EUROPEAN PSYCHOMOTRICITY JOURNAL

http://www.psychomotor.gr/epj.htm

ISSN 1791-3837
European Psychomotricity Journal 2008; 1; 2, 54-60
Published by: Athlotypo Sports Publishing
http://www.athlotypo.gr/

On behalf of:
Scientific Psychomotor Association Hellas

ORIGINAL ARTICLE

Effects of the characteristics of two different preschool-type setting on children's gross motor development

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Abstract
Many young children spent a major part of their day in formal preschool type-setting. The purpose of this study was to determine if gross motor development of preschool children is affected by preschool-type setting (public vs private). The sample consisted of 300 preschool children of both sexes (136 boys and 164 girls) aged 4-6 years who were enrolled at the two different types of preschool centers of Northern Greece. Half of the children (n=150) attended private preschool centers which had plenty of open space for playing, gymnasia, courts and playgrounds and included daily exercise physical activity programs. The rest (n=150) participated in formal public preschool centers that had limited spaces for sports and free play and did not include any physical education lessons into their schedule. The gross motor development of the children was assessed using the locomotor scale of the Griffiths test No II (Griffiths, 1984). The analysis of variance showed that children who attended the private preschool type-setting displayed higher quotients and could execute at a younger age every item of the locomotor scale. The results of the present study suggest that gross motor development of preschool aged children is affected by the stimulation level of school environment.

Key words: *preschool type-setting, Griffiths test, physical activity programs, preschool aged children, gross motor development*

Introduction

The process of growth and development occurs according to the rhythm that is established by genetic inheritance and environmental factors. Although the stages of psychomotor development are the same for all children worldwide, there are significant differences in development rate due to the special characteristics of the environment in which every child is growing (Barros, Fragoso, Oliveira, Cabral - Filho, & Castro, 2003; Brooks-Gunn, Klebanov, & Duncan, 1997; Giagazoglou, Kyparos, Fotiadou, Angelopoulou, 2007; Griffiths, 1984; Huston, McLoyd, & Garcia - Coll, 1994).

The preschool years are critical for children's motor development. In this early period, the children's permanence in an encouraging environment and their participation in motor activities could facilitate a normal development and offer possibilities to a larger potential of exploration and interaction (Gallahue & Ozmun, 1998). Physical education lessons are an ideal setting to improve child motor skills and increase physical activity for optimal health (vanBeurden, Barnett, Soc et al., 2003).

Many young children spent a major part of their day in formal preschool type-setting. The characteristics and the services provided on these settings might have great influence on children's development. School policies and practices directed toward providing preschool-aged children with physical activity, have the potential to influence greatly the overall physical activity levels of young children (Dowda, Pate, Trost, Almeida, & Sirard, 2004; Pate, Pfeiffer, Trost, Ziegler, & Dowda, 2004).

Childcare centers with supportive environment present an ideal opportunity to promote physical activity and help in the early development of healthy behaviors. The environment of the preschools centers is characterized by policies and practices regarding group sizes, physical spaces, use of time, etc (Cryer & Phillipsen, 1997). Unfortunately, the majority of the formal preschools in Greece are characterized by limited play areas, narrow buildings and large number of students in the classes. Additionally, although it is known that physical education programs, based on appropriate practices, should be an essential part of early childhood education, none of the formal, public schools includes them into their daily schedule.

On the contrary, private preschools in Greece, due to the high market competition, should offer high quality policies and practices in order to attract more children. Thus, almost every private preschool center provides daily physical activities, plenty of playground equipment and spacious indoors and outdoors areas. To our knowledge, no other research has examined the ways that the two different preschool-type settings (public and private) may affect the motor development of preschool children. Therefore, the purpose of this study was to determine if gross motor development of preschool children is affected by preschool-type setting (public vs private).

Methods

Type of Preschools

Each preschool was categorized by type (public and private). Preschools were randomly selected from the two types and invited to participate into the study. Eight preschools (four of each type) were enrolled into the study. Private preschool centers provided more supportive environment including active opportunities, portable and fixed play equipment, much more of open space for playing, gymnasia, courts and playgrounds with climbing apparatus (e.g. monkey bars, slides, swings). They also included sports activities (mini tennis, gymnastics, soccer) and 60 min of structured physical activities lessons into their daily preschool schedule. Contrarily, the formal public preschools were located in small buildings and had limited spaces for free play. Additionally, they spent the greater part of their school time in indoor play facilities that were included in the curriculum of a formal public preschool center in Greece and did not include any organized physical education lessons into their schedule.

Participants

All participants were enrolled at the two different types of preschool centers of Northern Greece. Three hundred preschool children of both sexes (136 boys and 164 girls) aged 4-6 years (Mean age= 57±9 months), participated in this study. Half of the children (n=150) attended public preschool centers, while the rest attended (n=150) private preschools. The children from private preschools participated in sport activities provided inside their schools, while none of the children from public school participated in any organized sport activity. All children spent at least five hours per day, five days per week at the preschool. Children with a history of perinatal problems, neurological diseases, sensory disturbances, premature children and children with epilepsy or other chronic diseases were excluded from the study. The parents were all informed about the procedures and gave informed consent for their children to participate.

Procedure

Gross motor development of the children was assessed using the Locomotor scale of the Griffiths test No II (Griffiths, 1984) which is standardized in Greek preschool children (Giagazoglou, Tsimaras, Fotiadou, Evaggelinou, Tsikoulas & Angelopoulou, 2005). The Griffiths scales are an internationally acknowledged and reliable method for the assessment of psychomotor development, consisting of six scales with strong developmental emphasis (Holt, 1991). The scales are designed to ascertain the level of psychomotor development of babies and young children from birth into early school life. In the first 2 years (Griffiths I) there are five different areas of ability, Locomotor (Subscale A), Personal- Social (Subscale B), Hearing and Speech (Subscale C), Eye-Hand coordination (Subscale D) and Performance (Subscale E). The Practical Reasoning Scale (Subscale F) is added for the years 3-8 inclusive (Griffiths II). The major advantage of the Scales is that every sub-scale gives a different developmental quotient and provides a clear diagnostic indication of individual problems in early childhood (Griffiths, 1984).

Griffiths (1984) states 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. Also, the Locomotor Scale can be used to supplement observation in studies of physical activities and development in both normal and physically handicapped children" (Griffiths 1984, p.p. 34-35).

Scale A (locomotor) consists of items related to gross motor skills such as running, jumping, throwing or kicking a ball and riding a bicycle. Scale A provides a basis for objective observation and a first impression of the general maturity of a young child.

A child's performance on the test expressed as a quotient, helps the examiner evaluate the development of the subject. The test scores are transformed into Developmental Ages (D.A) and then into Quotients: Developmental Quotient (D.Q) = Developmental Age x 100 / Chronological Age (C.A). The total number of test items is 36 in each scale and are placed in strict order of difficulty. There are six items for each year. Each item within each subscale carries two months of Developmental age credits (see Table 1). Thus, the number of items passed is multiplied by two. These results are always added with the number 24 which is a standard number for all children and the total number gives the Developmental Age credits in months. For example, if a 4 years old child (C.A= 48 months) passes 10 of the 36 items of the locomotor subscale, his/her D.A will be (14 x 2) +24 = 52 credits in months. Therefore his D.Q will be 52 x 100 (D.A x 100) / 48 (C.A) =108.

All children were individually tested by the same investigator in their schools. Certain information such as "if a child can ride a tricycle or other pedal toy" was elicited from the child or the mother by careful questioning. All the items of the locomotor scale were presented in the recommended order given by Griffiths (1984). It is usual to begin somewhat below the child's actual age and work on until he/she can pass no further items. Six failures in succession are usually enough to give the child full opportunity to do all he can (Griffiths, 1984, p.p 40).

Experimental design and statistical analysis

Data were presented as means ± SD. A 2x 2 Analysis of Variance was utilized to determine the effect of school attendance (public versus private), gender (boys

versus girls) or school attendance versus gender interaction. Furthermore, the estimates of effect size were calculated. The level of statistical significance was set at $p < .05$.

Results

The 2 way Analysis of Variance on mean Developmental Quotients on locomotor Subscale indicated a significant main effect of school ($F_{1, 296} = 74.34$; $p < 0.01$; $\eta^2 = 0.201$) but not significant effects of gender ($F_{1, 296} = 1.78$; $p > 0.05$) and school x gender interaction ($F_{1, 296} = 0.86$; $p > 0.05$)**.** The Mean scores for Developmental Quotient on Locomotor Scale was higher in private preschools (M=128, SD=20) compared to scores in public preschools (M=111, SD=13). The Mean values for Developmental Quotients across different preschool type setting are shown in Figure 1.

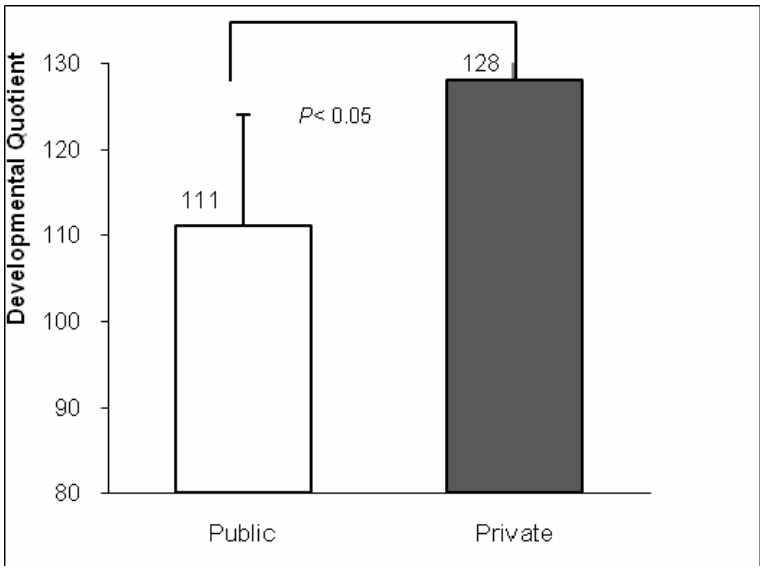

Figure 1. Mean developmental Quotients on Locomotor Scale for main effect of school attendance

Table 1 presents the 36 items of the locomotor subscale. The descriptive statistics have shown that the number of children who succeeded in 26 out of the 36 items was greater in children from private preschools compared to children from public preschools. In the remaining 10 items the number of children who succeeded was identical between those from private and public preschools.

Table 1. Number of children who passed every item from public and private schools

	Items of Locomotor scale		Public	Private
	Year III		**N**	**N**
1	Jumps off step: both feet together	III 1	146	147
2	Can stand on one foot (6 plus secs.)	III 2	150	150
3	Rises from kneeling	III 3	150	150
4	Crosses feet and knees sitting	III 4	150	150
5	Can stand and walk on tiptoe	III 5	149	150
6	Walks upstairs one foot on each step	III 6	148	148
	Year IV			
7	Can run fast indoors	IV 1	146	149
8	Can run a tricycle	IV 2	147	147
9	Marches to music	IV 3	141	141
10	Walks a chalk line	IV 4	143	148
11	Hops on one foot	IV 5	119	126
12	Jumps off two steps	IV 6	132	135
	Year V			
13	Can run to kick a ball	V 1	131	137
14	Walks downstairs 1 foot on each step	V 2	126	126
15	Touches toes knees straight	V 3	102	141
16	Can jump 6 inches rope feet together	V 4	114	129
17	Can climb on or off a bus	V 5	117	126
18	Can run upstairs	V 6	92	115
	Year VI			
19	Can bounce and catch a ball	VI 1	91	113
20	Can run fast out of doors	VI 2	94	103
21	Can throw up and catch a ball	VI 3	49	89
22	Can hop-skip 4 plus steps	VI 4	60	69
23	Jumps off three steps	VI 5	67	71
24	Hopscotch I	VI 6	43	78
	Year VII			
25	Can jump over a rope 10 inches	VII 1	60	85
26	Hop-skips freely indoors	VII 2	17	27
27	Hopscotch II (2 hopes)	VII 3	18	54
28	Can run all round playground	VII 4	39	82
29	Can skip with rope 3 plus	VII 5	3	14
30	Hopscotch III (3 hops)	VII 6	7	45
	Year VIII			
31	Runs downstairs	VIII 1	21	42
32	Jumps off 4 plus steps	VIII 2	10	20
33	Rides a bicycle (2-wheeler)	VIII 3	22	22
34	Hopscotch IV (4 hops)	VIII 4	3	32
35	Fast single Skipping	VIII 5	1	1
36	Skips well 12 plus (ordinary skipping)	VIII 6	1	1

Discussion

The aim of the present study was to determine if gross motor development of preschool children is affected by preschool-type setting (public vs private). The results suggest that the private preschool type-setting which provided a supportive environment including active opportunities, plenty of play equipment, open spaces and daily physical training and education had as a result children from private preschools to display higher Mean Developmental Quotients and to execute at a younger age every item of the locomotor subscale. However, it should be mentioned that we detected only a low-moderate effect size ($\eta^2 = 0.201$). Consistent with previous work, our findings suggest that when opportunities for practice, encouragement and instruction are provided, children expand their motor skills (Burchinal, Campbell, Bryant, Wasik, & Ramey, 1997; Cleland & Gallahue, 1993). Additionally, recent studies reported that preschool children's motor development is

positively related with the participation in vigorous activity (Fisher, Reilly, Kelly et al., 2005) and in organized sports (Ulrich, 2004).

On the contrary, the poor training on structured physical activities in conjunction with less stimulated environment (narrow classes, large group size, limited play areas), may probably contributed to the delay found in the locomotor of children who attended public preschools. Informal observation inside the public preschools indicated that children spent most of their day sitting, occupying with indoor activities like drawing, cutting with scissors etc. It is important schools to provide plenty opportunities for children to be active. Children who attended public schools had access to fewer active toys. Climbing apparatus (e.g. monkey bars, slides, swings), are the most expensive of the activity promoting toys and not all schools can afford this type of equipment (McKenzie, Sallis, Nader, Broyles, & Nelson, 1992). Our findings suggest that gross motor development of preschool aged children is associated with the stimulation level of school environment.

The private preschool centers, offered a sufficient infrastructure, appropriate equipment and care that gave their children better chances for the development of their motor skills. McKenzie et al. (1992) suggests that with proper direction and instruction, equipment can be used to teach children to be active, increase fitness and develop appropriate motor skills.

Another factor that probably exerted a strong influence on motor development of preschool-aged children, who attended private preschools, was the type of the provided exercise programs. Daily lessons with at least 60 min of varied, structured, motor and sport activities were included in the schedule of private preschools. These results are consistent with previous studies which suggested that preschools providing their children with adequate physical activity may influence the activity levels of their children (Finn, et al. 2002; Pate, et al. 2004). Besides, it has been recommended that preschool children should accumulate at least 60 min of daily structured physical activity. To meet the recommended 60 min of daily physical activity, structured activity sessions should be included into the daily preschool schedule and should emphasize a wide variety of movement experiences (National Association for Sport and Physical Education, 2002; American Academy of Pediatrics, 2001).

In summary, the results of the present study suggest that one environmental variable that clearly affects motor performance is schooling. Attending appropriate preschool intervention programs and preschools with a reliable and opportunity- rich environment could support the better gross motor development. Preschools have the responsibility for developing appropriate physical educational programs, providing proper activities and designing suitable school playgrounds. Physical educational support 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.

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ISSN 1791-3837