Effect of Vestibular Stimulation Versus Whole Body Vibration on Standing Balance in Children with Spastic Diplegic Cerebral Palsy

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Received date: March 17, 2017; **Accepted date**: April 24, 2017; **Published date**: May 01, 2017

Abstract

Introduction: Most cerebral palsy children have deficits in balance, co-ordination, and gait throughout childhood and adulthood. So, it is essential to seek an ideal physical therapy program to help in solving such widespread problem. The present study was conducted to compare between the effect of whole body vibration and vestibular stimulation on standing balance in children with spastic diplegic cerebral palsy.

Method: 30 children were randomly assigned to group 1 (n=15, male: 11, female: 4, mean age: 6.2, SD 2.48) and group 2 (n=15, male: 8, female: 7, mean age: 6.9, SD 2.01). Balance was measured by Pediatric balance scale and parents perception on balance. Group 1 received vestibular stimulation in addition to conventional physiotherapy while group 2 received whole body vibration addition to the same physical therapy program given to the group 1.

Statistical analysis: Data was analyzed using Mann Whitney U test by taking the change of score from pre to post. To find out the difference between the groups for changed score of Pediatric balance scale. Independent T-test was used for Parents perception on balance and within group difference analysis was done using Wilcoxon Signed Rank test for both the group separately.

Results: The Group 1 and Group 2 showed an change of 21.10 and 9.90 ranks on PBS and 3.73 & 1.60 on

nerve Ẑbers and activates monosynaptic and polysynaptic reẑex arcs resulting in contraction of muscle.

Subconscious contraction of the muscles causes many more muscle Ẑbers to contract than in a conscious, voluntary movement [19] reẑected through the heightened EMG activity [20,21].

HXe eẉects of sustained vibratory stimulation on muscle contraction, posture and kinesthetic perceptions are much more complex than merely contraction of the muscle being vibrated.

Vestibular system is one of the main structures to maintain balance, as it serves as an absolute reference in relation to the others, such as visual and somatosensorial systems. Adequately administered vestibular stimulation has been reported to improve balance; the vestibular-spinal reẑex generates body motion compensation, to maintain head and postural stability, and thus preventing falls [22].

Vestibular system when stimulated elicits responses that facilitate, muscles, to evoke movements of head, trunk and limbs to compensate for postural sway. HXe cerebellum with input from the vestibular system provides balance, orientation & coordination [23].

Vestibular stimulation over a period of time would improve sensory integration and balance in individual with cerebral palsy [24]. Vestibular stimulation could enhance arousal level, visual exploratory behavior, motor development and balance and reẑex integration in infants who are at risk and in development delay disorders [25].

Research has concluded the eẉect of SI therapy & particularly vestibular stimulation for balance was eẉective in children with CP [26].

A comparative study between Suspension therapy and whole body vibration was done for improving standing balance in children with cerebral palsy. SigniẐcant diẉerence was observed in favor of suspension therapy which was attributed to the eẉect of spider cage on improving function of vestibular system through development of equilibrium reactions to maintain & regain balance during standing.

Application of vestibular stimulation for CP children led to signiẐcant improvement in standing balance. Also, the children showed a new strategy which would lead to an increase in exploratory behavior which would help them to maintain balance.

Aim of study: HXe aim of the study was to compare the eẉects of vestibular stimulation with whole body vibration on balance in children with spastic diplegic cerebral palsy.

Methodology

Study design

A pre-test post-test experimental study design

Sample size: 30 children randomly allocated to 2 Groups by chit picking.

Group 1: Conventional therapy and vestibular stimulation (n=15, male: 11, female: 4, mean age: 6.2, SD 2.48)

Group 2: Conventional therapy and Whole body vibration (n=15, male: 8, female: 7, mean age: 6.9, SD 2.01)

Study duration: 4 weeks

Inclusion criteria

Children diagnosed as spastic diplegic cerebral palsy, of either sex in the age group ranging from 3 to 12 years, could understand and follow commands given by the therapist and could stand independently or with one hand support for at least 10 seconds.

Exclusion criteria

Children with types of cerebral palsy other than spastic diplegia, History of convulsions/epilepsy, impaired cognitive function, negative tilt board tip test, any recent surgical procedure for correction of deformity, soH tissue release etc.,

Procedure

Informed consent was obtained from parents of children who fulẐlled inclusion and exclusion criteria and randomly assigned to Group 1 and Group 2 Pre-test measurements of the dependent variables pediatric balance scale (PBS) and parents perception on balance (PPB) were measured on recruitment for the study by one investigator, who was blind to the type of treatment given.

Paediatric Balance Scale (PBS) is a reliable measure of functional balance for school age children with mild to moderate motor impairments. Test retest reliability=0.87 to 1.0; interrater reliability=0.997; correlation=0.89 to 1.0 [55].

Parent's perception on balance (PPB) is a observational measure of functional balance of child by parents using Visual Analogue Scale. Parents were asked to grade child's standing balance on 0-10 scale.

Group 1 treated by conventional physiotherapy + Vestibular stimulation

Technique of application of Vestibular stimulation: Procedure was explained to the parents. SPINNING- Child was asked to sit on hammock and spun 10 times to the right and 10 times to the leH, SLIDING- Child was asked to lie in supine position on a large physio roll, then the child was accelerated forward and backward direction 10 times by holding both the legs, BOUNCING UP AND DOWN- Child was made to sit on a large physio roll, holding the child from pelvis by therapist then bounced the child vertically up and down for 5 minutes. Total treatment duration was10 minutes.

Group 2 treated by conventional physiotherapy + whole body vibration

Technique of application of W ' hhe puive

Both the groups received conventional physiotherapy which includes bridging, quadruped, kneeling, sit to stand, reaching. Treatment was given for 5 days a week for 4 weeks.

Data Analysis

Data was analysed using Mann Whitney U test by taking the change of score from pre to post. To Ẑnd out the diẉerence between the groups for changed score of Paediatric balance scale. Independent T-test was used for Parents perception on balance and within group diẉerence analysis was done using Wilcoxon Signed Rank test for both the group separately (Figure 1).

An alpha level of 0.05 of signiẐcance was set for both the tests.

Analysis was performed using SPSS package 23 version.

Results

Study demonstrated eẉect

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