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Original article

IMPACT OF HYDROGYMNASTICS ON MOTOR ABILITIES AND SOCIAL BEHAVIOR AMONG PRESCHOOL CHILDREN

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Abstract

Purpose. The gymnastics in water (Hydro gymnastics) is a very popular activity preferred for pre-school children's and consists, basically, of exercises based on the use of the water resistance of the overload, making important to verify the psychological responses produced by exercise in aquatic and terrestrial environment in pre-school children's. The aims of this study were to examine the impact of the use of a Hydro gymnastics on motor capabilities and social behavior among primary children.

Methods. Twenty-four subjects 5-6 year-olds, from the town of Mansura, enrolled in this study. The participants were divided into an experimental group and a control group. Social behavior was assessed by PKBS-2 and motor capabilities were assessed by physical fitness tests adapted from EUROFIT test batteries. The PKBS-2 is comprised of 76 items on two separate scales. Completion of the rating form takes about 12 minutes. There are also five supplementary problem behavior scales available for optional use.

The Social Skills scale includes 34 items on 3 subscales:

- Social Cooperation
- Social Interaction
- Social Independence

The Problem Behavior Scale includes 42 items on two subscales:

- Externalizing Problems
- Internalizing Problems

The PKBS-2 was standardized with a nationwide sample of ratings of 3,317 children ages 3 through 6 years. Ethnicity, socioeconomic status, and special education classification of the standardization sample are very similar to those characteristics of the U.S. population, based on the 2000 census. Internal consistency reliability ranges from .96 to .97 for the two scale totals, and .81 to .95 for the subscales.

The Hydro gymnastics program contains free-play activities such as animal walks, color scatter, teddy bears, numbers and body awareness; learning social skills such as turn-taking, sharing, helping, staying with one's group, and listening. Flotation. All statistical analyses were calculated by the SPSS statistical package. The results are reported as means and standard deviations (SD). Differences between pre and post tests were reported as mean difference $\pm 95\%$ confidence intervals (mean diff $\pm 95\%$). Pearson correlations between all variables was used, the $p < 0.05$ was considered as statistically significant.

Results. Results indicated that motor capabilities, balance, explosive power, and muscular endurance improved significantly in the experimental group. Differences were also found between experimental and control groups with regard to social skills and problem behavior according to parents and teachers reports. Gender differences were noted in connection with motor capabilities, social skills and problem behavior. Significant relationships were found between motor capabilities and social behavior.

Conclusion. The results indicate that ten weeks of Hydro gymnastics exercises program can improve physical, social skills for primary children.

Key words: Hydro gymnastics, motor capabilities, PKBS-2, primary

Introduction

Preparing students for life success requires a broad, balanced education that both ensures their mastery of basic academic skills and prepares them to become responsible adults (Association for Supervision and Curriculum Development, 2007). It is important for families, schools, and communities to identify and effectively implement research-based approaches that promote children's social,

emotional, and academic engagement and growth in the early years of school.

The preschool years are critical in the development of basic cognitive, social behavioral and motor capabilities. Children enter the world with many needs in order to grow properly, many child educational leaders agree that the goal of elementary education is to stimulate and guide the development of children so that they will function

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in life activities. Caregivers, parents, and other adults, who deal with young children in some way must explore the developmental processes as they relate to the education of children (Humphrey, 2003).

The ability to develop social relationships with peers has been long regarded as one of the most important development tasks of childhood (Hartup, 1989; Jewett, 1992; McClellan & Katz, 1992; Lau, 2002). Children's behaviors that lead to social acceptance or rejection by peers may be the result of children's early social and emotional experiences, which occur in the context of families or schools. Research indicates that the quality of parent-child relationship plays an influential role in the development of children's relation with peers and that there is a relationship between children rearing practices, the development of children's social competence (Maccoby & Martin, 1983; Parke, et al., 1988; Catron & Allen, 2003). Children's parents who are warm and consistently enforce rules are more likely to be social accepted by peers than those parents who are rejecting, angry, or uninvolved (MacDonald & Parke, 1984; Putallaz, 1987; Lau, 2001, 2002).

Play is so important to optimal child development that the United Nations High Commission has recognized it for Human Rights as a right of every child. Forces including child labor and exploitation practices, war and neighborhood violence, and the limited resources available to children living in poverty challenge this birthright. However, even those children who are fortunate enough to have abundant available resources and who live in relative peace may not be receiving the full benefits of play.

Social play and peer interaction provide a framework for children to explore their physical and social environments. Conversely, lack of social interaction during childhood has been associated with a variety of social and emotional difficulties including behavior problems, peer rejection, depression, and low self-esteem (Cheah, et al, 2001; Kupersmidt, et al, 1990; Rubin, et al., 1998; Rubin, et al, 2002).

In this context, aquatic activities are considered, since an aquatic environment provides decreased gravitational action, less impact and increased support for body weight. Moreover, training in the water provides several other benefits, such as symmetric muscular work, circulatory stimulus, social contact and the sensation of welfare caused by the water temperature. Other positive aspects are that the body is not necessarily exposed and the absence of sweat sensation (Galdi, et al., 2004).

It has been estimated that at any given point in time, between 12 to 20% of children and

adolescents in the general population have a diagnosable mental health disorder (Institute of Medicine, 1989), with prevalence estimates reaching up to 30% for children from high-risk, socio-economically disadvantaged backgrounds (Raadal, et al., 1994; Tolan & Henry, 1996).

Even preschool children can be at risk for serious emotional and behavioral difficulties, with some studies reporting that approximately 20% of preschool children in the general population show moderate to clinically significant levels of emotional and behavioral problems (Lavigne et al., 1996).

However, physical exercises may present some limitations for the primary children due to the physiological modifications imposed by the growth process. The Hydrogymnastics shows some advantages for this population group with the utilization of the water physical properties, enabling a better yield for the primary children, besides showing less risks (Galdi, et al., 2004). Despite these potential benefits, the hydrogymnastics practice for the primary children has been yet not deeply studied. Thus, we intend to evaluate the effects of the Hydrogymnastics on the motor capabilities and social behavior among primary children.

Methods

Experimental Approach to the Problem

Two groups (experimental and control) performed a pre and post - training designed intervention in which Social behavior was assessed by PKBS-2 and motor capabilities were assessed by the Motorik- Module (MoMo) test battery were recorded. The experimental group (EG) (10 primary children) trained 1 hour per day 2 times a week on Hydrogymnastics training for ten weeks. The control group (10 primary children) continued their normal daily, while the experimental group completed a hydrogymnastics training program to see whether this type of training modality would have a positive or negative or no effect on social and physical variables.

Samples

Twenty-four subjects 5-6 year-olds, from the town of Mansura, enrolled in this study. The participants were divided into an experimental group and a control group. Social behavior was assessed by PKBS-2 and motor capabilities were assessed by the physical fitness tests adapted from EUROFIT test batteries. The PKBS-2 is comprised of 76 items on two separate scales. Completion of the rating form takes about 12 minutes. Children's height, body weight, and body mass index (BMI) were shown in Table 1. Height and body weight were measured in school clothing with shoes removed before the fitness tests. BMI was calculated through the formula of $BMI = \text{weight} / \text{height}^2$

kilograms/height in meters². Subject's parents and teachers were required to read and complete a health questionnaire and informed consent document; there was no history of injuries, diabetes or recent surgery.

Procedures

Exercise program

The Hydrogymnastics program was performed during a period of 10 weeks according to the recommendations of the ACSM (American College of Sports Medicine, 1995). The group first underwent an adaptation period of one week, during which elements such as self-confidence, body domain and balance were worked on.

The water level was maintained between the umbilical scar and subaxillary line (Baum, 1998). The training session was composed of warm-up exercises and stretching (10 min), resistance training (30 min) and cool down with relaxation (10 min). The warm-up was performed in the swimming pool with exercises for large muscular groups followed by wide and slow movements.

Resistance exercises were applied using accessories (aqua tubes, boards, gloves, balls) and several movement possibilities such as knee and elbow flexion and extension, supine, adduction and leg abduction. Due to the physical characteristics of the liquid environment, submersing movements and increases in speed were used as a form of increasing the load. Cardiac frequency was monitored continuously during the training sessions the program contain the Fundamental Movement Skills. These skills are used in the execution of many of the common physical activities which play an important role in child motor development. Animal Walking, Running, Hopping, Galloping, Skipping, Reach, Grasp, Release, Throwing, Catching, Kicking

Physical tests:

Each child completed a battery of health related physical fitness tests adapted from EUROFIT test batteries. Because of children's lower ages, we did not evaluate aerobic and aerobic power in our study. We used a 10- meter run test for testing speed. Speed increased during 3-year follow up, Children were individually administered following test items:

- The number of sit ups attained in 1 minute, which tested both abdominal strength and endurance, and pull ups for both arm strength and endurance.
- Sit and reach test which measured lower back flexibility by the furthest distance reached.
- Standing broad jump test (SBJ) (as far as a child can jump from a standing start) which assessed the strength of the lower body and legs.¹⁹
- Flamingo balance test which tested the duration of standing in an upright position on one leg.

- The 10-meter run, which measured speed and coordination according to the time a child took to run as fast as possible 10-meter distance. The reduced distance was selected for administration to the younger children.

Preschool and Kindergarten Behavior Scales

- Second Edition. PKBS-2:

The *Preschool and Kindergarten Behavior Scales-Second Edition* (PKBS-2) is a behavior rating scale designed for use with children ages 3 through 6 years. This unique behavior rating scale is easy to use, very practical, and based on a solid foundation of research. With 76 items on two separate scales, it provides an integrated and functional appraisal of the social skills and problem behaviors of young children. The scales can be completed by a variety of behavioral informants, such as parents, teachers, and other caregivers. The social skills scales are divided into the following subscales:

- Social cooperation items (12), describing cooperative and self-restraint behaviours and reflect behaviours characteristics that are important in following instructions from adults.
- Social interaction items (11), reflective of social initiation behaviours, that are important in gaining and maintaining acceptance and friendship from others.
- Social independence items (11), reflecting behaviours those are important in gaining independence within the peer group. Whereas the problems behaviour scale is divided into two subscales for internalizing problems and externalizing problems.
- The externalizing subscale includes items (27), that describe acting-out and disruptive under controlled behaviour problems, such as aggression, over-activity, and antisocial behaviours.
- The internalizing problems subscale includes items (15), describing over-controlled emotional/behavioural problems, such as social withdrawal, somatic problems, anxiety, and behaviours consistent with depressive symptomatology (Merrell, 2002; Merrell, 2003)

The researcher translate the instrument into the Arabic language

Statistical analysis

All statistical analyses were calculated by the SPSS statistical package. The results are reported as means and standard deviations (SD). Differences between two groups were reported as mean difference $\pm 95\%$ confidence intervals (meandiff $\pm 95\%$ CI). Student's t-test for independent samples was used to determine the differences in fitness parameters between the two groups. The $p < 0.05$ was considered as statistically significant



Results

Table 1. shown the age and Anthropometric Characteristics of the Groups (Mean \pm SD)

Group	N	Age [years]	Weight [kg]	Height [cm]	BMI [kg/m ²]
Experimental	12	5 \pm 1.9	25 \pm 2.9	118 \pm 3.1	20.5 \pm 1.8
Control	12	5 \pm 1.2	23 \pm 3.1	119 \pm 2.2	19.4 \pm 1.1

Table 1 shown the age and anthropometric characteristics of the subjects. There no significant differences were observed in the anthropometric characteristics for the subjects in the different groups.

Table 2. shown Mean \pm SD and " T " Test between two Groups (experimental and control) in physical variables

Variables	Experimental		T sign	Control		T sign	T sign between groups
	Pre	After		Pre	After		
Sit & Reach (cm)	10.0 \pm 4.0	14.0 \pm 4.3	Sign	9.8 \pm 3.7	10.11 \pm 3.8	Not sign	Sign
Sit-ups (rep/min)	11.3 \pm 3.8	12.6 \pm 6.6	Not sign	11.7 \pm 4.1	11.9 \pm 4.3	Not sign	Not Sign
Standing broad jump (cm)	75.6 \pm 10.1	84.2 \pm 8.2	Sign	79.8 \pm 9.3	81.2 \pm 10.6	Not sign	Not Sign
10-meter run(sec)	5.3 \pm 0.6	4.4 \pm 0.5	Sign	5.5 \pm 0.8	5.3 \pm 0.6	Not sign	Sign
Flamingo balance (sec)	7.9 \pm 2.9	8.5 \pm 4.8	Sign	7.4 \pm 3.2	7.6 \pm 3.9	Not sign	Sign

Significant differences, $p < 0.05$

It is clear from Table (2) That a statistically significant differences between the post measurements for the experimental and control groups in all physical variables except Sit-ups and Standing broad jump variables.

Table 3. shown Mean \pm SD and " T " Test between two Groups (experimental and control) in PKBS–2 variables

Variables	Experimental		T sign	Control		T sign	T sign between groups
	Pre	After		Pre	After		
Social cooperation	25.4 \pm 3.9	29.3 \pm 4.2	Sign	26.1 \pm 5.2	26.7 \pm 4.6	Not sign	Sign
Social interaction	25.1 \pm 3.7	28.0 \pm 2.9	Sign	25.5 \pm 4.5	25.9 \pm 3.7	Not sign	Sign
Social independence	27.0 \pm 4.0	29.7 \pm 4.4	Not sign	26.4 \pm 6.3	27.8 \pm 6.8	Not sign	Not sign
Social skills total	77.5 \pm 3.8	87.0 \pm 3.9	Sign	10.0 \pm 4.0	14.0 \pm 4.3	Not sign	Sign
Self-centred/explosive	14.1 \pm 3.8	11.3 \pm 3.7	Sign	13.9 \pm 4.3	12.8 \pm 3.9	Not sign	Sign
Attention	10.1 \pm 3.0	9.2 \pm 4.1	Not sign	10.3 \pm 3.9	9.7 \pm 4.5	Not sign	Not sign
problems/overactive	5.2 \pm 2.0	4.0 \pm 2.3	Not sign	5.0 \pm 2.9	4.8 \pm 2.2	Not sign	Not sign
Antisocial/aggressive	5.2 \pm 2.0	4.0 \pm 2.3	Not sign	5.0 \pm 2.9	4.8 \pm 2.2	Not sign	Not sign
Total externalizing problem	29.4 \pm 2.9	24.5 \pm 3.5	Sign	29.2 \pm 3.9	27.3 \pm 3.3	Not sign	Sign
Social withdrawal	4.4 \pm 1.5	3.6 \pm 1.2	Sign	4.5 \pm 1.3	4.2 \pm 1.4	Not sign	Sign
Anxiety/somatic problems	7.3 \pm 3.0	5.7 \pm 2.8	Sign	7.4 \pm 3.8	7.2 \pm 2.9	Not sign	Sign
Total internalizing problem	11.7 \pm 2.3	9.3 \pm 2.0	Sign	11.9 \pm 4.0	11.4 \pm 2.2	Not sign	Sign
Total-problem behaviour	41.1 \pm 2.5	33.8 \pm 2.6	Sign	41.1 \pm 2.4	38.7 \pm 2.7	Not sign	Sign

Significant differences, $p < 0.05$

It is clear from Table (3) That a statistically significant differences between the post measurements for the experimental and control groups in all social variables except Social independence, Attention problems/overactive, and Antisocial/aggressive variables .

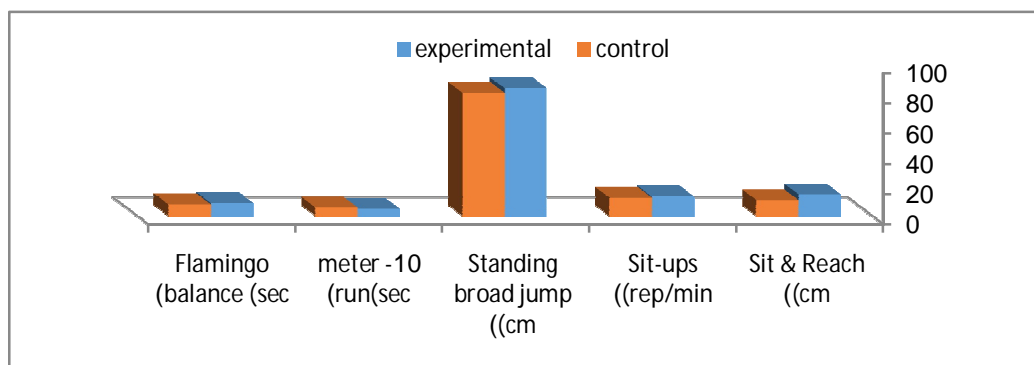


Fig 1: shows the differences between the two groups (experimental and control) in physical variables

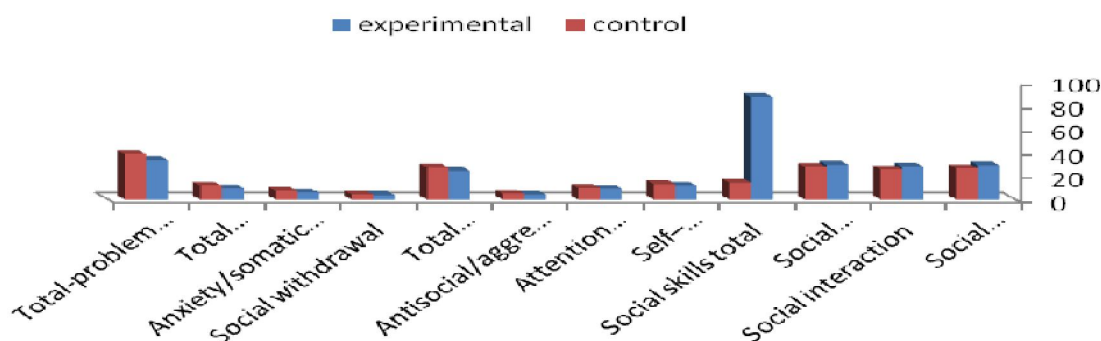


Fig 2: shows the differences between the two groups (experimental and control) in social variables

Discussion

This study assessed the effects of an 10-weeks Hydro gymnastics training program, on the motor capabilities and social behavior among primary children. Experimental results indicated that all variables were improvement in the experimental group only after the Hydro gymnastics training program.

The researchers believed that, the training program which designed and implicated on the experimental group were positive affected to improvement this variables .

A Study conducted by Grineski (1989) has provided support for these findings, the majority of which have included only young children with special needs. A few studies have directed attention to sport socialization before six years of age. Trulson (1986) tried to use sport as a treatment for delinquency and has provided some insight into the concept of sport as a delinquency deterrent. He found that self-esteem and social skills improved and scored below normal on aggression and exhibited less anxiety. Researchers expected differences in PKBS-2 between the school and home setting (Achenbach, et al., 1987; Wright & Piersel.1992; Merrell, 2002). The differences in PKBS-2 scores were found between school-based

and home based ratings for the PKBS-2 social skills scales. Home-reported scores were significantly higher than those reported by the schools. The same applied the PKBS-2. Problem behavior according to home reports was also significantly higher than school reports.

According to Morris et al, (1982) improvements in balancing skill as early as ages 3 and 4 years, balance test was not sensitive enough to detect them.22

The results of this study agree with the study of Baldauf, et al. (1984) determined that muscle strength increases 1/3 ratio every year between 3-7 ages. Other factors those effects muscle strength are muscle cross sectional area, muscle fiber diameter, muscle cell number, and differences in body parts with age.

There are few studies about the physical fitness status of 3-4 years old children. Morris et al studied on the gross motor movements of children ages between 3-6 years and they showed that the real efficiency is age. They found significant differences in throwing distance, running speed, and standing broad jump tests in the favor of boys in 3-5 year old children. (Morris et al, 1982)

Poor motor ability also makes the physical activity associated with social engagement more

demanding, and may reduce a child's capacity to deal with the social environment (Smyth & Anderson, 2000). The association between high frequency of social reticence and poor motor abilities fits well with the documented links between poor balance control and anxiety on the one hand (Balaban & Thayer, 2001; Balaban, 2002; Sklare, et al. 2001), and social reticence and anxiety symptoms on the other (Rubin & Asendorpf, 1993; Rubin, et al, 1995). It may be the case that the observed anxious behavior typically tied with social reticence partly reflects low motor abilities. The child with poor motor abilities may be motivated towards social interaction, but at the same time may feel anxious about the motor challenges posed by social engagement. Such children may find themselves on looking at other children's play without the ability to motor plan and execute the required actions for joining in. Alternatively, they may avoid the motor challenges of goal-oriented social behavior and wander about unoccupied. Thinking about approach-withdrawal motivational conflicts (Asendorpf, 1990) from the viewpoint of motor development may provide a new and viable approach to the assessment and understanding of the factors that drive reticent behavior. Neurophysiologic studies also suggest possible links between motor abilities and social behavior. It is widely recognized that there are extensive reciprocal connections between the pre-frontal cortex (PFC) and the amygdala, and that these two brain structures form a circuitry that is highly involved in various aspects of social behavior (Amaral, et al., 1992; Davidson, 2002; Fox, 1991; Kagan, 1994).

Conclusion

The results indicate that ten weeks of Hydro gymnastics exercises program can improve physical, social skills for primary children.

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