The effects of a movement intervention on motor performance of preschool aged children

Giagazoglou, P[1], Papadaniil, M[1], Dampa, A[1], Fotiadou, E[1]

[1] School of Physical Education and Sport Sciences, Aristotle University of Thessaloniki, Greece
pgiagaz@phed-sr.auth.gr

Abstract

The aim of the present study was to assess the effect of a 12-week, daily movement intervention program on the motor and balance performance of preschool aged children. Sixty four healthy preschool aged children were equally divided and assigned either to an intervention or a control group. The motor performance of the children was tested using the two motor scales of the Griffiths Test No II. Balance performance measurements were assessed using two tasks (Double-Leg Stance and One-Leg Stance), performed while standing on an Electronic Pressure Platform (EPS) pre- and post-movement program. It was found from the results that the intervention program resulted in significant improvements in the performance of all motor and balance tests of the intervention group comparing to the control group ($p<.05$). In conclusion, the findings of the present study indicate the significance of a movement program in improving motor performance in preschoolers.

Keywords: Training, motor development, posture, static balance control, physical education

Introduction

Significant changes take place in all fields of childhood development in the preschool years. A child's development is a holistic process, in which motor skills are of particular importance, as children learn through movement (Clark, 2007). Balance is also critical to the development of motor skills. Every movement we make, involves postural control. Whether we are standing quietly, running, hitting a tennis ball, or sitting at a desk, gravity always acts on our bodies. In this early period, both an encouraging environment and children's participation in motor activities redound to the normal development and contribute to the overall health of children (Piek et al., 2008).

Although the term development may imply that motor skills and balance are acquired 'naturally' through maturational processes (Clark, 2005, 2007), practice, encouragement and quality instruction are needed for the achievement of mature patterns (Goodway & Branta, 2003; Robinson & Goodway, 2009; Valentini & Rudisill, 2004). It was found that the instructional approach used to teach motor skills influence the stability of motor performance (Robinson & Goodway, 2009; Robinson, Wadsworth, & Peoples, 2012; Robinson, Webster, Logan, Lucas, & Barber, 2012). Thus, it is important to promote continued learning and development of motor proficiency through practice and participation in movement interventions consisted of planned movement activities that are developmentally and instructionally (Clark & Metcalfe, 2002; Robinson & Goodway, 2009; Zask, Barnett, Rose, et al., 2012).

Due to the critical importance of movement in a child's life, there is a need for research to determine the effectiveness of motor skill interventions in order to support the inclusion of movement and play programs in early education settings (Fisher et al., 2005; Logan et al., 2012). The dynamic nature of motor development makes it challenging to achieve the desired positive outcomes with movement programs. Although a lot of research in Greece gives sound evidence on the positive results of various developmentally appropriate movement programs on the motor proficiency of preschool aged children (Deli, Bakle, & Zachopoulou, 2006; Derri et al., 2001; Venetsanou & Kambas, 2004; Zachopoulou, 2004), unfortunately movement education has not become an integral part of the Greek kindergarten curriculum yet.

However, it has been suggested that children who are exposed to stimulating environments that are supportive of skill development are more likely to develop into confident and proficient movers (Goodway et al., 2003; McPhillips & Jordan-Black, 2007). It is clear that preschool children with higher motor performance, are more likely to adjust to normal schooling (Bart, Hajami, & Bar-Haim 2007), to learn more difficult skills and engage in multiple physical activities (Goodway, 2009; Robinson et al, 2015). Furthermore, it has been suggested that promoting healthy physical activity behaviours in preschool children has immediate impact on the health and well-being of children and serves as a powerful strategy to prevent or minimise the occurrence of chronic diseases in later life (Tremblay et al., 2012). Taking into consideration the importance of being active from early years, the purpose of the present study was to assess the effect of a 12-week, daily movement program on motor performance of preschool aged children.

Methods

Participants

Sixty-four (64) healthy pre-school aged children (Mean age=62.53±7.26 months) participated in the study. They were equally divided into two groups in terms of three criteria: gender, age and school placement. The 2 groups were matched according to school attendance, so that the risk of environmental and educational differences is minimized. The intervention group consisted of 15 boys and 17 girls who attended a 12-week daily exercise training program. The control group consisted of 15 boys and 17 girls (the rest of the children) who followed the regular school schedule without any organized physical education lessons. All parents provided written informed consent prior to their children's participation. The research was approved by an Institutional Review Board for the protection of human subjects, thus allowing both the children's involvement in the program and access to relevant information regarding the children's developmental status. The study was also approved by the local University Ethics Committee.

Measures

The motor performance of the children was assessed using the two motor scales of the Griffiths Test No II (Griffiths, 1984), whereas balance performance measurements were assessed using an EPS pressure platform (Loran Engineering S.r.I., Bologna – Italy) pre and post movement program. Motor scales of Griffiths test No II were standardized in Greek regarding typically developed preschool children (Giagazoglou et al., 2005). In particular, a previous edition of the test was used which was standardized by Giagazoglou et al., (2005), since the most recent version of Griffith's (Luiz et al., 2001) has not yet been standardized for Greek children populations. Several studies internationally have researched and reported favorably on the Griffiths Scales' reliability and validity (Griffiths, 1984; Hanson 1982). Griffiths (1984) used the test-retest method when testing for the reliability of the Extended Scales and obtained a high test – reliability (Cronbach's alpha coefficient value =0.77), indicating that the Griffiths scales are stable measures of development.

The Griffiths scales are designed to ascertain the level of psychomotor development of young infants from 3 to 8 years old. The major advantage of the scales is that every subscale gives a different developmental quotient and provides a clear diagnostic indication of individual problems in early childhood. Griffiths (1984) stated that: "each subscale was devised to be a separate and complete scale in itself each measuring only one avenue of learning or process of development, but measuring this one aspect as completely as possible. Or, two Scales such as Scale A (Locomotor) and D (Hand and Eye Coordination) might be used in conjunction with one another in an investigation into general physical efficiency in certain children" (pp. 34–35).

Locomotor scale consists of items related to gross motor skills such as standing on one leg, running, jumping, throwing or kicking a ball. Scale A provides a basis for objective observation and a first impression of the general maturity of a young child. Scale D (hand and eye coordination) consists of items related to fine motor skills, manual dexterity and visual monitoring skills such as building a tower of cubes, cutting with scissors, copying simple geometrical shapes, drawing pictures and threading beads on a lace.

The profile drawn from these areas provides information for decision purposes concerning further investigation or treatment. The test scores are transformed into Developmental Ages (D.A) and then into Quotients according to the following equation: Developmental Quotient (D.Q) = Developmental Age x 100 / Chronological Age (C.A). The total number of test items in each scale is 36 and they are placed in strict order of difficulty. There are six items for each year within each subscale, carrying two months of Developmental age credits. Thus, the number of items successfully performed (passed) is multiplied by two, with the number 24 always added as a standard one for all children to produce the total number that describes the Developmental Age credits in months. For example, if a 5 years old child (C.A= 60 months) passes 20 out of the 36 items on the locomotor subscale, his/her D.A will be (20 x 2) +24 = 64 credits in months. Therefore, his D.Q is equal to 64 x 100 (D.A x 100) / 60 (C.A) =106.6. Developmental quotients rather than mental age are used so as to make it possible to compare children of different chronological ages and also to compare a child's performance at different time periods.

Balance testing. All balance tests were performed on an Electronic Pressure Platform (Loran Engineering S.r.I., Bologna – Italy). The system uses 2304 force sensing resistors in an active area of 70 x 50 cm to record plantar pressure at 25Hz. All the children performed double-leg stance (DLS) and one-leg stance (OLS) balance tasks. During the double-leg stance the children were instructed to stand erect, as motionless as possible, in a normal comfortable posture, looking straight ahead at a cross marked at approximately eye level on a black board 3 m away. They were barefoot with feet shoulder width apart on the platform and their arms by their sides. Each child was requested to keep a quiet stance posture for 30 seconds.

During OLS, the participants were instructed to stand on one foot, which was placed pointing straight forward in relation to reference lines in the frontal and sagittal planes. The swinging leg was flexed 90° at the hip and knee joints with both arms hanging relaxed at the sides

(Ageberg et al., 2003). The participants were instructed to stand as still as possible, looking straight ahead at a point on the wall 65 cm away. The test order between legs was randomized. Data recording started once the subject was stable in the required posture. Ample time was provided for familiarization. If OLS balance was not maintained for 10 seconds, the trial was not recorded and the measurement was repeated. Participants performed two trials in each condition and data were averaged across the two trials. Tasks were realized without footwear at the same time of the day to avoid any chronobiological effect.

A computer program (Footchecker 3.2, Engineering S.r.I., Bologna- Italy) was used to compute peak to peak amplitude (CoPmax) and the standard deviation of the COP from the mean value of COP in antero-posterior (SDy) and mediolateral (SDx) axis in mm, often defined as sway amplitude.

Procedure

All the measurements took place in a familiar environment of each child's school in a spacious room equipped with the appropriate tools. All the children were tested individually by the same experienced examiner. Prior to the measurements, the examiner had an informal conversation with each child so as to establish a trusting relationship. The overall duration of the measurements was about 60 min for each child.

Exercise intervention training.

A 12-week movement program was implemented to improve balance and fundamental motor skills. The training program was applied to the intervention group daily for 12 weeks and each training unit lasted approximately 45 min. Indicatively, the training focused on motor skills such as walking, running, jumping, and rolling. Early in each week, children were introduced to basic motor skills, and movement concepts were added as the week progressed. Later in the program, when children demonstrated increasingly developed patterns of these skills, they were requested to perform more complex locomotor skills such as sliding, galloping, leaping, hopping, striking, dribbling, kicking, throwing and catching.

The participants followed a movement training routine using a variety of portable or stable gym equipment. Exercises selected for each session were challenging and attractive to young children and required mental concentration. Many exercises were performed using assistive equipment, such as benches, game cones, ropes, bars, steps, balls, balloons, and papers while performed. A large part of the program was covered by readiness and reaction activities, such as moving and pausing, and responding to various auditory stimuli. A physical educator, who was specialized in teaching and had experience in working with young children, implemented the intervention program. None of the children in the control or intervention group participated in other organized physical activities during the experimental procedure.

Statistical Analysis

An analysis of variance (two-way ANOVA) with repeated measures was used to examine differences between the two sessions (Pre-Post) between the two groups (EG-CG) in each dependent variable which were the scores of Griffiths motor scales and balance tests. The level of significance was set at $p<.05$.

Results

The Anova repeated measures tests indicated a statistically significant group x time interaction effect on gross motor scale ($F_{1,62}$= 176.40, $p < .001$, η^2=.077). Similarly, there was a statistically significant group x time interaction effect on Eye-Hand Coordination Scale ($F_{1,62}$= 69.72, $p < .001$, η^2=.529).

Concerning the double leg stance (DLS) balance task, the two-way Anova repeated measures revealed a significant group x time interaction effect on CopMax in Anterior/Posterior (A/P) direction ($F_{1,62}$= 19.02, $p < .001$, η^2=.235). However, in Medio/Lateral (M/L) there was not a significant interaction effect ($F_{1,62}$= .395, p =.532, η^2=.006). Regarding the CopSd in the same task (DLS), the results showed a significant interaction effect in A/P direction, ($F_{1,62}$= 14.06, $p < .001$, η^2=.185) but not in M/L direction ($F_{1,62}$= .995, p=.322, η^2=.016).

With regards to the one leg stance (OLS) task, the statistical analysis revealed a significant interaction group x time effect in A/P ($F_{1,62}$= 39.54, $p <.001$, η^2=.389), as well as in M/L direction ($F_{1,62}$= 5.82, p = .019, η^2=.086). Similarly, a statistically significant interaction was observed in A/P ($F_{1,62}$=11.15, p=.001, η^2=.152) and in M/L direction ($F_{1,62}$=9.52, p =.003, η^2=.133). The means and SD values of Griffith's scores as well as the

PRE and POST training balance tasks for Intervention and Control group are represented in table 1.

Table 1. Griffiths' scales means and SD values and Peak-to-peak amplitude of the center of pressure (CoP) displacement (CoPmax) and standard deviation of the CoP (CoPsd) in the Anterior Posterior (A/P) and in Mediolateral (M/L) direction in 2 balance tasks; PRE and POST training for Experimental and Control group (* p<*.05* pre to post)

	Intervention group (n=32)		Control group (n=32)	
	Pre	Post	Pre	Post
	Griffiths Scales (scores)			
Locomotor	105.22±7.39	118.00±6.47*	107.37±6.95	108.47±6.07
Eye-Hand Coordination Scale	105.78±7.40	116.00±7.18*	105.34±6.33	105.78±6.59
	Double Leg Stance (mm)			
CoPmax - A/P	24.37±9.14	16.79±5.69*	23.37±12.50	23.59±12.88
CoPsd - A/P	4.51±1.60	3.53±1.41*	4.49±1.92	4.49±1.96
CoPmax- M/L	10.01±4.41	8.69±4.30	10.23±6.61	9.47±6.43
CoPsd- M/L	2.37±0.92	1.92±0.96	2.00±1.20	1.82±1.33
	One Leg Stance (mm)			
CoPmax - A/P	52.84±15.02	35.46±14.57*	51.53±22.05	49.40±24.80
CoPsd - A/P	10.60±4.02	7.61±3.08*	10.24±3.89	9.54±4.12
CoPmax- M/L	28.46±7.61	22.90±7.37*	29.79±11.50	28.83±11.27
CoPsd- M/L	6.53±2.00	5.07±2.01*	6.62±2.41	6.18±2.40

Discussion

The movement program employed in the present study contributed to the improvement of both gross and fine motor skills as well as balance performance. It was found that children who attended the movement program scored higher than the control group on the skills included in this study for all the variables that were examined. These findings are consistent with previous studies that examined the effects of psychomotor intervention programs upon motor performance (Kambas, et al., 2010; Spanaki, Skordilis, & Venetsanou, 2010; Zimmer et al., 2008). Basic motor skills are the essential building blocks for the acquisition of more refined and complicated skills that can be applied later in life, such as sporting, recreational and physical activity pursuits (Gallahue, Ozmun, & Goodway, 2011). However, these skills could not develop to their full potential without opportunities to practice in environments that are stimulating and supportive (Taggart & Keegan, 1997). Thus, movement patterns used in this study, combined with suitable playing activities and the use of several materials seem to keep participants interested and productive and resulted in great improvements of balance, fine and gross motor skills. This idea is consistent with the views of previous researchers who have supported that childcare providers should formally schedule gross motor activities into their daily routines in order to improve children's motor and balance performance, (Deli et al., 2006).

In line with previous findings (Lemos, Avigo, & Barela, 2012; Queiroz, Ré, Henrique, Moura, & Cattuzzo, 2014), this study suggests that, even in early childhood, a developmentally adequate intervention provides gains in motor performance. During preschool years, it is important to promote physical activity through the development of motor skills. Studies have shown that children with poorer motor skills are less active than children with better-developed motor skills (Fisher et al., 2005; Kambas et al., 2012; Williams et al., 2008). Therefore, because the development of motor skills among children may be an important predictor of later physical activity levels (Venetsanou & Kambas, 2017), it must be ensured that young children are encouraged from their early years to optimal development of their motor skills through structured play.

The present results showed a significant performance improvement in all balance post-tests that took place after the participation of the subjects in a 12-week daily training program. To the best of our knowledge, no study has investigated with the same experimental design the impact of a movement program on COP displacements of healthy preschool aged children, since balance performance in preschool children is usually assessed with standardized motor tests. A previous study of healthy children between the ages of 3 and 6 years, using computerized dynamic posturography, indicated that balance control is not completed by the age of six (Foudriat et al., 1993). However, closer examination of the literature on maturational processes of the postural control system during childhood, shows that the age of 7 years represents an important milestone in maturation of the postural control system because at that time adult balance strategies begin to appear (Riach & Hayes, 1987). Taking into account that children should achieve mature patterns of balance and motor skills by the age of seven years (Deli et al., 2006), their development through organized practice from the preschool years seems essential. Participation in a developmentally appropriate movement program that provides task variations and several opportunities to practice balance and motor skills, allows a child to build a repertoire of experiences.

There is evidence that young children are at greater risk of sustaining falls than healthy young adults, because their neuromuscular system is not fully developed, and many fundamental motor skills are still emerging (Williams et al., 2008). The results of our intervention program support the idea that a well-planned physical activity program contributes to the development of abilities that enable successful performance of motor and balance tasks. Therefore, attending appropriate preschool intervention programs which have the potential to counter intrinsic fall risk factors (e.g., deficits in balance and motor delays), and preschools with a reliable and opportunity- rich environment could support the better overall motor development of children.

In conclusion, improvements in motor and balance performance by preschool aged children who participated in the 12-week motor intervention program are apparent in the present study, providing further evidence that properly selected exercises can also produce additional positive benefits. Physical education classes may be an important first step in providing a rich, active environment for all children in preschools. It is therefore recommended that all preschools should be encouraged to include physical education lessons in their daily schedule.

References

Ageberg, E., Roberts, D., Holmstrom, E., & Friden, T. (2003). Balance in single-limb stance in healthy subjects - reliability of testing procedure and the effect of short-duration sub-maximal cycling. *BMC Musculoskeletal Disorder*, *4*, 14.

Bart, O., Hajami, D., & Bar-Haim, Y. (2007). Predicting school adjustment from motor abilities in kindergarten. *Infant and Child Development*, *16*(6), 597-615.

Clark, JE. (2005). From the beginning: a developmental perspective on movement and mobility. *Quest*, *57*, 37–45.

Clark, J.E. (2007). On the problem of motor skill development. *Journal of Physical Education, Recreation & Dance*, *78*(5), 39-44.

Clark, J. E., & Metcalfe, J. S. (2002). The mountain of motor development: A metaphor. *Motor development: Research and reviews*, *2*(163-190).

Deli, E., Bakle, I., & Zachopoulou, E. (2006). Implementing intervention movement programs for kindergarten children. *Journal of Early Childhood Research*, 4(1), 5-18.

Derri, V., Tsapakidou, A., Zachopoulou, E., & Kioumourtzoglou, E. (2001). Effect of a music and movement programme on development of locomotor skills by children 4 to 6 years of age. *European Journal of Physical Education*, *6*(1), 16-25.

Fisher, A., Reilly, J.J., Kelly, L.A., Montgomery, C., Williamson, A., Paton, J.Y., & Grant, S. (2005). Fundamental movement skills and habitual physical activity in young children. *Medicine and Science in Sports and Exercise, 37*, 684–688.

Foudriat, B.A., Di Fabio, R.P., & Anderson, J.H. (1993). Sensory organization of balance responses in children 3–6 years of age: A normative study with diagnostic implications. *International Journal of Pediatric Otorhinolaryngology, 27*, 255-271. Giagazoglou, P., Tsimaras, V., Fotiadou, E., Evaggelinou, C., Tsikoulas, J., & Angelopoulou, N. (2005). Standardization of the motor scales of the Griffiths Test II on children 3 to 6 years in Greece. *Child Care Health and Development*, *31*(3), 321-330.

Gallahue, D. L., Ozmun, J. C., & Goodway, J. D. (2011). *Understanding motor development: Infants, children, adolescents, adults.* New York, NY: McGraw-Hill.

Goodway, J. D. (2009). What's skill got to do with it? A developmental approach to promoting physical activity in urban youths. *Journal of Physical Education, Recreation & Dance*, *80*(8), 38-40.

Goodway, J.D. & Branta, C.F. (2003). Influence of a motor skill intervention on fundamental motor skill development of disadvantaged preschool children. *Research Quarterly for Exercise and Sport, 74*, 36–47.

Goodway, J.D., Crowe, H., & Ward, P. (2003). Effects of motor skill instruction on fundamental motor skill development. *Adapted Physical Activity Quarterly, 20*, 298–314.

Griffiths, R. (1984). *The abilities of young children. A comprehensive system of mental measurement for the first eight years of life*. The test agency Ltd, London; 1984.

Hanson, R. (1982). Item reliability for the Griffiths Scales of Mental Development. *Child Care Health and Development, 8*, 151–161.

Kambas, A., Fatouros, Y., Christoforidis, C., Venetsanou, F., Papageorgiou, P., Giannakidou, D., & Aggeloussis, N. (2010) The effects of Psychomotor Intervention, on Visual-Motor Control as a Graphomotor aspect in preschool age. *European Psychomotricity Journal*, 3(1), 54-61.

Kambas, A., Michalopoulou, M., Fatouros, I. G., Christoforidis, C., Manthou, E., Giannakidou, D., ... & Zimmer, R. (2012). The relationship between motor proficiency and pedometer-determined physical activity in young children. *Pediatric exercise science*, *24*(1), 34-44.

Lemos, A. G., Avigo, E. L., & Barela, J. A. (2012). Physical Education in Kindergarten Promotes Fundamental Motor Skill Development. *Advances in Physical Education*, *2*(1), 17–21.

Logan, S.W., Robinson, L.E., Wilson, A.E., & Lucas, W.A. (2012). Getting the fundamentals of movement: a meta-analysis of the effectiveness of motor skill interventions in children. *Child Care Health and Development*, *38*(3), 305-315.

Luiz, D.M., Foxcroft, C.D., & Stewart, R. (2001). The construct validity of the Griffiths scales of mental development. *Child Care Health and Development*, *27*(1), 73-83.

McPhillips, M. & Jordan-Black, J.A. (2007). The effect of social disadvantage on motor development in young children: a comparative study. *Journal of Child Psychology and Psychiatry, 48*, 1214–1222.

Piek, J.P., Dawson, L., Smith, L.M., & Gasson, N. (2008). The role of early fine and gross motor development on later motor and cognitive ability. *Human Movement Science, 27*(5), 668–681.

Piek, J.P., Hands, B., & Licari, M.K. (2012). Assessment of motor functioning in the preschool period. *Neuropsychology review*, *22*(4), 402-413.

Queiroz, D. D. R., Ré, A. H. N., Henrique, R. D. S., Moura, M. D. S., & Cattuzzo, M. T. (2014). Participation in sports practice and motor competence in preschoolers. *Motriz: Revista de Educação Física*, *20*(1), 26-32.

Riach, C.L. & Hayes, K.C. (1987). Maturation of postural sway in young children. *Developmental Medicine and Child Neurology, 29*, 650–658.

Robinson, L.E. & Goodway, J.D. (2009). Instructional climates in preschool children who are at-risk. Part I: object-control skill development. *Research Quarterly for Exercise and Sport, 80*, 533–542.

Robinson, L. E., Stodden, D. F., Barnett, L. M., Lopes, V. P., Logan, S. W., Rodrigues, L. P., & D'Hondt, E. (2015). Motor competence and its effect on positive developmental trajectories of health. *Sports Medicine*, *45*(9), 1273-1284.

Robinson, L. E., Wadsworth, D. D., & Peoples, C. M. (2012). Correlates of school-day physical activity in preschool students. *Research quarterly for exercise and sport*, *83*(1), 20-26.

Robinson, L. E., Webster, E. K., Logan, S. W., Lucas, W. A., & Barber, L. T. (2012). Teaching practices that promote motor skills in early childhood settings. *Early Childhood Education Journal*, *40*(2), 79-86.

Spanaki, E., Skordilis, E., & Venetsanou, F. (2010). The effect of a psychomotor program on the motor proficiency of early elementary school children. *Inquiries in Sport & Physical Education*, *8*(2), 132-141.

Taggart, A. & Keegan, L. (1997). Developing fundamental movement skills in outdoor settings. Three case studies of children playing. *ACHPER Healthy Lifestyles Journal*, *158*, 11–17.

Tremblay, L., Boudreau-Larivière, C., & Cimon-Lambert, K. (2012). Promoting physical activity in preschoolers: A review of the guidelines, barriers, and facilitators for implementation of policies and practices. *Canadian Psychology/Psychologie canadienne*, *53*(4), 280.

Valentini, N.C. & Rudisill, M.E. (2004). An inclusive mastery climate intervention and the motor skill development of children with and without disabilities. *Adapted Physical Activity Quarterly, 21*, 330–347.

Venetsanou, F. & Kambas, A. (2004). How can a traditional Greek dances programme affect the motor proficiency of pre-school children? *Research in Dance Education*, *5*(2), 127-138.

Venetsanou, F., & Kambas, A. (2017). Can Motor Proficiency in Preschool Age Affect Physical Activity in Adolescence?. *Pediatric exercise science*, *29*(2), 254-259.

Williams, HG., Pfeiffer, KA., O'Neill, JR., Dowda, M., McIver, KL., Brown, WH. & Pate, RR. (2008). Motor skill performance and physical activity in preschool children. *Obesity*, *16*, 1421-1426.

Zachopoulou, E., Tsapakidou, A., & Derri, V. (2004). The Effects of a Developmentally Appropriate Music and Movement Program on Motor Performance. *Early Childhood Research Quarterly*, *19*(4), 631-642.

Zask, A., Barnett, L. M., Rose, L., Brooks, L. O., Molyneux, M., Hughes, D., ... & Salmon, J. (2012). Three year follow-up of an early childhood intervention: is movement skill sustained?. *International Journal of Behavioral Nutrition and Physical Activity*, *9*(1), 127.

Zimmer, R., Christoforidis, C., Xanthi, P., Aggeloussis, N., & Kambas, A. (2008). The effects of a psychomotor training program on motor proficiency of Greek preschoolers. *European Psychomotricity Journal, 1(2)*, 3-9.