

# Combined sensory motor approach to enhance participation of a child with west syndrome: a follow-up case study

## Abstract

This is a follow up case report of male child with West Syndrome, brought to Physiotherapy department at the age of 1 year with a chief complaint of unable to transit to sitting, standing and walking. He had poor ability to focus and orient to environment and poor somatosensory, kinesthetic, and proprioceptive awareness throughout his body. Parents also complained that he becomes aggressive and irritated on moving surfaces. Treatment strategies were targeted towards specific impairments of the sensory, neuromuscular, and musculoskeletal systems to improve his gross motor abilities. At the early age of 1 year the score of GMFM was 3.98% and GMFCS level was V. At the age of 5 years there was increase in score of GMFM with 84.07% and GMFCS changed to level II indicating level of independence is also improved. This suggest that participation of a child with West Syndrome can be improved with combine sensory motor approach.

**Keywords:** west syndrome, sensory-motor approach, community participation

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## Introduction

West syndrome (WS) is an epileptic syndrome of the infant occurring between the 3rd and 12th months of life.<sup>1</sup> Its incidence varies between 2.9 and 4.5 per 10,000 live births.<sup>2-5</sup> The prevalence is approximately 1/4000 -1/6000[6], and in 70% of cases, patients are male.<sup>2,3</sup> West syndrome is caused by a brain dysfunction whose origins can be prenatal, neonatal and postnatal.<sup>6</sup> It is an epileptic encephalopathy in which the deterioration of brain functions (cognitive, sensory and motor) is due to seizure.<sup>7</sup> Sensory integration (SI) theory was originally developed by A. Jean Ayres to focus on the neurological processing of sensory information.<sup>8</sup> SI theory is based on the understanding that interferences in neurological processing and integration of sensory information disrupt the construction of purposeful behaviors.<sup>9</sup> Interventions based on the classic SI theory use planned, controlled sensory input in accordance with the needs of the child and are characterized by an emphasis on sensory stimulation and active participation of the client and involve client-directed activities.<sup>10</sup>

The Neuro Developmental Treatment (NDT) method is currently perceived as one of the leading methods in the rehabilitation.<sup>11,12</sup> A key role in the method is played by the neural plasticity of the central nervous system (CNS): its ability to be changed (in both structure and functions) in response to stimuli such as various activities, changes in the environment etc.<sup>1</sup> It is now well known that gross motor movements are heavily dependent on sensory system.<sup>14</sup> Hence the purpose of this study is to combined sensory integration approach with NDT to enhance the home and community participation of a child.

## Case description

This is a follow-up cases study of 5 years old male child across his life from 1 year to 5 years. Rohit (changed name) was delivered by normal vaginal delivery and had a history of cry immediately after birth. Rohit's gross motor development was normal till 9 month of age

he was sitting independently at 9 month. According to parent report he had a history of seizures at the 10 month of age. There after he lost his sitting balance. He was then diagnosed as a case of West syndrome.

## Rohit at the age of 1 year

Rohit was brought to our therapy center by his parents with the chief concerns of inability to transit from supine to sit, sit independently, stand, and walk. When assisted to sit (against a wall or furniture), he could maintain sitting for a few minutes under supervision. For mobility he had to be carried manually or in a wheelchair.

He was completely dependent on parents for his activity of daily leaving. Rohit had poor ability to visually focus and orient himself to the environment. His also did not respond to sound and name when called. He showed poor somatosensory, kinaesthetic and proprioceptive awareness throughout his body. He showed avoidance of touching objects in his hands and dislike feet touching hard surface and grass. Rohit also used to become aggressive and irritated on moving surfaces such as a simple swing, car. Rohit had difficulty in understanding basic commands and his age appropriate cognitive abilities were also challenged.

In the neuromuscular system, Rohit had difficulty in recruiting postural muscles during various activities. Rohit could initiate postural muscle activity in sitting better than he could in standing but had difficulty sustaining it. His alignment and ability to sustain posture was poor in vertical postures. He could perform concentric and to some extent isometric muscle work, but he had extreme difficulty performing eccentric muscle work, with the trunk more affected than the extremities, and the lower extremities more affected than the upper extremities. Rohit demonstrated decreased co-activation of abdominal and back extensors, thus making it hard to assume and maintain vertical postures. As for the musculoskeletal system, he had poor strength generally in all postural muscles of the body. Tone of extremity and trunk muscles was towards lower side.

Quantitatively measuring his ability, Rohit scored 3.98% on the Gross Motor Function Measure (GMFM). He was on Gross Motor Functional Classification System (GMFCS).<sup>15</sup> Level V, as he was transported in a manual wheelchair.

### Intervention planning

Rohit's treatment program was based on combination of sensory integration and Neurodevelopment Treatment Approach.<sup>16</sup> This approach was directed not only towards physical independence, but it also targeted child's sensory aspects so that he could actively participate in society, like any other children. Strategies were targeted towards specific impairments of the sensory, neuromuscular, and musculoskeletal systems to improve his postural control, strength, and graded mid-range control using functional activities. He had one hour of therapy six times a week.

### Working on regulatory system

At the beginning of the session it was observed that Rohit shows self regulating behavior (shaking hands, rocking, grinding teeth) with poor awareness of environment and poor attention to activities. His treatment used to always start on suspended equipment (Platform swing) for vestibular stimulation. He was also wrapped in bed sheet and whole body compression with vestibular ball was given to stimulate proprioceptive and tactile system. These exercises helped to regulate his arousal to an optimal level and clam him so that he can actively participate in activity. These activities were also combined with visual and auditory stimulus with appropriate toys so that he can tract direction and movements can he facilitated in appropriate purposeful manner (Figure 1&2).



**Figure 1** Balancing over bolster.

### Working on gross motor function

After working on arousal, we began to work on appropriate functional goals. Treatment used to begin with Ball exercises to improve his postural control, mobility and stability. On ball we worked on sustained isometric contraction of trunk extensors to improve postural control. He was given reach-outs with stimulus of toys to improve mobility and stability was enhanced at proximal joints by pushing bolster in front and weight bearing on one extremity while

reaching with other. After working in prone position he was taken on sitting to develop trunk control and reach-outs were given in different plane to facilitate rotation component in the trunk. Weight shifting on ball activates vestibular system allowed him to learn to anticipate and correct his posture.



**Figure 2** Use of suspended equipment.

Then Rohit was taken to straddle sitting position on bolster and with feet weight bearing in front, he was given reach outs in sagittal plane to allow his COM to cross over the base and learn him to transit sit to stand. Therapist was all the time guiding and facilitating movement with appropriate sensory input. This had allowed him to gain control in trunk and further improve concentric, eccentric and isometric muscle work in lower extremity muscle. In standing, we worked for sustained postural control and balance on moving support surfaces such as tilt board, bolster. Activities such as ball catch and throw helped him to again develop anticipation to control balance and motor strategies for balance. Then stepping activities of step up and down on small height stool was taught to develop inter and intra-limb dissociation and improve co-activation at the trunk. Gait training was given with crossing bolster with on leg and placing it back with 5-6 repetitions. This activity allowed him to learn eye foot coordination and control graded movement on lower extremity.

### Working simultaneously on sensory and motor system

During the treatment session, providing meaningful sensory information was necessary to improve motor function. To achieve sitting, child was made to transit from stable to dynamic surface such as ball, it stimulated his vestibular system. Simultaneously visual tracking, auditory feedback and tactile stimulus with different texture were given to develop perception, direction, judgment, planning and anticipation to control posture and movement.

### Result

At the early age of 1 year (during the first visit for treatment), the score of Gross Motor Function Measurement (GMFM) was 3.98% and Gross Motor Functional Classification System Scale (GMFCS) level was V. There were sequential changes in gross motor abilities of Rohit during the period of his life journey, at the age of 5 years. There was increase in score of GMFM with 84.07%, which indicates that overall functional status of the child is improved with the combine

sensory motor approach. His GMFCS also decreased to Level- II indicating level of independence is also improved.

At the first visit to our outpatient department on GMFM lying and rolling component was 19.60% which is changed to 100% at the age of 5 years, sitting component was 3.33% at first visit which changed to 100% and other components like crawling and kneeling, standing, walking, running and jumping was 0% initially which has changed to 92.8%, 92.3% and 38.89% post treatment respectively.

## Discussion

The purpose of this case study was to document preliminary information of effectiveness of combine SI intervention and physical therapy for a child with west syndrome. Result identified significant post-intervention differences in GMFM may be due to treatment approach with combine therapy has helped the child to perceive better motor learning by modulating sensory perceptual issues. And there is well known fact that the sensory system does not produce movement but has a great role in modulating movement.<sup>17</sup>

The delayed in motor performance was predominantly due to self regulatory behavior. Self regulatory behavior serves as a regulatory function, which allow the child to process sensory information from the external environment and attend them without alternative, which cause sensory overload. Reduction of this self regulatory behavior may be indicative of a better ability to process sensory stimulus without need of regulatory strategies.<sup>18</sup> These strategies allowed the child to plan his movements during exercise and direct his attention towards toys during therapy sessions. Optimal tracking towards sound helped him to learn to anticipate posture and movement to much extent in these 5 years apart from sensory improvement. He could perform all his transitions right from rolling to supine to sit and further to standing on own. He could even walk 5-6 steps under supervision. Thus parents were relieved from carrying the child all the time and thus also improved his participation.

## Conclusion

Although movement and transitions are known be the basic concern for the child with developmental delay, sensory stimulation is equally important for the child movement modulation and actively participated in environment. Hence the present case report suggest that physiotherapy intervention with combined sensory and motor therapy helps to improve gross motor abilities as well as active participation of child with west syndrome in environment.

## Acknowledgement

There were no ethical issues and waiver was given from institutional Ethics committee.

## Conflicts of Interest

The authors declares no conflicts of interest.

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