PSYCHOMOTOR TRAINING ON COGNITIVE AND MOTOR SKILLS OF KINDERGARTEN DEAF STUDENTS

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Abstract
The purpose of this study was to examine the effect of a psychomotor training program, enriched with theatrical play, upon the cognitive and motor skills of Greek deaf and hard of hearing kindergarten students.The participants were 13 students, from two special kindergarten schools for deaf in Athens. The BOTMP - SF (Bruininks, 1978) was used to assess the motor skills and the ATHENA test (Paraskevopoulos & Paraskevopoulou, 2011) to assess cognitive abilities.Through random selection, the students served in the experimental - EG (N= 7) (1st school) and control - CG (N = 6) groups (2nd school). A 10 week intervention program was designed based on the psychomotor development with theatrical play and was carried out twice a week for the experimental group, according to the adaptation theory (Hutzler, 2007). Separate 2 X 2 ANOVAs, with t-parameter estimates for post hoc comparisons revealed a significant interaction effect with respect to the 'total motor skills', ‘upper limb coordination’ and the ‘visual motor control’ scores. The participants in the EG had a higher post test mean score compared to the CG, while no significant group differences were evident at pre testing. With respect to cognitive abilities, the results were significant for ‘picture memorization’, ‘distinction of graphs’ and ‘visual motor control’. Once again, the EG scored higher from the CG in post testing, while no differences between groups were evident at pre testing. The results have implications for curriculum design and teaching deaf and hard of hearing kindergarten students, and for preparing teachers to work in similar schools.

Key words: psychomotor training program, theatrical play, cognitive and motor skills, kindergarten students, deaf, adaptation theory.

INTRODUCTION

The motor and cognitive skills of deaf and hard of hearing (D/HH) students have been examined in the past. The effect however of psychomotor training programs upon their motor (Effgen, 1981; Lewis, Higham & Cherry, 1985; Rine et al, 2004; Shah, Rao, Malawade & Khatri, 2013) and cognitive (Calderon, 2000; Yoshinaga – Itano, 2003; Fotiadis, Fotiadou & Sidiropoulou, 2005) skills, has not been reported in depth yet. The few studies retrieved from the literature review are presented accordingly.

Rine et al. (2004) studied a twelve week program on motor development of 25 children, 3- 8½ years old. The experimental group (EG) participated in a psychomotor training program consisting of compensatory exercises, emphasizing on visual- motor control and balance, whereas the control group (CG) participated in a placebo program. The results revealed significant improvement in the EG compared to the CG, with respect to the sensory integrative postural control and inhibition of the motor developmental delays. Lewis, Higham and Cherry (1985) found a significant improvement in the static and dynamic balance of eleven children, 6 to 10 years old, who participated in a six week training program, compared to the control group.

Effgen (1981) on the other hand reached to an opposite conclusion after ten days of static balance training with 49 deaf children, 7-11 years old. Although the results were not significant, Effgen suggested that the psychomotor programs may be used to enhance the motor skills in general and the balance of deaf children. Shah, Rao, Malawade and Khatri (2013) claimed that motor development is linked to the cause of the deafness. They selected a group of 6-12 years old children with sensorineural hearing loss and examined the effect of a psychomotor training program on their gross motor development and postural control. The program included several activities to promote visual- motor control, balance, eye - hand coordination and general coordination. Shah et al (2013) found a significant effect in the intervention group which may be useful for researchers and practitioners seeking ways to improve the gross motor skills or postural control of deaf children.

With respect to the effect of psychomotor programs upon cognitive skills, very few studies were found. According to Katz and Schery (2006), in order to support deaf students, several elements need to be known; the nature of the disorder and its impact on language skills, the range of communication skills, general strategies for daily support in the school system, and the role of the special educator as a member of the intervention group. Katz and Schery (2006), stated furthermore, that if the early intervention programs do not take under consideration the above elements, they may not guarantee a positive effect upon the cognitive and language skills of deaf students. Calderon and Naidu (2000) and Yoshinaga - Itano (2000) on the other hand argued that all deaf children who received early education exhibited higher communication and cognitive skills compared to children who did not.

According to Sarris (2000), students use physical expression (gestures, facial expressions) to communicate. He found that the psychoeducational intervention with elements of theatrical play was effective primarily through psychomotor therapy, which aimed to help the deaf child to build the body shape and realize a real reference point in space. Calderon (2000) studied the combined effect of parents and teachers upon the cognitive skills of their children/ students. The researchers found that the parental participation in school programs was a significant factor for the language development and the early reading ability of their deaf children.

In 1970, a thirty years research began (Colorado Home Intervention Program - CHIP), offering intervention services to families with deaf children. The interventions began almost after the diagnosis of hearing loss (Yoshinaga – Itano, 2003). Teacher ratings were used for the estimation of language development, sign language and cognitive development. The researchers stated that the families were supported to make decisions based on objective criteria, followed the intervention strategies designed in accordance with the experts and managed to improve the communication skills of their children (compared to groups with similar sensory problems who did not follow the intervention (Yoshinaga – Itano, 2003).

According to Auxter, Pyfer and Huetting (1997) and Lampropoulou (1989), a combination of different communication modes must be followed to design a successful intervention program, named sign language, lip reading, tactile sign language and oral speech with visual and written stimulus. The researchers claimed that it is important not to ignore the language used in the student's school environment. The instructions given to children in an intervention program should be clear, primarily with sequence of movements and actions, extensive reasoning should be avoided, while verification after the instructions must be followed.

In Greece, Fotiadis, Fotiadou and Sidiropoulou (2005) claimed that physical education may improve the motor skills of deaf children, and offers a positive outlet for their social integration. Through participation in popular games and sports, students are developing the necessary motor skills, socialize, and enhance their self-esteem and self-efficacy. Furthermore, the role of physical activities and the participation in sports is an essential element of the curricula for deaf and hard of hearing students (Lambropoulou, 2004). Therefore, the purpose of the present study

is a first attempt to examine the effect of an organized psychomotor training program, enriched with theatrical play, on the cognitive and motor skills of Greek kindergarten deaf and hard of hearing students.

METHOD

Participants

Thirteen D/HH children from two different special schools of Athens participated in the study. The children in one school, served as the experimental group - EG (N= 7) and the students from the other school was the control group - CG (N = 6) (Thomas & Nelson, 2003). The experimental group participated in a psychomotor intervention program with elements of theatrical play. The intervention was administrated twice a week, for a period of ten weeks. Motor and cognitive testing was completed during pre- and post- intervention, for both groups. The psychomotor program was based on the Greek curriculum (Lambropoulou, 2004) with adaptations according to the individualized educational needs of the students (Hutzler, 2007), and incorporated the fundamentals of Zimmer's psychomotor training (2007) and elements of theatrical play (Kouretzis, 1991). The control group followed the daily schedule of kindergarten special schools.

Measures

The motor assessment of students was held with the Bruininks- Oseretsky Test of Motor Proficiency -Short Form (BOTMP - SF) (Bruininks, 1978). It has been designed to evaluate children aging 4½ - 14½ years and provides information to teachers, clinical psychologists and researchers with respect to the: a) motor skills, b) development and success of educational programs and c) motor and developmental disorders (Kambas, Aggeloussis, Proviadaki, Mavromatis & Taxildaris, 2004). The BOTMP- SF requires 15 minutes to administer and incorporates 14 items classified under 8 motor areas: 1) running speed and agility, 2) balance - static and dynamic assessment, 3) bilateral coordination, 4) strength - standing broad jump, 5) upper-limb coordination - catching a tossed ball with both hands and throwing a ball at a target with preferred hand, 6) response speed, 7) visual- motor control - drawing a line through a straight path, copying a circle with preferred hand and copying overlapping pencils with preferred hand, and 8) upper- limb speed and dexterity - sorting shape cards and making dots in circles. It is considered the most recognized package for the assessment of motor proficiency since it estimates important developmental skills (Wilson, Kaplan, Crawford & Dewey, 2000).

The ATHENA test was used to assess the cognitive skills of the participants (Paraskevopoulos & Paraskevopoulou, 2011). The test incorporates fourteen individualized diagnostic items evaluating the perceptual, cognitive, and psychomotor processes. It is considered a diagnostic tool of learning difficulties and evaluates necessary developmental elements for school learning and adaptation (Paraskevopoulos, Kalantzi-Azizi & Giannitsas, 1999). For the purposes of the present study, the participants were assessed in six items: 'language proportions ',' vocabulary ',' images memorization ',' number memorization ',' distinction of graphs', and 'visual -motor control' . Papanis et al. (2009) stated that the ATHENA is a multidisciplinary test of intra-individual assessment and offers a comprehensive view for critical developmental areas. It identifies areas where the students are lacking, areas that inhibit their ability to respond to the learning requirements, and supports the teaching - therapeutic intervention for students with and without disabilities.

Statistical Analysis

Separate 2 X 2 factorial ANOVAs evaluated the interaction effect between experimental condition (EG vs CG) and time (pre and post testing), with respect to

the motor and cognitive skills of deaf and hard of hearing kindergarten students. The t-parameter estimates were used for post hoc comparisons.

Intervention Program is represented in Table 1.

Table 1: Example of program

Role- myth	**Development - Motor activities**	**Materials**
'Pirates and the treasure'	Gross motor development- movements in different ways (balance, walking on tiptoe etc)	Chairs, boxes, mattress, tables, gymnastic hoops etc.
'Athletes in races with obstacles'	Gross motor development – jumps, running, crawling on the ground, turning etc.	Cords, automobile tires, exercise mat, bowling fitness etc
'River races'	Perception of space and body- activities of bilateral coordination	Flagpoles fitness, cylindrical soil pipe, automobile tires, paddle boat etc.
'The planets into the square of the universe'	Perception of space- shapes with the body- balls, spinning tops, triangles, squares and diamonds	Balls, gymnastic hoops, bares, big boxes etc.

RESULTS - DISCUSSION

A significant interaction effect was found with respect to the 'general motor proficiency' of the students. Significant interaction effects were found for: 'visual-motor control' and 'upper- limb coordination'. These findings are in agreement with previous researches supporting motor intervention programs for deaf children. Rine et al. (2004) found an increased sensory organization and postural control, and an inhibition of developmental delays in a group of deaf students. Shah, Rao, Malawade και Khatri (2013) reported a significant effect in the estimated motor skills of deaf students who followed a motor intervention program. Further, other researchers (Penella, 1979; Fotiadou, Tsimaras, Giagazoglou, Kokaridas & Angelopoulou, 2002) supported that the implementation of sports encourages the reduction of motor delays and balance deficiencies for deaf students.

With respect to the cognitive skills, the results were significant for 'pictures memorization', 'distinction of graphs' and 'visual motor control'. No significant interaction effect was found for the language items named 'language proportions', the 'vocabulary' and 'number memory'. These findings are in agreement with Moeller (2000) who stated that students with an access to early intervention programs exhibit higher developmental scores compared to children who have not taken part in any type of intervention in the past. Yoshinaga – Itano et al. (1998) studied the language abilities of 150 deaf/ hard hearing preschool children and concluded that those who had participated in early motor intervention programs (since 6^{th} month) had better language development than those who did not. Yoshinaga – Itano et al. (1998) studied children at a very young age, and these findings may not be comparable to the present study.

The statistical findings may be found in Table 2.

Table 2: *2 X 2 ANOVA interaction effect between the intervention program and the time*

Subtests	Λ	F	p	η^2
Total score of BOTMP- SF	.452	13.356	.004	.548
Upper- limber coordination		5.982	.032	.352
Visual motor control		6.049	.032	.355
pictures memorization		15.138	.001	.752
graphs discrimination		5.792	.035	.345
visual- motor coordination		12.692	.004	.536

CONCLUNSIONS

The present study revealed that the psychomotor intervention with theatrical play had a positive effect upon certain motor and cognitive skills of kindergarten deaf and hard of hearing students. The intervention was based on the adaptation theory and attempted to meet the individualized educational needs of the students involved. Appropriate interventions therefore may be an integral part of the educational process for kindergarten students. However, several limiting factors do not allow generalization of the present findings without caution. Residual hearing and communication particularities were not taken under consideration (sign language, speech, lip reading, oral skills etc). The sample size was limited to 13 participants who served in the experimental and control conditions. In the future, it would be useful to examine the effect of similar programs in all-round the school year with respect to the motor and cognitive development of kindergarten students, and even focus upon the collaborative efforts of both parents and special educators. Overall, the early identification of difficulties and the specification of each student's special education needs, are important. Accordingly, the individualized programs may follow the aspects of the general curricula in an attempt to offer the best educational support for all students.

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