EFFECTS OF A RECREATIONAL GYMNASTICS PROGRAM ON THE MOTOR PROFICIENCY OF YOUNG CHILDREN

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Original article

Abstract

A high level of Motor Proficiency (MP) in early years is associated with successful functioning within daily life and participation in physical activity both in short and long term. Therefore, the investment in movement programs that can boost the MP of young children is of great importance. The aim of the present study was to investigate the effect of a 6-month Recreational Gymnastics (RG) program on the MP of young children. Thirty-four children from Athens, Greece, aged 3-7 years (4.7+1.2 years) volunteered to participate in the research. Among them, 21 constituted the experimental group (EG) and attended the RG program, while 13 were allocated to the control group (CG) and did not participate in any organized form of physical activity. Pre and post measurements were conducted in both groups with the short form of the Bruininks-Oseretsky Test of Motor Proficiency – Second Edition (Bruininks & Bruininks, 2005). The ANOVA with repeated measures that was applied revealed that although both groups improved significantly their MP between the two measurements ($p<.001$), the EG significantly surpassed the CG in the post-measurement ($p<.05$). According to the above, it can be concluded that RG can be an effective means for the MP enhancement in early childhood.

Keywords: *motor proficiency, recreational gymnastics, young children, BOT-2.*

INTRODUCTION

Early childhood is considered as an ideal age period for the development of fundamental movement skills (Gallahue, Ozmun, & Goodway, 2012) that constitute the basis for both the skills needed for successful functioning within daily life and specialized movement skills required for the participation in physical activity (PA) and sports (Piek, Hands, & Licari, 2012). Qualitatively different aspects of gross and fine motor performance synthesize Motor Proficiency (MP), an index of motor development (Bruininks, 1978) that seems to be important for PA participation (Kambas et al., 2012; Rivilis, Hay, Cairney, Klentrou, Liu, & Faught., 2011). According to research carried in this field, a high level of MP during the first years of life is associated with high levels of PA (Cliff, Okely, Smith, & McKeen, 2009; D'Hondt, Deforche, De Bourdeaudhuij, & Lenoir, 2009; Fisher et al., 2005; Graf et al., 2004; Kambas et al., 2012; Williams et al., 2008).

Being influenced by various environmental factors (e.g. family features, such as socioeconomic status, parents' educational level, interactions among its members; schooling; socio-cultural context; participation in intervention movement programs) (Venetsanou & Kambas, 2010), MP is enhanced as children are offered opportunities to expand their skill repertoire

and refine the quality of their movements (Cleland & Gallahue, 1993). Relative research proves that participation in developmentally appropriate movement programs brings significant positive effects on the MP of young children (Bellows, Davies, Anderson, & Kennedy, 2013; Deli, Bakle, & Zachopoulou, 2006; Venetsanou & Kambas, 2004; Venetsanou, Kambas, Sagioti, & Giannakidou, 2009), enhancing in that way children's health (Venetsanou, Kambas & Giannakidou, 2015).

These assertions are extremely significant, especially nowadays, when children receive limited opportunities for participation in free PA (Venetsanou et al., 2015) and the investment in preschool training programs that could boost the MP of children remains a global concern of great importance (Cohen, Morgan, Plotnikoff, Callister, & Lubanset, 2014).

In that direction, Gymnastics can play a significant role as it is considered to be an excellent means for teaching movement skills and promoting health related fitness (Coelho, 2010; Corbin, Pangrazi & Franks, 2000). Research findings confirm that the participation in gymnastics programs results in MP improvement (Culjak, Miletic, Kalinski, Kezic, & Zuvela, 2014; Fallah, Nourbakhsh & Bagherly, 2015; Garcia, Barela, Viana, & Barela, 2011), and also brings benefits on children's skeletal development (Burt, Ducher, Naughton, Courteix, & Greene, 2013) and social behavior (Al-Awamleh, 2010).

Recreational Gymnastics (RG), being an activity for all children and not a sport only for the talented few, can offer many benefits to its participants in a fun and creative way (Lulla, 2011). As it is the case in other countries, also in Greece, RG programs hold a prominent place within physical education or sports training curricula as a form of exercise aiming to promote students' holistic development. In recent years, more and more Greek children as young as three years old, enroll in RG programs. However, there is still paucity of research in this area especially in regard of studies that examine the effects of RG programs on the MP of young children.

Therefore, the aim of the present study was to investigate the effect of a 6-month RG program on the MP of children aged 3-7 years, hypothesizing that children who participate in such a program (experimental group) will improve their MP more than children who do not participate systematically in any kind of exercise (control group).

METHODS

Thirty-four children (5 boys and 29 girls), aged between 3-7 years (M= 4.7 years, SD= 1.2) participated in the study. All the participants lived in Glyfada, Attica, Greece, and had no previous experience in RG. Among them, 21 were just enrolled in RG classes organized by two local gymnastics clubs in Athens and were allocated to the Experimental Group (EG).

In order for the influence of the RG program on children's MP to be examined, we tried to find children of the same age with the EG who did not participate in any extracurricular movement program. These children would constitute the Control Group (CG). For this purpose, the first author visited six preschool settings of the municipality of Glyfada and informed preschool educators and parents about the purpose of the study. Through this process, 13 children volunteered to participate. These children were allocated to the CG and participated only in the activities determined by the Greek Kindergarten Curriculum.

For the measurement of the MP of children the Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (BOT-2) (Bruininks & Bruininks, 2005) was used. The BOT-2 is designed so as to (a) determine the level of MP of youth aged between 4-21 years; (b) detect potential movement difficulties; (c) contribute to the design and evaluation of intervention movement programs (Bruininks & Bruininks, 2005). In the present study, the short version of the battery (BOT-2 SF) was used.

The BOT-2 SF includes the following 14 items drawn from the 53 items of the BOT long form: drawing a line on a zig-zag path; folding a paper; copying a square; copying a star; transferring pennies; dropping and catching a ball; dribbling a ball; jumping in place; tapping feet and fingers; walking forward on a line; standing on balance beam; one leg stationary hop; knee push-ups; sit-ups.

The time required for the administration of the BOT-2 SF is approximately 20 minutes. During the assessment, the raw score of the performance of the examinee on each item is recorded on the evaluation form. The 14 raw scores are converted into point ones, ranging from two to 13, which are added to compile the total battery point score. Normative data, provided in the BOT-2 manual, can be used in order for standard scores and percentiles ranks to be estimated (Bruininks & Bruininks, 2005). In the present study, the total BOT-2 SF point score was used.

The technical adequacy of the battery is sufficiently supported by several research findings (Bruininks & Bruininks, 2005; Lucas et al., 2013; Wuang & Su, 2009), while, as far as the Greek population is concerned, there is sufficient evidence supporting both the test – retest reliability (Mitsios, Voukias & Venetsanou, 2016) and the construct validity (Voukias, Zavolas, Mitsios, & Venetsanou, 2015; Voukias, Zavolas, Voukia, Venetsanou, & Karaiskos, 2014) of the BOT-2 SF.

Pre-and-post measurements with the BOT-2 SF were administered in September 2015 and April 2016 respectively, with the pre- measurement taking place before the start of the RG program and the post one immediately after the end of the program. Both measurements were conducted indoors for each group separately, in the sports clubs for the EG and in classrooms of the kindergartens for the CG. Each child was tested individually from expertly trained users of the BOT test battery. Written parental consent was given for all children's participation in the study.

The RG program applied in the present study was based on the pedagogical approach of Psychomotor Education, according which children are given multiple opportunities to choose their way of action while moving their body and improving their motor-perceptual skills (Zimmer, 2006). The skills practiced within the RG program were classified in three major categories: locomotor, non-locomotor and orientation skills. Based on the principles of movement education (Laban, 1980) and the guidelines for the design and implementation of high quality physical education programs (National Association for Sports and Physical Education-NASPE, 2004), the learning outcomes of the RG program focused on children's:

- Physical development – at the level of motor abilities like coordination, flexibility, agility, muscle strength, endurance and bone strength.
- Movement competence – at the level of understanding and performance of general categories of body movement i.e. travelling, weight transfer, balance, jumping - landing and rotation, all being developed with an emphasis on the concepts of space, effort and relationships.
- Cognitive development – with an emphasis on exploration, problem solving and decision making.
- Social development – with a focus on partner and group work, peer tutoring and assessment.

Taking in mind the individual differences among children and the within-group heterogeneity of learning styles, pretend play, music and team games were included as teaching aids, in order to encourage individual expression, self-awareness and social interaction between the EG participants (Lindqvist, 2001; Mosston & Ashworth, 2002).

The program was applied for a 6-month period, twice a week (from September 2015 to April 2016). Each RG lesson lasted one hour and 30 minutes.

The data were analyzed with a 2 (groups) x 2 (measures) analysis of variance (ANOVA), with repeated measures on the

second factor. Post hoc analyses were also conducted with the use of the Bonferroni test, with alpha set at .05.

Moreover, in order to further strengthen the results of the study, an analysis of covariance (ANCOVA) was also used, with the two groups' post-test total BOT-2 SF scores as the dependent variable and their pre-test measurement as the covariate variable. All analyses were carried out with the SPSS 22 statistical package.

RESULTS

Means and standard deviations for the pre and post-test measurements of both groups are shown in Table 1. The Kolmogorov-Smirnov test that was applied revealed that the data were normally distributed. From the results of the ANOVA it was found that the group by measurement interaction was not statistically significant ($F_{1,32}$= 4.031, p = .053), while as regards the main effects of the two factors, they were both significant ($F_{1,32}$= 86.49, p= .000, η^2= .73 and $F_{1,32}$= 5.83, p=.022, η^2= .154 for "measure" and "group", respectively).

Table 1.
Means and Standard Deviations for BOT-2 SF Total Scores by Measurement and Group .

Group	Pre Measurement	Post Measurement
Control	27.15 ± 12.6	35.08 ± 11.55
Experimental	35.71 ± 13.5	48 ± 13.5
Total	32.44 ± 13.63	43.06 ± 14.11

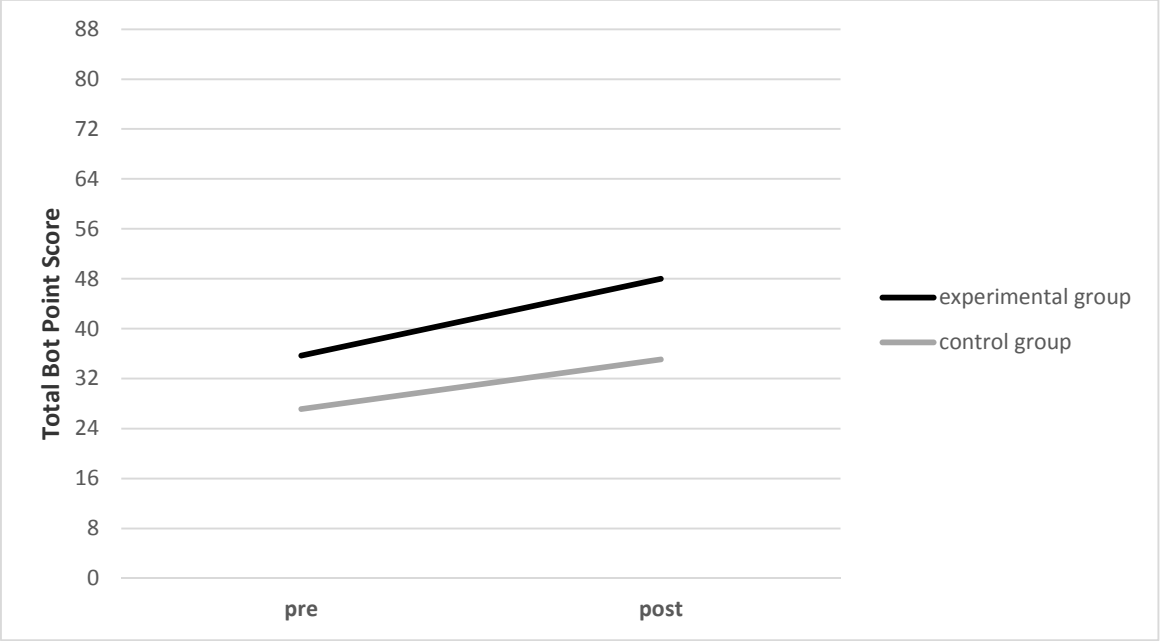

Figure 1. Total BOT Score of Experimental and Control Group in Pre and Post Measurements.

Specifically, all participants improved their performance between the two time points (pre and post) (Mean Difference = 10.104, p=.000). This developmental trend was also evident in each group's intra-test performance, with both the CG (Mean Difference= 7.9, p= .000) and the EG (Mean Difference= 12.3, p= .000) showing a statistically significant improvement of their MP (Figure 1).

As far as the comparison between the two groups in each measurement is concerned, it was found that in the pre-test measurement, there were no statistically significant differences between their total BOT-2 SF scores (Mean Difference= 8.56, p= .075), although the EG had higher scores than the CG. On the contrary, during the second measurement, the MP difference between the two groups proved to be statistically significant (Mean Difference= 12.92, p= .007).

From the results of the ANCOVA it was revealed that the factor "group" had a statistically significant impact on children's MP ($F_{1,31}$= 6.24, p=.018, η^2= .17), after controlling for the effect of the pre-test ($F_{1,31}$= 115.41, p=.000, η^2= .79).

DISCUSSION

The present study assessed the impact of a 6-month RG program on the MP of children aged 3-7 years. Pre-and-post measurements were administered to all research participants, in order to determine whether the indices of MP in the EG would be better than those of the CG, as a result of the program.

From the results it was revealed that the performance indices of both groups on the BOT-2 SF were improved between the two measurements. This was an expected finding attributed to the process of biological maturation during the six-month period of the research. According to relative research, age is a mediator of the maturation and performance in children that can play a determinant role in their motor development, allowing alterations to occur rapidly (Butterfield, Lehnhard, & Coladarci, 2002; Delaš, Miletić, & Miletić, 2008; Fisher et al., 2005; Gallahue & Ozmun 2005).

However, researchers agree that motor development is further enhanced when children grow in supportive learning environments that offer multiple opportunities for participation in developmentally appropriate activities (Akin, 2013; Al-Awamleh, 2010; Božanić, Kalinski, & Žuvela, 2011; Culjak et al., 2014; Fallah et al., 2015). In the present study, the noticeable improvement of the EG group in the post-test measurement provided evidence regarding the significant impact of contextual factors on the MP in young children. The differences between the two groups were not statistically significant at the beginning of the intervention, but they became noticeable at the end of the program. It seems that the RG program significantly contributed to the development of the MP of children in the EG.

Similar findings are reported in relevant research projects that used RG as a means for improving various indices of motor performance in young children, such as fundamental movement skills (Akin, 2013; Culjak et al., 2014), body control (Garcia at al., 2011) and fitness (Lyulina, Zakharova, & Vetrova, 2013). The former attributes are considered as potential indicators of health and robustness in youth, since they are connected with movement economy, enhanced strength and endurance capabilities, as a result of putting less effort on every given task (Lloyd, Colley & Tremblay, 2010; Trajković, Madić, Sporiš, Aleksić-Veljković & Živčić-Marković, 2016). Therefore, the integration of physical fitness parameters within movement programs should be considered with great attention by curriculum developers, especially within early childhood education where a foundational level of skills and abilities should be expected by all children. In this direction, RG programs can be used as a suitable and effective means, especially when they are designed according to children's developmental needs and are implemented by expert physical education teachers within appropriate training sessions.

As it was proven by the intra-performance improvement of the CG, free play can also have a positive impact on the motor development of young children (Corrie & Barratt-Pugh, 1997). However, this impact is lower compared to the impact of purposefully organized exercise programs as the RG program of the present study. The

latter was structured purposefully with an emphasis on promoting the needs and abilities of the particular group. The course content covered a wide range of topics that addressed physical capacities (e.g. strength, postural control, and flexibility), cognitive attributes (e.g. recall, memory, concentration) and psycho-social skills (e.g. self-expression, communication, and acceptance).

Within a non-competitive and inclusive learning environment of fun and enjoyment, children were encouraged by their physical education teacher to reach their full potential and increase their skill level and abilities. Relevant studies have shown that multiple benefits can be achieved when children participate in movement programs that are designed so as to maximize fun, communication and understanding during the process of motor learning. Music/movement programs (Venetsanou & Kambas, 2004), psychomotor education and creative movement programs (Bhatia, Davis, & Shamas-Brandt, 2015; Kouli et al., 2010; Venetsanou et al., 2009; Wang, 2003; Yarimkaya & Ulucan, 2014), or preschool physical education programs (Bellows et al., 2013), all can act as mediators in the personal and social skill development of young children. The pedagogical value of such programs lies on their offering of an enjoyable and educational approach to movement, one that supports well-being and development of children in all levels (Fisher et al., 2005; Graf et al., 2004; Williams et al., 2008).

This study has some limitations that should be noticed. The small sample size and the fact that all the participants lived in the same city should be considered when interpreting the findings from this study. If the effect of the RG on children's MP is to be thoroughly investigated, more studies, recruiting larger samples from several geographical areas, are needed. However, besides its limitations, this study provides evidence about the effectiveness of RG programs for the optimal development of young children's motor proficiency. Considering that a low level of movement skills during the first years of life interferes with normal motor and social development and reduces opportunities for children to feel competent and autonomous in their everyday living (Cliff et al., 2009; D'Hondt et al., 2009; Fisher et al., 2005; Graf et al., 2004; Williams et al., 2008; Wrotniak, Epstein, Dorn, Jones, & Kondilis, 2006), yet it is understood that participation in such programs should be encouraged.

As contexts for providing developmentally appropriate movement instruction, RG programs can encourage young children to successfully experience the benefits of a physically active and healthy lifestyle. However, before such claims can be supported with greater certainty, future studies, examining the impact of RG programs on physical, cognitive and affective parameters of the development of children, are needed.

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