Effect of Vestibular Stimulation on Motor Functions in Children with Spastic Cerebral Palsy

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ABSTRACT

Background and purpose: *Cerebral palsy, which is an umbrella-like term, used to describe a group of chronic non progressive defect impairing control of movement and posture, is the most common condition seen by pediatric physical therapists, and it poses a challenge to practitioners due to the large variation in prognosis for motor function of children with this diagnosis. The purpose of this study was to evaluate the effect of vestibular stimulation program on motor function in children with spastic cerebral palsy.* ***Subjects:*** *Thirty spastic cerebral palsied children, age ranging from 1-5 years, were involved in the study, met the following criteria; spastic cerebral palsy, have at least good head control, respond to visual and auditory stimuli, had no history of uncontrolled convulsions, had not undergone an orthopedic procedure in the last year, had not receive any medications to reduce spasticity for the previous six months, and had no current cardiac problem. Children were randomly distributed into two groups; vestibular stimulation group and traditional physical therapy group.* ***Measurements:*** *Both basic gross motor abilities and motor abilities in daily situations of all children were assessed before and after application of the intervention by using gross motor function (GMFM) and Pediatric Evaluation of Disability Inventory (PEDI).* ***Intervention:*** *Intervention was applied daily for six weeks, one group received vestibular stimulation including the use of specific vestibular stimulation equipments followed by traditional physical therapy, while second group received only traditional physical therapy,* ***Results:*** *The results of the study revealed a significant improvement in motor abilities of all children in vestibular stimulation group as measured by GMFM & PEDI, where P value was < 0.05 in both measures. While traditional physical therapy group did not show a significant improvement.* ***Discussion:*** *The result of this study supported the hypothesis that using vestibular stimulation program in addition to traditional physical therapy for the treatment of spastic CP children is more effective than using traditional physical therapy alone.*

INTRODUCTION

Cerebral palsy (CP) interferes with normal development as a result of neurological damage to cortical centers with resultant abnormality of muscle tone, delayed reflex maturation, and the presence of associated abnormal patterns of posture and movement. A general goal of physical therapy for CP children is to decrease the influence of abnormal muscle tone while simultaneously facilitating the emergence of normal postural and movement components. In addition with CP, unless normal postural and movement components develop, abnormal development is manifested as various compensations, clinically seen as postural deviations, asymmetries, or deformities[1].

The incidence of CP in industrial countries is in the same order of magnitude as adult onset of diabetes and stroke[1,11,18,19,].

There have been an increases in the incidence and prevalence of CP that may be related to improved documentation of cases by national registries, advances in neonatal care, or other factors[19].

The relation between impaired balance and functional limitations has meant that a major focus of many intervention programs in CP children is to improve postural control, thereby enabling the child to recover stability more effectively. However, there is limited evidence available to show that specific training targeting the postural control system improves the efficiency and effectiveness of reactive balance control in this population[28].

Vestibular rehabilitation is an exercise based approach directed at maximizing CNS compensation for vestibular pathology. Treatment is primarily composed of exercises directed at habituating or remediating dizziness, improving gaze, retraining balance, increasing physical fitness. Rehabilitation of vestibular disorders is directed at helping the patient become asymptomatic via CNS compensation and not at resolution of the underlying pathology[4].

The vestibular system in humans and in many other animal species, serves three main functions:

1- The control of spinal reflexes that elicit adjustments of muscle activity and body position for the maintenance of upright posture.
2- The control of eye movements that help stabilize the gaze while the head is in motion, thereby reducing the movement of an image on the retina.
3- The perception of motions and spatial orientation[13].

One common problem for the child having moderately or severely disabling CP is the inability to control adequately the position of his head and trunk. Although he may be able to maintain a precarious static sitting balance, movement of his arms and hands can disturb this balance. Conversely, movement of the head is frequently associated with abnormal upper extremity displacement, interfering with hand function. Both reactions are serious postural problems for a child in play, educational, or, later, vocational settings[22,35].

Several studies have suggested the importance of vestibular input for modulation of different types of afferent input (e.g., tactile and proprioceptive) and for increasing visual attentiveness and visual orientation, as well as for increasing motor and exploratory ability[17]. Researched have identified vestibular dysfunction in a number of clinical conditions including Down syndrome, minor neurological impairment, hyperactivity disorders, mental retardation and developmental delayed infants[12].

Vestibular rehabilitation is the use of activities and exercises to treat vertigo, balance problems, functional limitations and disability to improve gross motor skills and to facilitate reflex integration caused by impairments in the vestibular system[14,16]. When the body is relatively stable, such as while sitting or standing quietly, there is little head movement and visual and somatosensory cues are sufficient to maintain postural stability in patients with vestibular loss. During locomotion, however, the frequency of head movements exceeds the compensatory ability of these systems[15].

In physical therapy, one objective of practice is to help clients develop successful strategies that can be used to accomplish functional tasks. Achievement of a new motor habit through practice is more effective if it is somewhat difficult and requires effort. These conditions facilitate important information processing activities[33]. One of the major issues in relation to pediatric physiotherapy services for CP children is that the effectiveness and efficacy of therapeutic interventions could not be determined owing to poor quality of research either due to small study groups or

poor measures or due to many other technical and ethical problems, all contributes to the lack of experimental evidence to help physiotherapists prioritize and standardize the care they deliver to CP children[24,29,34].

The purpose of this study was to assess the effect of vestibular stimulation program in addition to traditional physical therapy on gross motor activities and amount of assistance provided during activities of daily living in children with spastic CP along six weeks program, and compare it to the effect of applying traditional physical therapy alone in a control group. Our null hypothesis was that CP children in both groups would improve similarly.

Study design

The study was designed as prospective randomized controlled clinical trial. It was initially approved by the Research committee of the Department of Rehabilitation Sciences at the college of Applied Medical Sciences, King Saud University.

SUBJECTS AND METHODS

Vestibular stimulation (VS) group data were; 10 male (66.7%) and 5 female (33.3%), participated in this study. Their mean age 40.07±11 months, height 91±8 cm, weight 12.7±2.5 kg. The majority of cases were spastic diplegic represented 46.7%, quadriplegic represented 33.3%, hemiplegic represented 20%. The majority of cases were level IV according to GMFCS represented 33.3%, level I represented 26.7%, level III represented 20%, level II represented 13.3%, level V represented 6.7%.

While Traditional Physical therapy (TPT) group data were; 8 male (53.3%) and 7 female (46.7%), participated in this study. Their mean age 41.05±9 months, height 99±6 cm, weight 12.4±3 kg. The majority of cases were spastic diplegic represented 53.3%, quadriplegic represented 33.3%, hemiplegic represented 13.3%. The majority of cases were level IV according to GMFCS represented 46.7%, level I represented 13.3%, level III represented 20%, level II represented 13.3%, level V represented 6.7%.

The 30 CP children involved in the study met the following inclusion criteria; spastic CP, age range from 1-5 years at the onset of the study, classified into levels I to V according to Gross Motor Function Classification System (GMFCS), but have at least good head control, respond to visual and auditory stimuli, had no history of uncontrolled convulsions, had not undergone an orthopedic procedure in the last year, had not receive any medications to reduce spasticity for the previous 6 months, had no current cardiac problem. Exclusion criteria included; children with other types of CP, children above the age of 5 years or less than 1 year, children who does not have good head control, children who does not respond to visual or auditory stimuli (either due to blindness or deafness or severe mental retardation), children with uncontrolled convulsions or VP shunt, children with severe medical or orthopedic problems, children who live out of Riyadh city, children who have difficulties in transportation and can not join the program daily, and children who is not accompanied by their initial career. The sample of the study was divided randomly into two groups of equal number, experimental group and control group. Experimental group was received vestibular stimulation in addition to traditional physical therapy, while the control group received the traditional physical therapy only.

Location of the study was conducted at pediatric physical therapy department in King AbzulAziz University hospital in Riyadh.

Clinical measurement

Both basic gross motor abilities in a standardized environment and motor abilities in daily situations were studied using: Gross Motor Function Measure (GMFM-66) and Pediatric Evaluation of Disability Inventory (PEDI).

Gross Motor Function Measure (GMFM)

GMFM is a standardized observational instrument designed and validated to measure change in gross motor function over time in children with cerebral palsy. The GMFM measures basic gross motor functions by an independent rater in a standardized environment. The GMFM takes approximately 45 minutes to administer. All items generally can be completed by age 5 years in children without motor delays[23]. The GMFM is scored by observation of a child's performance on each item. Items are scored on a 4-point ordinal scale: 0=does not initiate, 1=initiates <10% of activity, 2=partially completes 10% to <100% of activity, 3=completes activity). Scores for each dimension are expressed as a percentage of the maximum score for that dimension. A total score is obtained by adding the scores for all dimensions and dividing by 5 (i.e., the total number of dimensions). Each dimension, therefore, contributes equally to the total score. The GMFM total scores can range from 0-100[26].

Pediatric Evaluation Disability Inventory (PEDI)

It is a standardized test designed to identify and describe functional impairment in children, monitor progress and can be used as an outcome measure to evaluate different therapeutic programmes. It is a judgment – based parent-structured interview used by professional in rehabilitation medicine, is a clinical instrument for the assessment of functional status in children up to 7.5 years of age.[18] The PEDI measures performance in the daily environment as assessed by parents or caregivers. The PEDI is able to measure both capability (what the child can do) and performance (what the child actually does do) of routine daily child hood activities in 3 domains: 1) self-care, 2) mobility, 3) social function domain[22]. Each domain consist of 3 parts: (1) functional skills (current capability of selected tasks in 197 items), (2) caregiver assistance (the extent of help the caregiver provides in 20 items), and (3) modifications (environmental or technical modifications needed to enhance the children's function in 20 items)[5,20,32].

Because the focus of present study was on the children's motor abilities & functions, only the first two domains were used. The social function domain was not used.

Tests were applied for each child within three days Pre start and post end of treatment program. Assessments took place at the usual treatment room.

The initial assessment reflected the pre-treatment results, while the second assessment six weeks later, reflected the post-treatment results.

The data and time of all assessments were recorded and every effort was made to schedule the first assessment and treatment sessions and second assessment on the same time of the day.

Interventions

The intervention phase consisted of 6 weeks of rehabilitation program. All children were treated in the same gym. Mothers attended with their children. The treatment

area consisted of a large room containing physiotherapy equipment and supplies that serve children with developmental disabilities. Once the child arrives to the Gym with his/her mother, treatment session starts on scheduled time and continue for one hour. Each child received his/her treatment at the same time daily during the six-week program. The assistant physical therapist were familiarized with intervention used by the researcher and had been following researcher instructions through the whole program for each child.

Vestibular stimulation program (VS)

- Vestibular stimulation equipments used in the program included the following, used in the same consequences mentioned: toy horse, a frame with a suspended platform [Hammock nets (swing)], tilting board/ 10 minutes, bolster therapy ball and scootter board.
- VS treatment was applied along one hour of treatment session. Same activities were applied every treatment session, for 6 weeks.
- The child was not passive recipient but an active, working participant. It is well accepted that active involvement is crucial for success in any therapeutic intervention.

Toy horse riding

- Child Sit on toy horse, feet supported, child facing front of the horse in front of a mirror with physical therapist at the back of the child.
- Childs assessed to reach front of the horse and hold with two hands to maintain sitting position.
- Therapist will start moving the swing forward & backward in slow movement.
- Facilitation of children's midline head and head control is applied. The therapist and the child used the movement of the horse to maintain normalized muscle tone and promote weight shift.
- If child is able to move horse by him/her self, therapist will encourage him/her to do so with close supervision.
- If possible, child was instructed to raise his/her arm/arms into different positions to increase trunk extension, rotation and righting responses.

A frame with a suspended platform

- Child lying prone in the swing with therapist assisting him/her at the chest or leg level according to child condition and response.
- Mirror placed in front to the child.
- Therapist will start moving the horse forward & backward in slow rhythmical movements.
- Child working to maintain his head and trunk extended up.
- Bouncing of child in net was applied within patient tolerance.
- When child level of balance permits, child was instructed to raise his/her arm/arms in to different positions to increase trunk extension, and encouraged to do unilateral and bilateral hand activities.

Ball therapy

- Child sitting or lying on a therapy ball of appropriate size for patient, Child position was changed according to patient physical abilities and mode (sitting, supine, prone).
- Therapist at front or back of the child according to position applied, child response observed and amount of assist required.

- Destabilizaing base of support was achieved by placing hands or feet closed together or by flexing/extending knees while sitting.
- Ball being moved by the therapist; rocking the ball in different directions and bouncing in slow rhythmical movement.

Tilting board (rocking board)

- Child lying or sitting or kneeling or standing accompanied by therapist on the tilting board (child position depends on child physical ability and mode) child working to maintain his balance.
- When child level of balance permits, child was instructed to raise his/her arm/arms in to different positions to increase trunk extension, and encouraged to do unilateral and bilateral hand activities.

Scotter board

- Child positioned on prone position on a scooter board, encouraged tomove it by himself if he/she can, if not, therapist will give assist of different grades according to child needs.
- When strength of child trunk and upper extremities permits, child was instructed to raise his/her arm/arms in to different positions to increase trunk extension, and encouraged to do unilateral and bilateral hand activities, and to move scooter in different directions.

During ball, horse and tilt board therapy, Instructor selected various tasks and positions based on the child individual needs. When using the swing, tilt board and scooter, children were encouraged to reach for different objects using one or both hands together. (to improve postural alignment).

- To ensure safety, helmet was fitted to the child if needed.
- For those children with GMFCS III and IV and V, given assistance and support was provided more during the Vestibular stimulation program.

Traditional physical therapy (TPT)

TPT was provided for each child in the second 30 min of the session. TPT was based on the assessment of the treating therapist and on her observations of child response in physical therapy Gym, regardless of child specific problems or response at home. Some of the exercises applied in traditional treatment included; Passive ROM and stretch exercises, active ROM exercises, mat exercises, balance exercises, stairs training, gait training, neurodevelopmental techniques.

RESULTS

Vestibular stimulation group

Table (1): Comparison of mean values of GMFM, pre and post treatment in VS group.

Pre GMFM		Post GMFM		Paired differences		P value
mean	SD	mean	SD	mean	SD	.001
58.8	±22.55	66.3	±21.3	7.5	±4.2	

Total GMFM

The mean value of GMFM for VS group was 58.8% ±22.55 pre treatment, while it became 66.3% ±21.3 post treatment. There is a significant improvement (P = .001). (Table 1, Fig. 1)

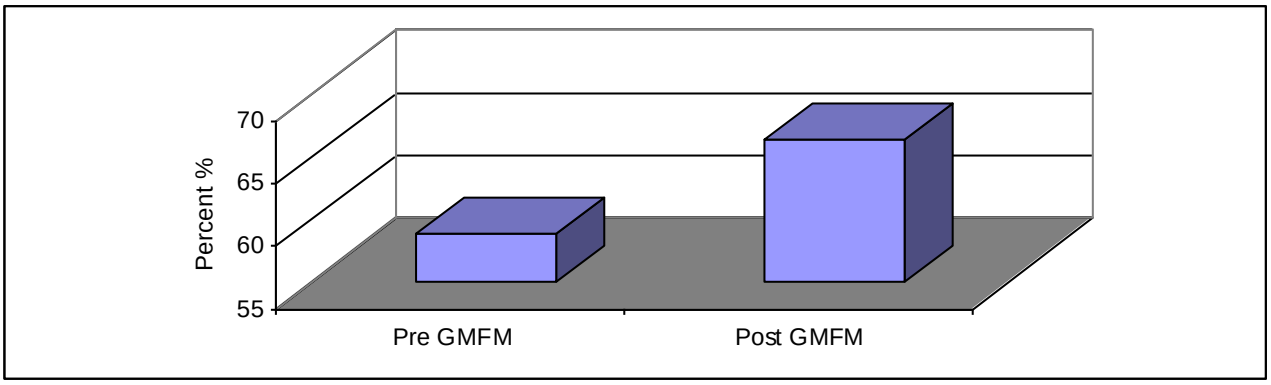

Fig. (1): Comparison of mean values of GMFM, pre and post treatment in VS group.

Table (2): Comparison of mean values of PEDI, pre and post treatment in VS group.

	Pre PEDI		Post PEDI		Paired differences		P value
	Mean	SD	Mean	SD	mean	SD	
Total PEDI	44.5	±21	52.7	±22	8.2	±5.1	.001
self-care domain	46.4	±20	53.34	±21.2	6.94	±4.3	.001
Mobility domain	44.4	±24.3	52	±24	7.7	±6.3	.002
Self Care Assistance domain	42	±20	52.7	±20.5	10.7	±7.87	.001
mobility Assistance domain	47.4	±29	60	±27.2	12.4	±8.2	.001
Total care-Assistance domain Total	44.7	±23.6	56.3	±22.8	11.6	±7.1	.001

Total PEDI

The mean value of PEDI total for VS group was 44.5 ±21 pre treatment, while it increased to 52.7±22 post treatment. There is a significant improvement (P = .001).

SELF CARE domain in PEDI (SC)

The mean value of self-care domain scoring in PEDI for 46.4 ±20 pre treatment, while it became 53.34±21.2 post treatment. There is a significant improvement (P = .001).

Mobility domain in PEDI (M)

The mean value of mobility domain in PEDI 44.4 ±24.3 pre treatment, while it became 52±24 post treatment. There is a significant improvement (P = .002).

Scores of self-care assistance domain in PEDI SC assist)

The mean value of self-care assistance domain in PEDI was 42% ±20 pre treatment, while it became 52.7 ±20.5 post treatment. There is a significant improvement (P = .001).

Scores of mobility assistance domain in PEDI (M assist)

The mean value of mobility assistance domain in PEDI 47.4 ±29 pre treatment, while it became 60 ±27.2 post treatment. There is a significant improvement (P = .001).

Total scores of care-assistance domain in PEDI

The mean value of total scores of care-assistance domain in PEDI domain in PEDI was 44.7±23.6 pre treatment, while it became 56.3 ±22.8 post treatment. There is a significant improvement (P = .001).

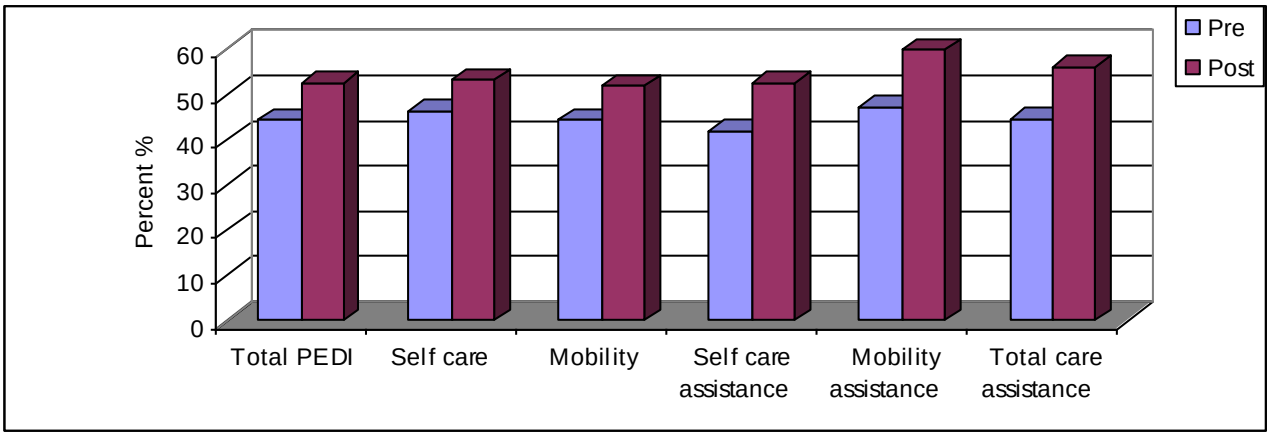

Fig. (2): Comparison of mean values of PEDI, pre and post treatment in VS group.

Traditional physical therapy group

Table (3): Comparison of mean values of GMFM, pre and post treatment in TPT group.

Pre GMFM		Post GMFM		Paired differences		P value
mean	SD	mean	SD	mean	SD	.0063
56.7	±20.1	58.4	±23.6	1.7	±4.2	

Total GMFM

The mean value of GMFM for TPT group was 56.7% ±20.1 pre treatment, while it became 58.4% ±23.6 post treatment. There is no significant improvement (P = .0063).(Table 2-1, Figure 2-1)

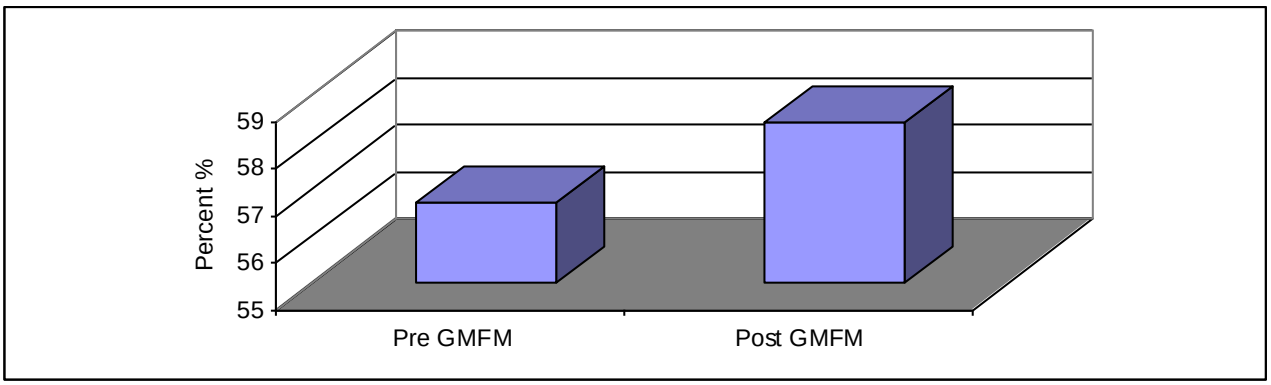

Fig. (3): Comparison of mean values of GMFM, pre and post treatment in TPT group.

Table (4): Comparison of mean values of PEDI, pre and post treatment in TPT group.

	Pre PEDI		Post PEDI		Paired differences		P value
	mean	SD	mean	SD	mean	SD	
Total PEDI	43.4	±20	45.3	±23	1.9	±8.4	0.273
self-care domain	45.2	±22	46.2	±20	1	±5.6	0.812
Mobility domain	41	±20	43.1	±21	2.1	±7.2	0.213
Self Care Assistance domain	44.2	±24.3	46.5	±23	2.3	±8.3	0.604
mobility Assistance domain	45.4	±23	46.9	±22	1.5	±6.1	0.165
Total care-Assistance domain Total	43.6	±22	44.5	±20	.8	±7.6	0.415

Total PEDI

The mean value of PEDI total for VS group was 43.4±20 pre treatment, while it increased to 45.3±23 post treatment. There is no significant improvement (P = .273).

SELF CARE domain in PEDI (SC)

The mean value of self-care domain scoring in PEDI for 45.2±22 pre treatment, while it became 46.2±20 post treatment. There is no significant improvement (P = .812).

Mobility domain in PEDI (M)

The mean value of mobility domain in PEDI 41 ±20 pre treatment, while it became 43.1±21 post treatment. There is no significant improvement (P = .213).

Scores of self-care assistance domain in PEDI SC assist

The mean value of self-care assistance domain in PEDI was 44.2 ±24.3 pre treatment, while it became 46.5 ±23 post treatment. There is no significant improvement (P = .604).

Scores of mobility assistance domain in PEDI (M assist)

The mean value of mobility assistance domain in PEDI 45.4 ±23 pre treatment, while it became 46.9±22 post treatment. There is no significant improvement (P = .165).

Total scores of care-assistance domain in PEDI

The mean value of total scores of care-assistance domain in PEDI domain in PEDI was 43.6±22 pre treatment, while it became 44.5 ±20 post treatment. There is no significant improvement (P = .415).

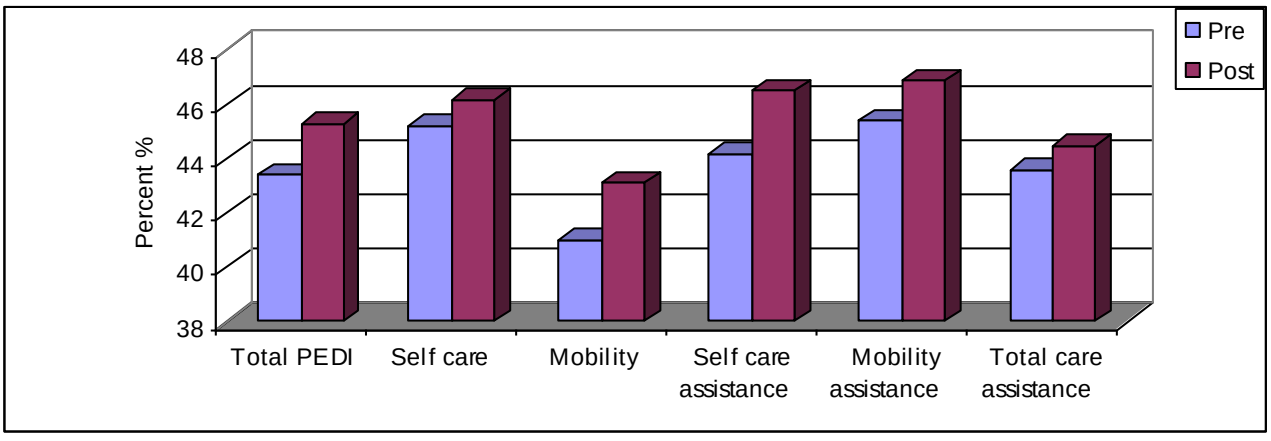

Fig. (4): Comparison of mean values of PEDI, pre and post treatment in TPT group.

DISCUSSION

In the present study, the effect of applying vestibular stimulation in addition to traditional treatment showed significant improvement in comparison to application of traditional physical therapy alone. The program, which was applied for 6 weeks, revealed a significant improvement in motor function of spastic CP children as measured by GMFM & PEDI. The aim of VS is to enable the children to master important tasks and participate in day-to-day activities in their environment.

A relationship between changes in muscle tone and changes in labyrinthine signals has been suggested in the rehabilitation literature. For example, the bobaths observed apparent changes in tone with changes of the position of the head in space[9].

Little research information is available to explain how the vestibular system is involved in controlling or coordinating motor skills, postural reflexes and developing exploratory behaviour. But it was hypothesized that the VS has an influence over all on-going sensory experiences and may activate synapses that previously have been dormant in children with vestibular dysfunction[12].

Ivey on 1980 used a round scooter board with uprights and a rim in providing VS for CP children, who had fair sitting balance. Improved head control, balance and use of arms and hands both while children were using the stimulator and after its use was noticed. Tonic neck reflexes may be temporarily partially inhibited to allow more bilateral midline grasp. Hypotonic clients have shown increased muscle tone. It is an excellent motivator[16].

In examining the therapeutic consequences of VS technique, a study compared behavioral measures between 12 CP children who were exposed to 16 sessions of horizontal and vertical semicircular canal stimulation over a four weeks period. A control group of 11 CP children was included. A quantitative evaluation of a series of reflexes and of gross motor skills showed a highly significant degree of improvement in VS group. Also showed improvements in fine motor control and in social/emotional behaviour[8,27]. Other studies have demonstrated similar improvements following semicircular canal stimulation. Normal infants showed improved motor performance in head, neck, and trunk control and in righting reactions. Infants with Down syndrome showed the greatest improvement in head control[8]. Sellick published a study on 1980,[27] where 20 CP children ranging in age from 8-56 months and covering most diagnostic categories were allocated in to a treatment group or to a control group after having been matched into pairs. Those in the treatment group received 16 sessions of controlled VS over a 4 weeks period, while the control children did not. A session comprised 10 spins in a hand-operated rotating chair, fitted with a velocity indicator and located in a darkened room. During the study, all the children continued with normal management, except that VS was not deliberately provided outside treatment sessions. Motor function was measured one week and 18 weeks after treatment, and the same gains were found for the control and experimental groups. These results conflict with the previous reports that VS is an effective therapy for CP. Some of the children in the study may have received early intervention program that may include some degree of VS while others may not[27].

The assumption is that patients receiving tactile or VS need this input to normalize their

nervous systems[37]. ElShazly on 1998 studied the effect of VS on CP's. In the study, 20 CP children with mild spasticity, age ranging from 3-6 years, were sub-classified in to two groups of equal number. First group received VS in addition to traditional therapy, while second group receive only traditional treatment. Program was performed for 8 weeks, 6 days/week. Gross motor skills were measured using GMFM. Results showed a significant improvement in the VS group which supported previous studies[12]. A number of researchers attribute improved motor development following VS to an enhanced interaction between the vestibulo-ocular and vestibulo-spinal systems. It was evident from observations made during and after treatment sessions that CP children vary in their response to VS in terms of postrotary nystagmus and individual tolerance[27].

It should be cautioned that not all children are tolerant of VS. Children with serious cardiovascular disorders, susceptibility to recurrent seizures, or who would not tolerate semicircular canal stimulation should be excluded from participation[8]. Motivation is the only child personality characteristic unrelated to the diagnosis of CP that was identified as a determinant of change in motor abilities. Children who are motivated to achieve motor abilities are more likely to actively participate in intervention than children who are not motivated[2].

Sleep which is a common complaint of parents of children with developmental disabilities. Reaching about 88%[3,24,25]. In present study, mothers reported improvement in children sleep after intervention ranged from 67% after VS intervention.

Lepage measured the quality of social life in 89 CP children and reported that 40% of these children experienced a very restricted social life. Moreover, various combinations of severe functional limitations were associated with a poor quality of social life, and about two thirds of children with walking problems encountered a restricted social life[21]. Therapists are encouraged to consider psychosocial aspects of the child as well as physical and social aspects of the environment in which the child lives[1]. Extreme social isolation may not be a direct consequence of impairment or disability, but that it might arise from severe functional loss and other factors such as dependency on others, restricted choices, physical barriers, lack of self-confidence in social skills, or previous experience of rejection[21].

In present study, observable improvements were seen not only in gross motor function, but also in other mental, social and behavioral status. Speech improvement was noticed in clarity of speech, volume and articulation. Some children showed increase in vocabulary, memory and concentration. Children started to show joy, anxiety, decrease fear, improved concentration and following of instructions and self -confidence. Became more social, playful and more eager to go out of the house and play. Some of them started to use bicycles and mothers also reported enjoyment of music and dancing. All of these improvements reduced the irritability of the child, decrease crying, improved sleep and has given great relief to caregivers. These changes in physical and mental status can influence mental and social development, as well as enhancing the quality of life. It had been noticed and reported by mothers of children in VS intervention. When reviewing the literature, it was found that same improvements had been reported in VS programs. Similar results have been documented in other studies following Hippotherapy[6,7,31,36]. Play may have a major

effect, as it provides physical, cognitive, social and emotional values to the child[30,38].

Study limitations included; Small sample size, absence of a detailed assessment of children IQ, detailed assessment of the children and parents psychological responses could not be provided with no psychologist participating in this study, the continuation of the effects of interventions after at least six weeks of the program could not be measured because of difficulty of controlling parents during such period (some families may continue to apply physio at home and hospitals while others may not), which may not reflect the actual effects of the interventions after such period. So studies over longer periods are recommended to check that progress does not slow down or even give way to regression if treatment of this intensity is continued for longer periods of time.

In conclusion; Vestibular stimulation program includes a special subset of play medium. Play that can provide CP children with opportunities to explore, learn, gain new skills and experience sensory input in a safe and satisfactory environment, a chance that they usually lack. Results of this study showed improvement in gross motor activities and functional skills following six weeks of Vestibular Stimulation in addition to traditional physical therapy program. Not all children will be able to join such program due to certain contraindications and not all children may have the same level of motivation.

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الملخص العربي

تأثير تنبيه جهاز الاتزان على الوظائف الحركية في الأطفال المصابين بالشلل الدماغى

تهدف هذه الدراسة إلى بيان اثر تنبيه جهاز الاتزان على الوظائف الحركية في الأطفال المصابين بالشلل الدماغى . وقد اشتملت عينة الدراسة على خمسة عشرة طفلا مصابين بالشلل الدماغي تتراوح أعمارهم بين 1-5 سنة لديهم القدرة على التجاوب السمعي والبصري ولديهم القدرة على التحكم في وضعية الرأس ولو جزئياً ولم يجر أي منهم أية عملية جراحية في السنة الأخيرة ولا يتعاطون أية أدوية بغرض تقليل التقلصات طوال الستة اشهر الأخيرة.

ولقد تم قياس الوظائف الحركية للأطفال عينة الدراسة قبل وبعد البرنامج العلاجي عن طريق طريقتين ثبت فعاليتهما في هذا المجال. وقد تضمنت الدراسة برنامجا علاجيا يشتمل على تنبيه جهاز الاتزان بالإضافة إلى العلاج الطبيعي التقليدي لمدة ستة أسابيع.

ولقد أظهرت النتائج تحسنا ملموسا في الوظائف الحركية في الأطفال عينة البحث مما يثبت فعالية البرنامج العلاجي المتضمن تنبيه جهاز الاتزان إلى جانب العلاج التقليدي .