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## **Effect of Motor-Rehabilitation Training Programme for Children with Cerebral Palsy**

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The objective of this study was to determine the impact of implementing a sport-training programme to improve motor-rehabilitation skills in children with cerebral palsy. Such improvements became evident on the gross and fine muscular motions due to the implemented motor-rehabilitation-training programme. The sport-training programme used a variety of motional tests on children 8-12 years of age diagnosed with cerebral palsy. Four males and four females with mild spasticity participated in the programme. The sport-training programme aimed to improve coordination, accuracy, flexibility, neuro-muscular coordination, ability to balance and also the visual/optic-motor coordination including motor awareness among the chosen group of children. Motor experiments were conducted, improvements due to the programme reached acceptable and adequate results as true indicators. Statistical analyses such as the t-test and Wilcoxon test for two-related samples before t and after were applied on the results of the training sport-programme. The results showed some differences in the average of pre and aft-measurements in the general motor skills experiments. Differences were also found in the average of pre and aft-measurement in the fine motor skills for the aft-measurements. The difference was within ( $\alpha \leq 0.05$ ).

**Key words:** Cerebral palsy, flexibility, neuro-muscular coordination, spasticity, visual/optic-motor

## INTRODUCTION

Special education plays a significant role through different sport-training programmes to improve the lives of people with special needs worldwide. A direct interaction of people with special needs within the society is an indicator of civilized nations as every one in the society has the right to live with mutual understanding of duties and responsibilities toward the society. People with cerebral palsy are considered as a group of special needs people. In recent years many educators adopted a variety of sport-training programmes and rehabilitation programmes to improve the ability of special needs people. This became evident as they became capable to help themselves accomplish specific tasks in every day activities. Such programmes aimed toward improving different skills in people with cerebral palsy including and not limited to the physical, mental, or social interactions. Individuals with cerebral palsy can be recognized by unnatural symptoms such as irregular movement in walking, setting and other motor-motions for every day activities (Al-Alam, 1994). Kirk and Chalfant (1984) indicated that children, who have difficulties in gross motor skills, might fail in developing the motor awareness coordination, as a result of weakness in coordination between the eye and the hand when handling things. This clarifies the fact that healthy body shape is capable of accomplishing any physical movement successfully. Cerebral palsy is recognized as a form of handicap directly connected to motor paralysis interrelated to brain damage (Al-Roosan, 1998). Authors during different time periods indicated that cerebral palsy in children could occur from losing muscle control in the early stages of the child's life even during pregnancy or during birth (Damino, 2003; WHO, 2002; Warner, 1992).

Cerebral palsy is an abnormal change caused by damage in the nervous system, leading to unbalanced growth and motor imbalance (Kriger, 2006). The symptoms of cerebral palsy include muscle weakness and other difficulties in the child's capability of motor movement. The American Academy for Cerebral Palsy integrated the types of cerebral palsy according to muscle weakness. This system is considered the most popular worldwide and can be divided into five types: Spasticity, Athetosis, Ataxia, Rigidity and Tremor (American Academy for Cerebral Palsy, 2004).

This research directly deals with spasticity cerebral palsy children between the ages of 8-12 implementing a sport-training programme to improve their motor-rehabilitation. Children with spasticity cerebral palsy are known to have hyper muscle tension and excessive muscle response (Kriger, 2006). The amount of muscle

tension depends on the general case of the child and the level of motivation. If severe hyper tension exist, the body remains in a certain position leading to contraction in the injured parts, specially the ones close to the body center. Such phenomenon develops into contracture positional anomaly lordosis or hip anomaly, knees and fingers as less use of such parts cause more weakness. Spasticity cerebral palsy is the most common type of cerebral palsy (50-60%) and is divided into Quadriplegia, Paraplegia and Hemiplegia. Over eighty percent of spasticity cerebral palsy occurs during pregnancy with athetosis in muscles leading to size shrinkage (Warner, 1992; WHO, 2002; Messerols, 2002).

Prevention of cerebral palsy starts with the female caring for her health at puberty and as a mother in the future. A pregnant woman needs to ensure the best possible diet for her and the un-born child. Strengthening the immune system by taking the series of vaccinations needed. Different social, economical and environmental issues in a society plays a significant role in the health care of the woman and the unborn child (Cornell *et al.*, 1997). Health awareness programmes for pregnant women are a useful tool used worldwide to reduce the chances of different diseases to the unborn children especially cerebral palsy. Many studies indicated that (80 of 1000) newborn children with total weight less than 4.4 lb might be diagnosed with cerebral palsy. Recently and due to different health awareness programmes for pregnant women reduced the number to (15 of 1000) newborn children in developed countries and (2.0-2.5 of 1000) newborns in the United States (Kriger, 2006). Such reduction became evident due to two major factors: (a) improvement of pregnant women and future mothers. (b) Sufficient intensive care for newborn babies in the diagnosed stage of cerebral palsy (Vizkelety *et al.*, 1991).

Duties of any society toward children with cerebral palsy are not limited to one task of action, support, or assistance. This is due to many reasons including the burden of these children on themselves, their families and as a result on the whole society reflecting on social, psychological and economical aspects of life. In addition to such facts, in most third world countries families with cerebral palsy children usually lack education and the social life they deserve. Usually one member of the family is designated to assist the diagnosed child with daily activities where such assistant would lack attending school, deprived of education and social relationships. In every stage of the cerebral palsy child new equipments are needed with extra cost on the family. The author believes that simple tools and physical therapy sessions are the key elements in improving the conditions of cerebral palsy children.

Implementing a sport-training programme to improve motor-movements in children with cerebral palsy. The programme tested activities before and after the improvements of gross-motor skills as statistical indicators at one level of ( $\alpha \leq 0.05$ ). Further more, the implemented programme activities were tested on the fine motor skills before and after at one level of ( $\alpha \leq 0.05$ ).

## MATERIALS AND METHODS

Students within the age group of 8-12 diagnosed with mild spasticity cerebral palsy from a specialized education school for cerebral palsy children were chosen for the designed sport-training programme. To build a training programme, several studies were reviewed, including: (Vermeer, 1987; Winnick and Short, 1985; Wilmore, 1982; Price, 1980; Weiss and Beck, 1973). Initially, the sample group showed a lack of physical fitness and after warm up then increasing the educational units to five a week. Every programme contained 36 units each in a 50 min long period. A full review of each child's file and medical records to assure similarities of conditions among sample members were conducted. A total of eight children (4 males and 4 females) with normal intelligence quotient (IQ), diagnosed with hemiplegia spasticity cerebral palsy were chosen for the programme as shown in Table 1.

The sport-training programme consisted of 36 training units divided into two categories as follows:

- Relaxation of muscular tension exercises to decrease hyper tension muscles such as flexibility exercises, deep breathing exercises (to reach the relaxation level of breathing during sleep), control the amount of required muscular tension to accomplish a certain job, motor relaxation practices (vibrations) and all mentioned exercises together for satisfaction body relaxation.

- Water physiotherapy exercises was used in order to activate blood circulation in the body and to dispose of excessive accumulation of waste as it was generated from chemical changes in the muscles by using water and its heat temperature to relax the joints and skin in order to increase the motion range in different joints.

Three types of training were used:

- Appropriate motor models in water
- Structured water games.
- Motor control in water.

Reliability content was conducted on all tests and items in the rehabilitation programme. As presented to different experts in the field for direct feed back, comments and suggestions that might help in the rehabilitation programme processes including implementation, or any expected outcome and improvements on all tests for motor skills (gross and fine) activities as shown in Fig. 1. On the other hand, discrepant reliability was applied on the motor rehabilitation tests on the same number of a group of healthy students' from the same age living under the same social conditions. The results indicated significant differences in averages of motor skill tests among healthy students and diagnosed students leading to statistical significant differences among the two groups as shown in Table 2. Pre and aft motor tests were conducted within a two-week period to accomplish external validity. The outcome provided true validity in the range of (0.78-0.98) such values are suitable for the study as it represents actual physical measurements.

Table 1: Distribution of the sample group

Sample group	No. of sample group	Age range
Male	4	9-12
Female	4	8-11

Table 2: Discrepant reliability for motor skills among normal and diagnosed children

Type of tests	Sample condition	No. of samples (n)	Average of performance	Standard deviation	t-test values	$\alpha$
Throw	Diagnosed	8	13.25	2.66	-8.569	0.01
	Normal	8	23.13	1.89		
Catch	Diagnosed	8	11.00	3.42	-4.743	0.01
	Normal	8	26.50	8.59		
Stretching and Flexibility R. Side	Diagnosed	8	32.88	8.19	-3.662	0.01
	Normal	8	52.81	13.05		
Stretching and Flexibility L. side	Diagnosed	8	33.75	8.43	-2.220	0.01
	Normal	8	47.38	15.17		
Dynamic flexibility	Diagnosed	8	8.75	1.28	-4.258	0.01
	Normal	8	15.96	4.61		
Zigzag running	Diagnosed	8	22.10	2.80	13.957	0.01
	Normal	8	8.83	1.30		
Side waking on Balance board	Diagnosed	8	12.49	1.55	5.20	0.00
	Normal	8	8.29	1.63		
Forward waking on Balance board	Diagnosed	8	12.52	0.95	2.88	0.002
	Normal	8	10.08	2.90		
Building cubes	Diagnosed	8	1.50	0.93	4.249	0.01
	Normal	8	3.25	0.71		
Stringing beads on threads	Diagnosed	8	7.17	2.91	-14.016	0.01
	Normal	8	22.05	0.73		

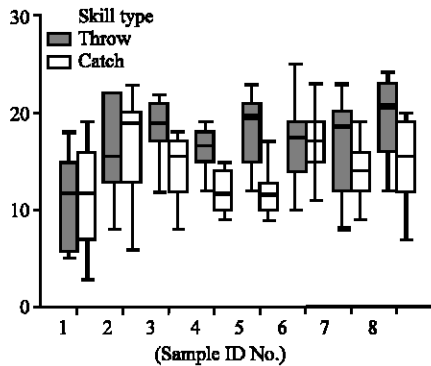


Fig. 1: Performance of motor skills (catch and throw)

## RESULTS AND DISCUSSION

The goal of this research was to evaluate the effectiveness of a sport-training programme on motor skills for children (males and females) diagnosed with mild spasticity cerebral palsy within the age group of 8-12. Statistical analysis using Wilcoxon Test revealed at significant difference at the level of ( $\alpha \leq 0.05$ ) in the average general motor skills before and after the implementation of the sport-training programme as shown in Table 3. Indicating improvements on the general motor skills at different levels among the sample group. An increase in the number of successful attempts became evident after the implementation of the sport-training programme. On the other hand, a decrease in the time needed to accomplish different motor skill activities (which demanded the use of the large muscles) were recorded for most of the sample group. Such accomplishments indicate an improvement of the balance level, neuro muscular harmony, accuracy and speed in motion response in the sample group due to the implementation of the proposed sport-training programme.

Further more, the sport-training programme measured improvements of the fine motor skills on the same sample group before and after conducting the programme. The statistical analysis using Wilcoxon Test on different activities of fine motor skills before and after indicated a significance difference at ( $\alpha \leq 0.05$ ) as shown in Table 4. Leading to the fact that improvements on the fine motor skills were present among the sample group as a result of the fine motor skill activities in the sport-training programme.

The sport-training programme test results presented as graphs in Fig. (2-7) showed the improvement differences before and after the implementation of the programme in all sample groups. The sport-training programme test achievement was dependent on the performance during a limited time. The gross motor skill

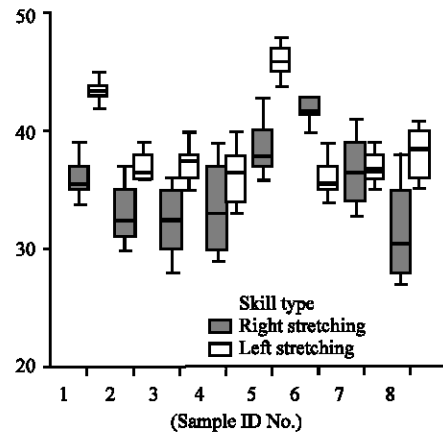


Fig. 2: Performance of motor skills (right and left stretching)

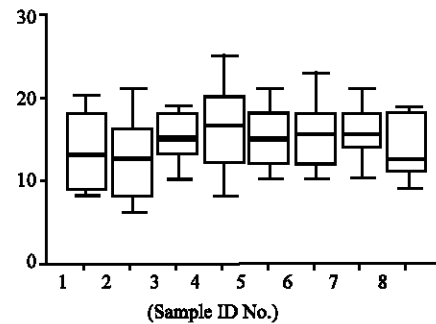


Fig. 3: Performance of motor skills (dynamic flexibility)

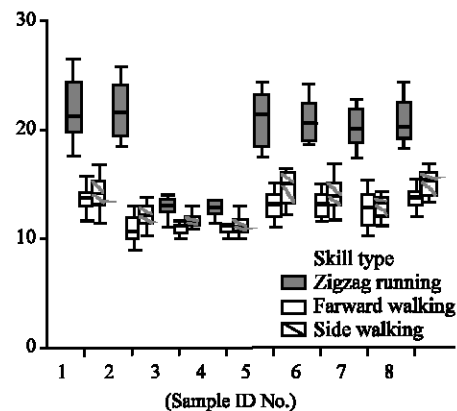


Fig. 4: Performance of motor skills on the balance board

activities used in the programme such as throw and catch, stretching, zigzag running, protraction, side and forward walking on the balance board, flexibility and dynamic flexibility showed improvements. The performance of these test exercises depends strongly on the big muscles of the body, level of balance, neuro muscular harmony, softness and speed of motion response. This is

Table 3: Wilcoxon test before and after implementation of the sport training programme (Gross Motor Skills) at the level of  $\alpha \leq 0.05$

Type of tests	Pre-test		Aft-test		Wilcoxon	$\alpha$
	Average	Total	Average	Total		
Throw	4.50	36.0	12.50	100.0	36.0	0.001
Catch	4.50	36.0	12.50	100.0	36.0	0.001
Stretching and Flexibility R. Side	5.19	41.5	11.81	94.5	41.5	0.005
Stretching and Flexibility L. side	6.00	48.0	11.00	88.0	48.0	0.03
Dynamic flexibility	4.50	36.0	12.50	100.0	36.0	0.001
Zigzag running	11.13	89.0	5.88	47.0	47.0	0.03
Forward waling	10.81	86.5	6.19	49.5	49.0	0.05
Side waling	9.50	76.0	7.50	60.0	60.0	0.05

Table 4: Wilcoxon test before and after implementation of the sport training programme (fine motor skills) at the level of  $\alpha \leq 0.05$

Type of tests	Pre-test		Aft-test		Wilcoxon	$\alpha$
	Average	Total	Average	Total		
Building cubes	4.50	36.0	12.50	100.0	36.0	0.00
Stringing beads on threads	4.50	36.0	12.50	100.0	36.0	0.00

in strong agreement with Volman *et al.* (2002) in response to the improvement in speed and accuracy in the neuro muscular harmony for different motor skill activities. Also the results of the improvements on the protraction test exercises agreed with Deluca (2002) tests, as the optimum goal was to reach maximum limits for protraction in the members of the sample group. It is worth mentioning that protraction is considered a helping factor in dynamic flexibility. The leg muscle force, which is considered as a central base in measuring the level of physical shapeness, in addition to the other test exercises such as the zigzag running, forward walking on the balance board came in strong agreement with the study conducted by Plundell and Shepherd (2002).

On the other hand, the study showed significant differences in the average of all pre and aft tests for the fine motor skills such as the speed of building cubes and stringing beads on threads in a limited time frame. These tests depended on the visual movement coordination and the sensory movement awareness. This is in full agreement with the results of the study conducted by Pumin and Kayihan (2000) on the improvement in the sensory movement awareness for a sample group having spacticity. Pumin and Kayihan (2000) emphasized on the importance of the rehabilitation programmes for people with cerebral palsy.

Dynamic flexibility test results showed improvement in all individuals in the sample group. Keeping in mind that the absence or shortages of dynamic flexibility is the main cause of disability in accomplishing activities that require flexibility in movements. For example, playing childhood games such as role play for females and any speed games for males assure normal growth, however the absence of capabilities to play such games create an

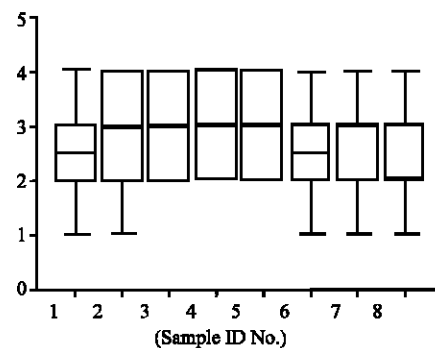


Fig. 5: Performance of fine motor skills (speed in building cubes)

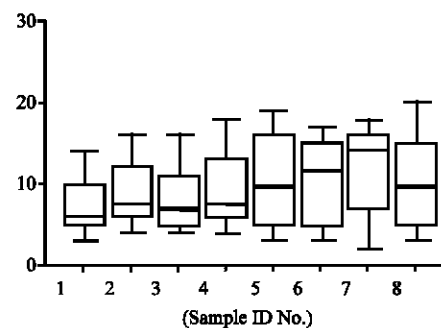


Fig. 6: Performance of fine motor skills (stringing beads on threads)

inconsistency with negative results such as fear, depression and loneliness. Such complications prevent the release of energy in children leading to physical and physiological problems. This agrees with the conducted research by Tieman (2003) on children between the ages of 6-14 years where motion is essential for daily activities

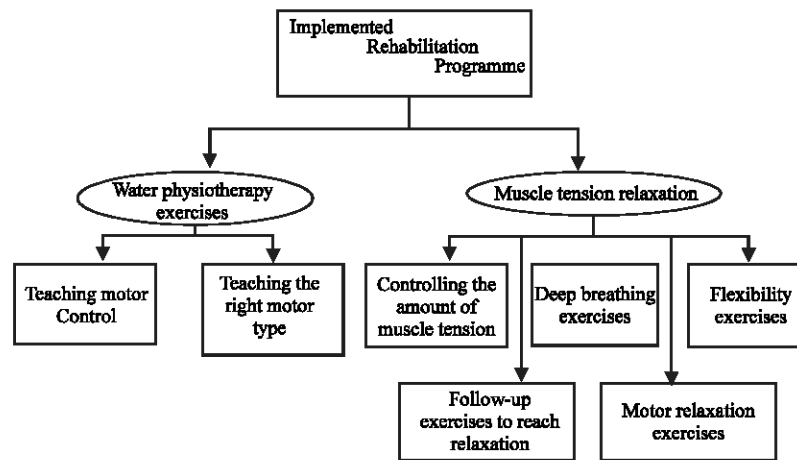


Fig. 7: Hierarchy of the implemented sport training programme

and its absence may limit the social activities for children with cerebral palsy. The present study is also in agreement with Ketelaar *et al.* (2001) which showed that increasing levels of motion capabilities, awareness and training would provide happiness and joy to overcome obstacles in children with cerebral palsy. The success of a child in completing an exercise for the first time brings him joy and further trust in himself and his capabilities, as it was very noticeable with the sample group in this research. Coppold (2004) and Damian and Abel (1998) assured through different studies that training through exercises for children with brain paralyses showed positive results in motion level and every day activities. The consistency of achieved motions in cerebral palsy children improves their ability to rely on themselves for most of the daily activities.

## CONCLUSIONS

The following results can be concluded from this research:

- There are individual differences in the performance among the sample group in all of the general and fine motor skill related tests.
- Organized rehabilitation programmes for motor skills is a major factor in improving the level of performance and the use of internal energy in children diagnosed with spasticity cerebral palsy.
- Rehabilitation exercises for children with cerebral palsy is a major contribution factor in reducing the feeling of fear in accomplishing different daily tasks and raising the level of self-confidence in the diagnosed children.

- A structured sport curriculum implementation on weekly bases for spasticity children plays a significant role in nourishing and improving the life styles of children diagnosed with cerebral palsy.
- Specialized educational schools for children with cerebral palsy should focus on planned programmes that are keen to raise the inter action of children with different social and physical activities among the community.
- Aimed seminars toward the families and society of children with cerebral palsy and how to deal with them on a daily bases would be of great benefit to both society and the children.
- Further enhancement of the educators of cerebral palsy children with what is new in educational perspective is always a plus for the society as a whole.

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