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ORIGINAL ARTICLE

The effects of a psychomotor training program on motor proficiency of Greek preschoolers

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Abstract

Psychomotor Training (PT) in preschoolers focuses mainly on handling problematic cases and their perceptual-motor development. The aim of the current research is the study of Psychomotor Training (PT) effectiveness on motor proficiency of preschool aged children in Greece. A PT approach, based on basic principles of Psychomotor Education, was applied on a group of preschoolers (n=233) aged 59.75±6.45 months, while a control group (n=212) of similar aged children followed the typical education programme of the public Kindergarten but not the PT programme. Motor proficiency in both groups was evaluated by the MOT (Motoriktest für vier-bis sechsjährige Kinder) 4-6 test battery (6 criterion measurements) at the beginning and in the end of the PT programme. The results indicated that there was a significant interaction between the PT programme and the group factor ($F_{1,419}=573.8$, $p<.001$, $\eta^2=.991$), while post-hoc comparisons revealed that both the experimental ($p<.001$) and the control group ($p<.05$) were significantly improved at the end of the training intervention. A significant interaction was noticed between the group and the age factor ($F_{3,419}=124.3$, $p<.001$, $\eta^2=.586$) while post-hoc comparisons revealed that motor proficiency improvement in the experimental group was significantly greater ($p<.001$) than that noticed in the control group independent of age. It was also found that four-yr-old children demonstrated the most significant motor proficiency improvement after the implementation of PT compared to other three age groups in the experimental group. Conversely, there was no age effect in the control group concerning motor proficiency improvement. Finally, a significant interaction was found between measurements and age. Post-hoc comparisons revealed a significant improvement in all measurements of motor proficiency with the exception the the comparison between second and third and between fourth and fifth. The results of the present study indicate the significance of PT programs in improving Motor Proficiency in preschoolers.

Key words: Psychomotricity, Intervention, Kindergarten

Introduction

Psychomotor Training (PT) is widely used during pre-school age to handle developmental disorders that might lead to future school failure during primary school education (Kiphard, 1994). Psychomotor Training focuses on three areas of performance: gross motor and ball skills training based on the principles of Kiphard (1994) and Gallahue (1998) and body awareness training based on Sherborne's work (1990).

The PT design in pre-school aged children must take into account both their developmental characteristics and their individual personality characteristics (Zimmer & Cicurs, 1993). According to Lorenz and Stein (1988), PT must meet six important principles: a) appropriateness of the exercise protocol, b) programme suppleness, c) self-determination, d) use of previous experience, e) decision right, and f) independent action.

The PT must be preceded by an initial evaluation of children's' motor proficiency. Motor proficiency evaluation helps to determine the individual abilities of each child regarding his adaptation to the demands of PT leading eventually to

specific modifications of the PT parameters while the benefits of the intervention programme will be enhanced. In addition, PT conditions must ensure improvement of children's self-esteem and self-confidence through positive motivation (Zimmer & Cicurs, 1993; Zimmer, 2006).

In Miyahara's meta-analysis (1996) the effectiveness of interventions is supported by numerous authors, mainly when data are being compared with non treatment. A PT, it is considered as the most appropriate educational method for the preschool age (Volkamer & Zimmer, 1986; Zimmer, 2006; Zimmer & Cicurs, 1993). Its main advantages include the improvement of each child's motor proficiency (Eggert, 1995; Zimmer, 1991) respecting the individual characteristics as well as the fulfillment of voluntary children participation in the program. Finally, PT aims at improving children's self-efficacy (Zimmer, 1991; 2006) and motivation (Beckmann & Beckman, 1980; Johannknecht & Luetje, 1990a, b). Additionally, Rintala et al. (1998) found that PT improves motor proficiency more than Regular Physical Education programs in children with Developmental Language Disorders.

Although PT is totally recognized in most European Countries its application in Greek kindergartens is limited. The purpose of the present study is the investigation of Psychomotor Training (PT) effectiveness on motor proficiency of preschool aged children in Greece.

Methods

Participants

The sample of the study involved 220 girls and 215 boys aged between 48 and 72 months (Mean=59.46, SD=±6.63 months). All children were pupils in public Kindergartens in the area of Thrace in northeastern Greece, without an identified neurological sensory or motor problem and were selected through stratified sampling procedures. The total sample was divided into two groups: a) the experimental group involving 116 girls and 107 boys (Mean=59.82, SD=±6.41 months), and b) the control group involving 114 girls and 98 boys (M=58.31, SD=±7.19 months). Each group involved the same number of children from each of the four age groups (children between 48 and 53, between 54 and 59, between 60 and 65 and children between 66 and 71 months) according to the manual of MOT 4-6 (Zimmer & Volkamer, 1987).

Measurements and data collection

The "Motoriktest für vier-bis sechsjährige Kinder" (MOT 4-6) test battery was used for the measurement of the children's motor proficiency (Zimmer & Volkamer, 1987). This battery included the following 18 tests:

1. Jumping in and out of a horizontal hoop
2. Toe-to-heel walking in forward direction
3. Making dots on paper with pencil (tapping)
4. Picking up a handkerchief using the toes (twice: preferred, non-preferred leg)
5. Jumping repeatedly sideways across a rope.
6. Catching a dropped stick
7. Carry of balls into a box
8. Toe-to-heel walking in backward direction
9. Overhead toss for accuracy

10. Picking up matches and putting in box
11. Step through a vertical hoop (twice)
12. One-legged jump into a hoop (twice: preferred leg, non-preferred leg)
13. Catch a rubber-ring (twice)
14. A stride jumping with rebound with arm clapping above head (jumping 10 sec.)
15. Standing jump over a rope
16. Body rolling along vertical axis (twice: back-front-back, front-back-front)
17. Raise-sitting with a ball from squat position
18. Jumping in and out of a horizontal hoop while making successive 90 degrees turns (twice).

Each test, except from the first one, was assigned a score of either 0, 1 or 2 (maximum). The first test was used only as a «warm up». Then, the individual test scores were added and the total test battery score was calculated, with 34 being the maximum score (Zimmer & Volkamer, 1987). The experimental group participated in a PT program in addition to the typical program of the public Kindergarten that excludes organized psychomotor activities. The control group followed only the typical education program of the public Kindergarten. Measurements were undertaken at the beginning, and at the end of the school year.

The class teacher of the experimental group was a specialized physical educator, who wasn't participated in the experimental protocol. Data were collected by a qualified, for the MOT 4-6 test battery, member of the research staff.

Components of the PT program

The PT program was carried out four times per week for 45 minutes each time. The goals of the specific program, based at the concept of Gallagher and Ozmun, (1998), concern the perceptual-motor development parameters (body awareness, space awareness, directional awareness and temporal awareness) as well as Hirtz's concept (Hirtz, 1985) of coordination variables (space and time orientation, ability of kinesthetical differentiation, response ability, rhythmic ability and static & dynamic balance). The program also aimed at the development of specific motor skills (gallop, hop, jump, strike, bounce, catch, kick and throw). In addition, the psychomotor approach proposed by Zimmer (2006) was the main methodological tool for the application of the PT. This approach emphasized in three directions: body, social and material experiences.

The first 5-10 minutes of each session focused on the connection of the team through static oral and touch ground activities. The main part of the session involved the primary PT activities (about 25-30 min). The last part was used for relaxation purposes (5-8 min).

Experimental design and statistical analyses

A 2x4x2x2 (measurement x gender x age x group) MANOVA with repeated measures on the first factor was applied to the data to test pre- and post-PT score differences, between the experimental and the control group (factor "group"), among boys and girls of four different age groups (66-71, 60-65, 54-59 and 48-53 months). The dependent variable of the current research were children's performance at MOT 4-6. Post hoc comparisons were made using the Scheffè's test (Scheffè, 1959). The level of significance was set to $p < .005$.

Results

Table 1 shows means and standard deviations of the dependent variable in pre- & post-PT measurements, for each age group and gender, both for the experimental and the control group.

Table 1. Means (M) and standard deviations (SD) of the performance on MOT 4-6 of the sample at pre-post measures

Measure	group	Experimental				control			
	Age (Months)	48-53	54-59	60-65	66-71	48-53	54-59	60-65	66-71
Pre	sex	M±SD	M±SD	M±SD	M±SD	M±SD	M±SD	M±SD	M±SD
	♂	9.6±3.6	14.7±5.4	16.8±4.3	19.3±4.8	9.5±3.6	14.9±5.2	16.5±4.2	19.5±4.6
Post	♀	11.7±4	13.7±4	17.2±4.5	17.9±4.8	11.7±4	13.7±4	17.2±4.4	18.1±4.8
	♂	12.7±3.6	17.9±5.4	19.9±4.3	26.4±4.1	10.5±3.5	15.9±5.2	17.5±4.3	20.6±4.7
	♀	15±3.9	16.9±4	20.4±4.5	25.7±4.6	12.8±3.9	14.8±4	18.2±4.4	19.2±4.9

The results revealed no statistically significant differences between the experimental and the control group in the pre-intervention scores ($F_{1,433} = 4.215$, $p > 0.05$). As far as the interactions among variables are concerned, the results revealed no statistically significant interactions among gender, age, group and measurement ($F = 2.83$, $p = .38$). However, statistically significant interactions were found among group, measurement and age ($F = 399.3$, $p < .001$), as well as between measurement and age ($F = 408.1$, $p < .001$). Measurement had a statistically significant main effect ($F_{1,3} = 10.2$, $p < .001$) in the “group” factor, showing that the experimental group was significantly improved, compared to the control group ($MD = 3.18$, $P < .001$) between the two measurements.

The main effect of the “age” factor in the “measurement” factor was also significant ($F_{3,3} = 112.1$, $p < .001$). Scheffè’s comparisons revealed that in the pre-PT measurement the children aged 66-71 months had better performances than children between 48-53 ($MD = 8.05$, $p < .001$) and between 54-59 ($MD = 4.42$, $p < .001$). Moreover, children between 60-65 had better performances than children between 48-53 ($MD = 6.28$, $p < .001$) and between 54-59 ($MD = 2.65$, $p < .001$). Finally, the age group 54-59 had better performances than the group 48-53 ($MD = 3.64$, $p < .001$). In the post-PT measurement the post-hoc comparisons showed that the group of children aged 66-71 months had better performances than the groups 48-53 ($MD = 10.21$, $p < .001$), 54-59 ($MD = 6.6$, $p < .001$) and 60-65 ($MD = 3.94$, $p < .001$). In addition, the age group 60-65 had better performances than groups 48-53 ($MD = 6.27$, $p < .001$) and 54-59 ($MD = 2.65$, $p < .001$). Finally, the group 54-59 had better performances than the group 48-53 ($MD = 3.62$, $p < .001$). The performances of the different age groups in the pre- and post-PT measurements are presented in Figure 1.

Finally, a significant interaction was also found between the “group” and “age” factors ($F_{3,419} = 124.3$, $p < 0.001$). Post-hoc comparisons revealed that motor proficiency improvement in the experimental group was significantly greater than that of the control group independent from age. Moreover, four-year-old children demonstrated the most significant improvement of motor proficiency scores after the PT application relatively to the other age groups of the experimental group.

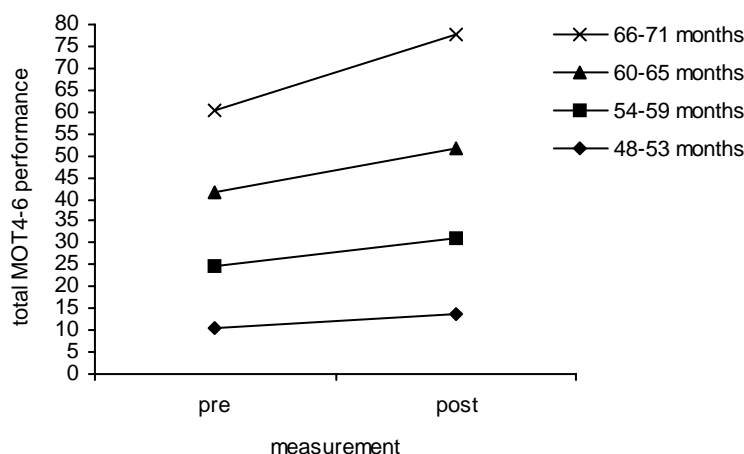


Figure 1. Motor proficiency changes in the experimental group

In contrast, no significant differences were found among the four age groups of the control group regarding their motor proficiency improvement.

Discussion

Results of the present study indicate that there is no significant variation on the variables examined between boys and girls within different age groups during the preschool period. Previous studies support the notion that at early childhood there is no significant effect of sex in motor-proficiency oriented tests (Eggert, 1971; Hirtz, 1985; Winter, 1987; Zimmer & Volkamer, 1987). Hirtz (1985) reports that some significant differences arise between boys and girls, on specific skills, but at a later stage of childhood. In contrast, Kambas et al (2001) have traced differences during preschool years in space orientation and time in favor of the boys and in rhythmic ability in favor of the girls. In agreement with the work of Kambas et al (2001), Schneider (1993), who used the MOT 4-6 test battery to evaluate motor proficiency, found that girls demonstrated a significantly better performance than boys. The sample of the previous mentioned study, did not participate in some intervention program and it was consisted of 200 children of 4-6 years of age who were measured three times within a three year period (at the age of 4, 5, and 6).

It has also been reported that performance in MOT 4-6 test battery is differentiated within various stages of the preschool period. Zimmer and Volkamer (1987), noticed significant differences between various age stages similar to those used in the present study during the validation of the MOT 4-6 testing battery. Moreover, in Schneider's study (1993) mentioned above, older children exhibited a better performance compared to younger children in all tests. In addition, Toriola and Igbokwe (1986) while studying the effects of sex and age on motor proficiency of preschoolers in Nigeria they noticed that in the majority of measurements older children scored higher than the younger ones. Nevertheless, it is widely accepted that childhood is characterized by an abrupt development leading to substantial differences between children in motor proficiency status from year to year (Bruininks, 1978; Winter, 1992). This is probably due to the plasticity of various neurological processes which are largely affected by motor activity (Demeter, 1981; Pickenhain, 1979).

Training intervention is considered as the most important factor which may influence motor development (Roth & Winter, 1994; Winter, 1992). Results from the present study confirm this notion as well as, at least in part, the theory of a linear improvement of motor abilities during childhood reported by Roth and Winter (1994). The effects of a PT program are confirmed by the results of previous investigations as well (Aggelousis et al, 1999; Schuck & Adden, 1972; Zimmer, 1991).

The specific characteristics of PT program make it more attractive to the children because: 1) they decide for the type and the way of the daily motor activities and 2) program's flexibility respects the individual characteristics of the children. Moreover, the fact that its effectiveness, as it is proved by the current research makes it appropriate for pre-school aged children. Finally, the focalization of the PT program in self-esteem, self-confidence and self-efficacy makes it more preferable in relation to other methodological approaches.

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