their school performance and limits their function level. Motor and exercise programs have been associated with improvement in cognitive function and behaviour control. Psychomotor education comprises a holistic movement approach that uses play as basic method to support children's development. The aim of this study was to assess the effect of a psychomotor education program on school behavior of school aged children with intellectual disability (ID). Twenty children with ID, 8-12 years old, participated in the present study. The participants were divided into an intervention group and a control group. The intervention group attended a 16-week psychomotor education program at a frequency of 2 lessons per week, for 45 minutes. School behaviour was assessed with a classroom rating scale appropriate for use with ID children. The specific scale comprises of 16 items which describe two distinct factors. The fist factor is the attention-distraction (AD) and the second one inhibition-excitation (IE). According to the results, children who participated in the intervention program, improved their performance in school activities requiring concentration of attention and control behavior. In conclusion, this study provides evidence that psychomotor education program can be used as an effective intervention for improving school behavior of children with ID.**

Keywords **– Attention, Control, Mental Retardation, Stimulation, Training.**

I. INTRODUCTION

Children diagnosed with Intellectual Disability (ID) have significant difficulties in intellectual and adaptive functioning (American Psychiatric Association, 2013), which affect their school performance. The main difficulties observed in basic cognitive function of children with ID are perception and memory (Lindblad, Gillberg & Ferell, 2011). Attentional abilities are poorer in children and adolescents with ID (Carrasco, Castillo, Aravena, Rothhammer & Aboitiz, 2005; Rhodes, Riby, Matthews & Coghill, 2011) and influence significantly learning and behaviour (Deutsch, Dube & McIlvane, 2008; Simonoff et al., 2007). Furthermore, they often exhibit symptoms of the Attention Deficit Hyperactivity Disorder (ADHD) (Voigt, Barbaresi, Colligan, Weaver & Katusic, 2006). More specifically, they usually can't control their behaviour, their motor or verbal reactions are often exaggerated or unnecessary and their movements are uncoordinated. Furthermore, they can't concentrate on specific stimuli that they receive from their environment. As a result, cognitive development is affected, with obvious difficulties in school learning and performance (Hastings, Beck, Daley & Hill, 2005; Guerrin, Buckley, McEvoy, Hillery & Dodd, 2009; Pearson, et al. 2004).

The most popular scale for assessing school behavior of children with ID is Conners' Rating scale (Buckley, Hillery, Guerrin, McEvoy & Dodd, 2008; Malfa, Lassi, Bertelli, Pallanti & Albertin, 2007) and Attention-Distraction, Inhibition-Excitation Classroom Assessment scale (ADIECAS, 1975) (Cavanaugh & Tervo, 1997; Deb et al. 2008; Guerrin et al. 2009). Conners' Rating scale is the most commonly used scale for diagnosing

ADHD whereas ADIECAS scale was developed specifically for use with population with ID (Guerrin et al. 2009; Strand, Sturney & Newton, 1990; Turner, Sloper & Knusen, 1991).

According to the literature, physical movement can play an important role in the development of young children. Specifically, physical activity positively affects perception, attention span and reaction time of typical child development and children with learning disabilities, ADHD, or ID (Hillman, 2009; Tomporowski, Davis, Miller & Naglier, 2008; Verret, 2012; Yılmaz & Soyer, 2018). Studies that use exercise as an intervention indicate a positive correlation between increased physical activity and cognitive ability. Specifically, motor-intensive and long-term exercise programs have been associated with improvement in executive function, memory, planning and behaviour control. These findings are enhanced by previous studies suggested significant improvements in academic performance as well as in cognitive functions such as visual-auditory discrimination (Budde, Voelcker-Rehage, Pietrabyk-Kendziorra, Riberro & Tidow, 2008; Hillman, Castelli & Buck, 2009).

A recent research indicated the positive effect of rhythmic exercises and games on attention concentration and memory in children with ID. Specifically, students with ID who were attending rhythmic activities such as dancing and music games increased the concentration of attention. The use of music and rhythm is thought to increase the synapses of the brain and activates the reticular system of the brain area that has a significant role in controlling attention, in the inhibition, planning, organization and individual behaviour (Javan, Framarzi, Nattaj & Sabetimani, 2011; Javan, Framarzi, Abedi & Nattaj, 2014).

Psychomotor education comprises a holistic movement approach, with aim to improve all aspects of each child personality. Children practice in perceptual, motor, sensory activities and learn to localize and process the various inputs of their environment. Play is the basic method of psychomotor education. Playful activities enhance children's motivation for participation and support children's holistic development. A child learns how to organize information, to use appropriate language and thoughts, expresses creativity, observes and understands basic rules of social behaviour. The effect of play activities are considered important for cognitive, social, emotional and language development of the child (Hamm, Mistrett & Ruffino, 2006; Campbell et al. 2008; Javar et al. 2011).

The purpose of this study was to assess the effect of a psychomotor education program on school behavior of school aged children with ID. A specific psychomotor education programme that stimulated all sensory systems was designed and implemented for the participants of the present study. Participants should learn to balance in various positions in stable and unstable surfaces while they perceived various visual, audio, tactile inputs, in order to increase their concentration of attention and control their behaviour.

Table I. Original subscales proposed by Evans and Hogg (1984), Guerin (9).

Subscale 1: Attention–distraction (AD)	**Subscale 2: Inhibition–excitation (IE)**
Item 1 Requires additional stimulation to continue a task	Item 8 Speaks (decisiveness)
Item 2 Concentration is	Item 9 Speaks at length
Item 3 Capacity for work is	Item 10 In action is
Item 6 Reaction to a problem is	Item 11 Speaks (speed)
Item 7 Perseveres for a long time	Item 16 Speaks (volume)

Subscale 1: Attention–distraction (AD)	Subscale 2: Inhibition–excitation (IE)
Item 14 Listens to instructions well	Item 18 Ease of distraction
Item 15 Works well towards a set objective	Item 20 Level of inhibition
Item 19 Is very easy to very difficult to distract	
Item 21 To get attention for a new task is	

II. METHODS

A. *Participants*

Twenty children with moderate Intellectual Disability (ID), 8-12 years old participated in the present study. All the participants were recruited either from special schools or from integrated classes of typical schools. 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.

Participants were equally divided into groups based on four criteria: age, height, weight and moderate IQ level (using Wechsler Intelligence Scale). They were assigned in two groups, an interventional and a control. Ten participants comprising the interventional group which attended a 16 week psychomotor education program at a frequency of 3 lessons per week, for 45 minutes. The other 10 participants comprising the control group, followed their regular school schedule. All parents or legal guardians of the participants provided written informed consent before participation in the program as it was approved by the ethics committee of our university.

B. *Testing's Procedures and Instrumentation*

School behaviour was assessed with a classroom rating scale appropriate for use of children with ID. The specific scale comprises of 16 items which describe two distinct factors. The fist factor is the attention-distraction (AD) and the second one inhibition-excitation (IE) (Table 1). AD related to the ability to work well to a set task, to resist disruption and distraction, to attend well to instruction and to persevere. IE refers to how well a child can restrain actions, the coordination of movement and ability to inhibit responses. The items were rated on a seven-point likert scale by 6 teachers before and after the intervention program. The higher score indicates better performance (Guerin et al. 2009).

Guerin et al. (2009) examined internal consistency of the two factors and found to be internally reliable. Cronbach alpha values for AD were calculated .92 and for EI .84.

Test reliability was examined with the method of test-retest reliability. Teachers complete the specific scale twice in a two weeks period time. Correlation coefficient between the first and the second measurement was strong (r = .89).

The questionnaire was adapted in Greek language on the proposed methodology by Vallerand (1989) which includes the following phases: a) technical two-way translation b) examination of the translation by specialists in this area, c) pilot study.

C. *Psychomotor Education Program*

Program design comprised of static and dynamic balance activities, enhanced with various sensory inputs which promote motor and sensory integration of each child. More specifically, children were asked to perform motor activities while they learned to interpret visual, tactile and audio stimuli coming from their environment.

The main objective was also to strengthen the children's perception of space and time with static and dynamic balance activities organized at different levels and directions. Additionally, it was given emphasis on the awareness of the concept of rhythm, order, succession and duration. Participants performed all exercises with rhythm that originated either by musical instruments, or from their own body (Fotiadou, 2002; Fotiadou et al., 2009). Rhythmic exercises and exercises with bilateral motor coordination aimed at enhancing the concentration of attention. Technique focus of eyes and vestibular stimulation were also used to avoid attention deficit and improve balance abilities.

Participants were often encouraged to take initiatives to improvise small parts of movements to improve their creativeness, invention and expression (Fotiadou, 2002; Fotiadou et al., 2009). Symbolic stories were used while participants performed locomotors activities to enhance motivation and imagination.

D. *Statistical Analysis*

All data are presented as means ± SD. Independent t test was used to examine the differences between the two groups for the pre and the post measurement. Paired t test was used to examine the differences between the two measurements for each group. The level of significance was set at $p < .05$.

Table II. Attention-Distraction (AD), Inhibition-Excitation (IE) means and SD values PRE and POST training for experimental and control group.

	Experimental Group (n = 10)	
	PRE	**POST**
AD	3.6 ± 1.09	4.05 ± 0.77
IE	3.9 ± 0.51	4.68 ± 0.38
	Control Group (n = 10)	
	PRE	**POST**
AD	3.4 ± 0.99	3.05 ± 0.89
IE	3.8 ± 0.51	3.41 ± 0.49
*p<.05 PRE to POST test		

III. RESULTS

The independent sample t-test revealed that there was a significant difference in school behavior variables, between the two group, after the intervention program. The data indicated that students who participated in the intervention program had higher mean score in Attention-Distraction (AD) variable (4.05 vs 3.05). The difference between two groups was statistically significant $t (18) = 3,83$, $p <.05$, $r = .34$. Similarly, on the Inhibition-Excitation (IE) variable the intervention group had higher score comparing to the control group (4.68 vs 3.41). The difference was statistically significant $t (18) = 6,46$, $p <.05$, $r = .33$. Paired t test, showed a

statistically significant difference between pre and the post measurement for the intervention group. Participants of the intervention group increase their scores in all the items which described their school behavior. More specifically, the difference was statistically significant both for AD t (9) = - 5,02, p <.05 and for IE variable r = .38 , t (9) = - 7,07, p <.05, r = .35.

IV. DISCUSSION

The psychomotor education program employed in the present study contributed to the improvement of school behavior of both variables that were examined. After 16 weeks, the children of the intervention group improved their performance in school activities requiring concentration of attention and control behavior. These findings are consistent with recent studies suggested that regular physical activity programs had positive effects on the social and school behavior characteristics of individuals with Intellectual Disabilities (Best 2010; Brooks, Floyd, Robins, & Chan, 2015; Guvendi & Ilhan, 2017; Yılmaz & Soyer, 2018).

The intervention group of the present study participated in a multidimensional movement program that stimulated all sensory systems. They had to learn how to balance in various positions in stable and unstable surfaces watching simultaneously various visual, audio or tactile stimuli. The balance and coordination activities cause changes in brain areas such as the cerebellum, which is important for cognitive and motor development of individuals (Budde et al., 2008; Reynold et al., 2003). However, it has been suggested that the execution of complex motor movements appears to be a fundamentally cognitively-engaging task (Diamond 2009). Furthermore, research with animals specifies that complex motor activity brings morphological changes to the brain whereas simple motor activity does not (Carey et al., 2005).

Similarly, to the present study, previous researches have used dance programs and rhythmic activity in children with ID, in order to improve basic cognitive functions such as memory and attention span. The findings of this paper are in agreement with previous research results stated that dance and rhythm play activities lead to an increase in brain synapses and activation of the reticular system areas directly linked to specific cognitive functions (Javan et al., 2011; Javan et al., 2014). It seems that the use of several acoustic music and rhythmic stimuli could enable the participation to an education program of children with ID in order to control their motor and verbal behaviour and maintain their concentration. The engagement of the participants with ID in psychomotor educational or other compound physical activity programs informally affect the quality of learning process. The engagement in a compound physical activity program that works through multiple pathways would have a stronger effect in cognitive activity that recruits higher-order brain regions and requires adaptive thinking (Best 2010). Thus, it seems important during movement educational programs to offer variable practice activities to provide sensory information in different contexts to facilitate learning. The complex sensory motor stimulation offered by the present program, provides a training method that could be an effective physical activity intervention that lead individuals with ID to learn strategies, to receive and process information more effectively.

V. CONCLUSION

In conclusion, the option of the specific psychomotor program revealed successful for this population. Participants learned to control their reactions to stimuli and limit unnecessary, exaggerated movements. The present investigation has highlighted the interdependent relationship between motor and cognitive development

and demonstrate the importance of exercise for education of children with ID. This information provides valuable insight to administrators, teachers and the school community in regard to the importance of using psychomotor education in the school to enhance learning in all areas that affect children's development.

REFERENCES

[1] American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®), 2013. American Psychiatric Pub.
[2] J.R. Best, Effects of physical activity on children's executive function: Contributions of experimental research on aerobic exercise. *Developmental review*, 30(4), 2010, pp.331-351.
[3] B.A. Brooks, F. Floyd, D.L. Robins, W.Y. & Chan, Extracurricular activities and the development of social skills in children with intellectual and specific learning disabilities. *Journal of Intellectual Disability Research*, 59(7), 2015, pp. 678-687.
[4] S. Buckley, J. Hillery, S. Guerin, J. McEvoy & P. Dodd, The prevalence of features of attention deficit hyperactivity disorder in a special school in Ireland. *Journal of Intellectual Disability Research*, 52, 2008, pp. 156-162.
[5] H. Budde, R. Voelcker-Rehageb, S. Pietraíyk-Kendziorraa, P. Ribeiroc & C Tidow, Acute coordinative exercise improves attentional performance in adolescents. *Neuroscience letters*, 441, 2008, pp. 219-223.
[6] D.W. Campbell, W.O. Eaton & N.A. McKeen, Motor activity level and behavioural control in young children. *International Journal of Behavioral Development*, 26, 2002, pp. 289–296.
[7] J.R. Carey, E. Bhatt, A. Nagpal, Neuroplasticity promoted by task complexity. *Exercise and Sport Sciences Reviews*, 33, 2005, pp.24–31.
[8] X. Carrasco, S. Castillo, T. Aravena, P. Rothhammer & F. Aboitiz, Williams syndrome: pediatric, neurologic, and cognitive development. *Journal of Pediatric Neurology*, 32(3), 2005, pp. 166-172.
[9] B.F. Cavanaugh & R.C. Tervo, The child with attention deficit hyperactivity disorder and learning disability. *South Dakota Journal of Medicine*, 50, 1997, pp. 193–197.
[10] S. Deb, A.J. Dhaliwal & M. Roy, The usefulness of Conners' Rating Scales-Revised in screening for Attention Deficit Hyperactivity Disorder in children with intellectual disabilities and borderline intelligence. *Journal of Intellectual Disability Research*, 52, 2008, pp. 950–965.
[11] C.K. Deutsch, W.V. Dube & W.J. Mcllvane, Attention deficits, attention‐deficit hyperactivity disorder, and intellectual disabilities. *Journal of Developmental Disabilities Research Reviews*, 14 (4), 2008, pp.285-292.
[12] A. Diamond, All or none hypothesis: A global-default mode that characterizes the brain and mind. *Developmental Psychology*, 45, 2009, 130–138.
[13] E.G. Fotiadou, K.H. Neofotistou, M.P. Sidiropoulou, V.K. Tsimaras, A.K. Mandroukas & N.A. Angelopoulou, The effect of a rhythmic gymnastics program on the dynamic balance ability of individuals with intellectual disability. *Journal of strength and conditioning research*, 23, 2009, pp. 2102-2106.
[14] E. Fotiadou, P. Giagazoglou, D. Kokaridas, N. Angelopoulou, V. K. Tsimaras & C. Tsorbatzoudis, Effect of rhythmic gymnastics on the dynamic balance of children with deafness. *European Journal of Special Needs Education*, 17, 2002, pp. 301-309.
[15] S. Guerin, S. Buckley, J. McEvoy, J. Hillery & P. Dodd, The psychometric properties of the Attention-Distraction, Inhibition-Excitation Classroom Assessment Scale (ADIECAS) in a sample of children with moderate and severe intellectual disabilities. *Research in Developmental Disabilities*, 30, 2009, pp. 727-734.
[16] B. Góvendi & E. L élhan, Effects of adapted physical activity applied on intellectual disability students toward level of emotional adjustment, self-managingand the socialization: Parent and teacher interactive research. *Journal of Human Sciences*, 14(4), 2017, pp. 3879-3894.
[17] E.M. Hamm, S.G. Mistrett & A.G. Ruffino, Play outcomes and satisfaction with toys and technology of young children with special needs. *Journal of Special Education Technology*, 21, 2006, pp. 29-35.
[18] R.J. Vallerand. Vers une mıthodologie de validation trans-culturelle de questionnaires psychologiques (Towards a cross-cultural validation methodology for psychological questionnaires): Implications pour la recherche en langue franŋaise, Canadian, Psychology/Psychofogie canadienne (Implications for research in the French language, Canadian, Psychology / Psychofogie canadienne), 1989, 30: 662-80.
[19] R.P. Hastings, A. Beck, D. Daley & C. Hill, Symptoms of ADHD and their correlates in children with intellectual disabilities. *Research in Developmental Disabilities*, 26, 2005, pp. 456-468.
[20] C.H. Hillman, D.M Castelli & S.M. Buck, Aerobic fitness and neurocognitive function in healthy preadolescent children. *Medicine & Science in Sports & Exercise*, 37, 2005, pp. 1967-74.
[21] A. Javan, S. Framarzi, A. Abedi & F. Nattaj, Effectiveness of Rhythmic play on the Attention and Memory functioning in Children with Mild Intellectual Disability (MID). *International Letters of social and humanistic sciences*, 6, 2014, pp.9-21.
[22] A. Javan, S. Framarzi, F. Nattaj & M. Sabetimani, The Effectiveness of Rhythmic Movement Games on Attention in Children with Mental Retardation, *Journal of Educational and Management Studies*, 1, 2011, pp. 8-15.
[23] G.L. Malfa, S. Lassi, M. Bertelli, S. Pallanti & G. Albertin G, Detecting attention-deficit/hyperactivity disorder (ADHD) in adults with intellectual disability: The use of Conners' Adult ADHD Rating Scales (CAARS). *Research in developmental disabilities*, 29, 2007, pp. 158-164.
[24] D. Pearson, D. Lane, C. Santos, C.D. Casat, S.W. Jerger & K.A. Loveland, Effects of methlphenidate treatment in children with mental retardation and ADHD: Variation in medication response. *Journal of the American Academy of child and adolescent psychiatry*, 43, 2004, pp. 686-698.
[25] D. Reynolds, R. Nicolson & H. Hambly, Evaluation of an Exercise-based Treatment for Children with Reading Difficulties. Dyslexia. *An International Journal of Research and Practice*, 9, 2003, pp. 48-71.
[26] S.M. Rhodes, D.M. Riby, K. Matthews & D.R. Coghill, Attention-deficit/hyperactivity disorder and Williams syndrome: Shared behavioral and neuropsychological profiles. *Journal of Clinical and Experimental Neuropsychology*, 33(1), 2011, pp. 147-156.
[27] E. Simonoff, A. Pickles, N. Wood, P. Gringras & O. Chadwick, ADHD symptoms in children with mild intellectual disability. *Journal of the American Academy of Child & Adolescent Psychiatry*, 46(5), 2007, pp. 591-600.
[28] S. Strand, P. Sturmey & J.T. Newton, A classroom rating scale for use with mentally handicapped children: A replication of the ADIECAS. *British Journal of Clinical Psychology*, 29, 1990, pp. 121–123.
[29] P.D. Tomporowski, C. Davis, P. Miller & J. Naglieri, Exercise and children intelligence, cognition and academic achievement. *Educational Psychology Review*, 20, 2008, pp. 111-131.
[30] S. Turner, P. Sloper & C. Knussen, The validity and applicability of the ADIECAS classroom rating scale in a sample of children with Down's syndrome. *Journal of Mental Deficiency Research*, 35, 1991, pp. 384-391.

[31] C. Verret, M. Guay, C. Berthiaume, P. Gardiner & L. Beliveau, A Physical Activity Program Improves Behavior and Cognitive Functions in Children with ADHD: An Exploratory Study. *Journal of Attention Disorders*, 16, 2010, pp. 71-80.
[32] A. Yilmaz & F. Soyer, Effect of physical education and play applications on school social behaviors of mild-level intellectually disabled children. *Journal of Education Sciences*, 8 (2), 2018, pp 89.

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