

Recognizing the Sensory Abilities in Cerebral Palsy Children

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ABSTRACT

Objective: To evaluate the sensory abilities in different type of cerebral palsy (CP) children.

Design: Retrospective, chart review

Subject and method: This study was conducted at the Institute of Physical Medicine and Rehabilitation, Dow University of Health sciences from January 22, 2011 to March 23, 2011 in a period of 2 month. 60 CP children already diagnosed with required categories (hemiplegia, diplegia, and quadriplegia) without mental retardation between the ages from 4-8 years were included in this study after seeking consent from their parents, while CP children (Athetoid, ataxic, dystonic) below 4 years and above 8 years of age and other developmental disorders were excluded. Convenient sampling was used. A standardized questionnaire was developed to assess parent's perception of their children's sensory profile. It was a self-reporting questionnaire with five point scoring system. Trained Occupational Therapist assisted parents in filling out the form for the collection of data. **Result:** Data was analyzed by analysis of variance (ANOVA). the mean age was 5.47. Results show that 8 out of 38 items have significant value (p 0.05) on Item analysis. Mean value was calculated for each subtypes of CP, therefore classified them according to Dunn criterion on components of short sensory profile. On gender difference significant difference was found on tactile sensitivity, taste/smell sensitivity, under responsive /seek sensation and visual /auditory sensitivity.

Conclusion: The differences of classification in each subtypes on seven components along with significant differences on 8 items on short sensory profile indicates that CP children suffer from sensory processing disorder that interferes with their performance. Thus it draws an attention to wards a neglected side of palsy so that more accurate assessment and intervention planning could be implemented for effective rehabilitation program of cerebral palsy children.

Key words: sensory problems, cerebral palsy, sensory motor rehabilitation, Sensory integrative approach.

INTRODUCTION

Cerebral palsy (CP) comprises of a group of disorders related to movement and posture, the most common childhood physical disability. In CP, motor deficit is accompanied by sensory impairments along with difficulty in communication and behavioral problems that adversely affect the prognosis of disease.¹ The incidence of CP varies across various regions and World report on prevalence estimates for CP ranges from 1.5 to more than 4 per 1,000 live births,² more common in under privileged socio-economic populations.

Sensory processing deficit impede the CP child over all development, they are considered to be the primary or secondary to their motor problems interfering with

perceptual, intellectual and emotional development of CP children^{6,9} resulting in poor body awareness, abnormal body image and poor spatial relationship thus decreasing the ability to explore the environment.⁴

Sensory deficits are often neglected as parents are less aware of their child behavior towards sensory events. For the last twenty years researchers are now paying more attention towards the sensory needs of CP.⁶ Jerome in his study identified and compared sensory abilities between cerebral palsy and typical children⁶.

It is noted that Dysfunction in sensory processing along with motor deficits results in various abnormal functional behaviors of CP children.¹³ When CP child suffers sensory disorder it could lead to difficulties in the perceptual skills, speech development and emotional expressions.¹² Studies focusing on somatosensory deficits noted tactile processing disorders in CP,¹⁷⁻¹⁸ although, it is difficult to identify proprioceptive abilities and vestibular processing disorders due to neuro motor deficits.¹⁶

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Motor limitations along with sensory deficits limits the child exploration of environment and decreases the ability to experience different sensory stimuli.⁹ Blanche in her study described that traditionally more work was done on motor dysfunction of CP as compared to sensory dysfunction.¹⁸ However current theories are now emphasizing on sensory motor therapy approach^{7,9-10,16,18} as it plays an active role to enhance motor function and control.

Shamsoddin R. in his experimental study showed the effectiveness of sensory integration and vestibular stimulation to improve gross motor function in children with diplegic spastic CP.^{11,15} As per author's knowledge no studies so far have focused only on somatosensory abilities of cerebral palsy as only Jerome (2007) identified the sensory processing abilities in CP, but these sensory abilities were not compared among subtypes of CP because of small sample size (30 patients).⁶ He recommended that future studies should be done to compare sensory processing abilities among subtypes of CP as it would give better explanation on sensory processing problems within CP. On the basis of his recommendation this present study aims to recognize various sensory issues in different types of Cerebral Palsies. This is done by comparing the components and items on sensory profile among different types of cerebral palsy children.

METHODOLOGY

The study was conducted at Institute of Physical Medicine and Rehabilitation, Dow University of Health Sciences from January 22, 2011 to March 23, 2011 for period of two months. Convenience sampling was used. 60 CP children already diagnosed with required categories (hemiplegia, diplegia, and quadriplegia) without mental retardation (4-8 years) were included in this study after seeking verbal consent from their parents. The ethical review board of investigator has given the permission to this study. Permission to administer short sensory profile was also received from the author; its utilization was purchased by the institute. The study was a retrospective, chart review and occupational therapist was trained to assist the parents in filling out for collection of the data. After seeking the informed consent from the parents of the CP children short sensory profile was administered to collect data. The short Sensory Profile (Dunn, 1999) is a validated tool which is used for the standardized assessment and is designed to measure the sensory processes of children between the ages 3 to 10 years. This tool helps analyze information regarding the CP child's responsiveness to various sensory stimuli and identifies processing deficits in the sensory systems that may inhibit the child from

participating in daily activities. It contains 38 items. Care giver rates items on a five point-likert scale. The parents make subjective yet standardized ratings of their child's responses. Responses to each behavioral statement are as follows. It is graded under the heading of 1=always, 2=frequently, 3=occasionally, 4=seldom and 5=never. This screening form is used to evaluate functional behavior related to sensory processing disorder (McIntosh et al 1999). Scores that fall within one standard deviation of the mean for each category represent "Typical Performance." Scores that fall between one to two standard deviations below the mean fall into the "Probable Difference" category. Finally, scores that fall more than two SDs below the mean illustrate a "Definite Difference" on short sensory profile.²⁵

Data was collected by a trained occupational therapist. After data collection, scoring was done by using SPSS version 16. ANOVA was used for item analysis and T-test was used to compare gender difference on component score of short sensory profile.

RESULTS

Parents of 60 cerebral palsy children with hemiplegia, diplegia and quadriplegia participated in this study out of which 13 were hemiplegics (5 boys and 8 girls), 23 diplegics (13 boys and 10 girls) 24 were quadriplegics (20 boys and 4 girls), the mean age was 5.47. (see table 1 & table 2).

On various components of short sensory profile subtypes of cerebral palsy were classified according to Dunn's criterion. Results of children with hemiplegia indicate probable difference on tactile sensitivity (MEAN= 27.65), Taste /smell sensitivity (12.25) under responsive/seek sensation (MEAN= 25.13) auditory filtering (MEAN=21.54) and visual auditory (MEAN=15.69). However the Mean Value on movement sensitivity (MEAN=12.15) for hemiplegic children lies on typical performance. On contrary, definite difference was found on low energy/weak component (MEAN=14.53) of short sensory profile. On the other hand, the Mean Value of diplegic children on tactile sensitivity (MEAN=27.4) Taste /smell sensitivity (MEAN=13.08) movement sensitivity (MEAN=9.27) auditory (MEAN=21.04) scores these children on probable difference. Furthermore, definite difference was found on under responsive/seek sensation (MEAN=17.57), low energy (MEAN=14.91) and visual/auditory sensitivity (MEAN=13.31) component of short sensory profile. Further, the quadriplegic scores on probable difference where the mean value for Taste /smell sensitivity (MEAN=13.2), movement sensitivity

Table 1: Shows Total Number of Male and Female among Subtypes of CP

Types	Total	Male	Female
Hemiplegia	13	5	8
Diplegia	23	13	10
Quadriplegia	24	20	4
Total	60	38	22

Table2: Mean age

Minimum	Maximum	Mean age	Standard deviation
4	8	5.47	1.262

Table 3: Comparison of Response Score to Various Components on the Sensory Profile Among Subtypes Of Cerebral Palsy

Variables	Hemiplegia	Diplegia	Quadriplegia
	MEAN	MEAN	MEAN
Tactile sensitivity	27.65 PD	27.4 PD	25.34 PD
Taste/smell sensitivity	12.25 PD	13.08 PD	13.2 PD
Movement sensitivity	12.15 TP	9.27 PD	11.49 PD
Under responsiveness/ Seek sensation	25.13 PD	17.57 DD	22.09 DD
Auditory filter	21.54 PD	21.04 PD	19.79 DD
Low energy	14.53 DD	14.91 DD	13.23 DD
Visual /auditory sensitivity	15.69 PD	13.31 DD	14.67 DD

Key
TP=Typical Performance, PD= Probable difference, DD= definite difference

(MEAN=19.79). Conversely, on under responsive/seek sensation (MEAN=22.09) low energy/weak (MEAN=13.23) visual/auditory sensitivity (MEAN=14.67), these children scores on definite difference. (See table 3)

On item analysis, the result showed significant variation on 8 out of 38 items on short sensory profile. The P-value <0.05 was taken. Items analysis indicates significant lower mean on item,^{13,15-16,18,21,38} in diplegic CP children. On the other hand, the quadriplegic children had significant lower mean on 26 and 33 on short sensory profiles. (See table: 4)

On gender difference the mean value was taken out on components of short sensory profile. (See table 5) Statistically significant difference for male in

Table 5: Gender Difference on Component Score on Short Sensory Profile

Components	Gender	Mean SD	Mean SD	Mean SD
Tactile sensitivity	Male	27.8 8.2	29.1 4.5	23.5 8.1
	Female	27.6 6.8	24.8 8.3	29.0 3.9
	P-Values	0.97	0.164	0.06
Taste/smell sensitivity	Male	14.8 6.6	13.9 6.4	12.3 5.8
	Female	11.1 5.5	12.0 5.6	17.8 2.1
	P-Values	0.301	0.45	0.005
Movement sensitivity	Male	12.8 2.0	10.9 2.7	10.7 3.3
	Female	11.8 3.4	8.2 3.8	12.5 1.7
	P-Values	0.55	0.05	0.3
Under responsive/seek sensation	Male	29.2 4.7	18.5 7.6	20.9 7.4
	Female	22.6 6.3	16.4 6.8	26.3 5.6
	P-Values	0.05	0.5	0.2
Auditory filtering	Male	19.4 6.9	19.8 6.3	19.7 5.6
	Female	22.9 3.3	22.7 6.8	20.3 0.5
	P-Values	0.24	0.3	0.8
Low energy/weak	Male	15.6 4.2	14.1 6.0	13.3 5.1
	Female	13.9 4.8	16.0 5.7	13.3 2.5
	P-Values	0.5	0.4	1
Visual/auditory sensitivity	Male	15.4 1.5	13.2 5.7	13.3 4.0
	Female	15.9 5.1	13.5 4.1	13.3 4.6
	P-Values	0.8	0.8	0.04

quadriplegic on Taste /smell sensitivity (P-value 0.005) while for diplegic mean difference for female are significant (P-value 0.05) on movement sensitivity. On the other hand, female children with hemiplegia has significant variation on under responsive/seek sensation (P-value 0.05).Moreover on visual auditory in quadriplegic male have significant difference. (P-value 0.04)

DISCUSSION

This study helped to identify sensory problems and analyzed items of short sensory profile among subtypes of cerebral palsy. Mean values verified sensory problems in cerebral palsy children that interfere with the child performance. These differences are also significant on different components of short sensory profile; however it does not indicate significant difference among subtypes of cerebral palsy. Furthermore on item analysis results indicate significant difference for 8 out of 38 items within the group.

Children with cerebral palsy frequently have difficulty processing tactile information. Researchers identified that Poor tactile perception results in poor hand functioning.^{12,20-22} The present study verified the presence of tactile processing deficits among sub-types of CP, although no significant difference was found with in the group.

On the other hand, due to movement constraint it was difficult to assess vestibular processing disorder however; the results of present study showed that

Table 4: Comparison of Response Score to Each Item between Diagnoses

Item#	Description	Mean	SD	Mean	SD	Mean	SD	P-Values
1	Express distress during grooming (e.g light or cries during haircutting, face washing, finger nail cutting)	4.0	1.5	3.9	1.2	3.5	1.6	0.59
2	Prefer long sleeved clothing when it is warm or short sleeves hen it is cold.	4.2	1.5	4.5	0.9	3.9	1.7	0.29
3	Avoid going bare foot, especially in sand or grass	3.7	1.8	3.7	1.6	3.6	1.8	0.99
4	React emotionally or aggressively to touch	3.7	1.9	3.6	1.6	3.4	1.8	0.86
5	Withdraws from splashing water	4.1	1.4	4.0	1.6	3.9	1.7	0.91
6	Has difficulty in standing in line or close to line	4.2	1.3	3.4	1.7	3.5	1.8	0.41
7	Rub or scratch out a spot that has been touched	3.9	1.6	4.4	1.2	3.8	1.7	0.48
8	Avoid certain taste or food smells that are typically part of children's diet	2.9	1.7	3.6	1.9	3.7	1.8	0.36
9	Will only eat certain foods	2.9	1.8	2.9	1.7	2.7	1.9	0.95
10	Limit self to particular food textures	3.3	1.8	3.6	1.8	3.6	1.8	0.89
11	Picky eater, especially regarding food textures	3.5	1.9	3.1	1.7	3.2	1.7	0.76
12	Become anxious or distressed when leave feet grounds	4.6	0.8	3.8	1.6	4.3	1.3	0.22
13	Fear falling heights	3.5	1.5	2.3	1.6	3.5	1.9	0.04
14	Dislikes activities where head is upside down	4.0	1.4	3.6	1.6	3.7	1.5	0.75
15	Enjoy strange noises/seeks to make noise's sake	3.5	1.7	2.0	1.4	3.0	1.9	0.02
16	Seek all kind of movements and this interferes with daily routines	4.2	1.1	2.4	1.6	2.4	1.8	0.00
17	Become overly excitable during movement activity	3.5	1.6	2.7	1.7	3.1	1.5	0.41
18	Touches people and objects	2.9	1.7	1.7	1.3	2.7	1.5	0.02
19	Does not seem to notice when face and hands are messy	3.4	2.0	3.5	1.7	3.6	1.7	0.95
20	Jumps from one activity to another so that it interferes with play	3.6	1.5	3.0	1.7	3.7	1.6	0.35
21	Leave clothing twisted on body	4.1	1.5	2.4	1.7	3.5	1.6	0.01
22	Is distracted or has trouble functioning if there is a lot of noises around	3.0	1.6	3.2	1.9	3.1	1.8	0.96
23	Appears to not hear what you say (for example, does not "tune in" to what you say, appears to ignore you)	4.0	1.3	4.2	1.6	3.7	1.5	0.45
24	Can't work with background noises	4.0	1.3	3.4	1.9	3.9	1.4	0.47
25	Has trouble completing task when the radio is on	3.0	1.8	2.6	1.7	3.0	1.9	0.67
26	Doesn't respond when name is called but you the child's hearing is o.k	3.9	1.7	4.4	1.1	2.9	1.8	0.01
27	Has difficulty paying attention	3.7	1.3	3.2	1.7	3.2	1.7	0.61
28	Seems to have weak muscles	2.0	1.3	1.8	1.2	1.6	1.2	0.67
29	Tires easily especially when standing or holding particular body position	2.4	1.3	2.2	1.5	2.6	1.7	0.66
30	Has a weak grasp	2.5	1.6	3.1	1.6	2.0	1.5	0.08
31	Can't lift heavy objects	2.5	1.5	2.8	1.6	2.1	1.6	0.32
32	Prop to support self	2.5	1.3	2.3	1.4	3.3	1.7	0.06
33	Poor endurance/tries easily	2.7	1.4	2.8	1.5	1.6	0.9	0.01
34	Respond negatively to unexpected or loud noises	2.9	1.8	2.6	1.6	3.1	1.9	0.60
35	Hold hands over ears to protect ears from sound	3.5	1.8	3.4	1.8	3.7	1.6	0.82
36	Is bothered by bright lights after others have adapted to the light	3.3	1.8	3.1	1.5	2.5	1.9	0.28
37	Watches every one when they move around the room	1.8	1.4	1.7	1.1	2.4	1.6	0.19
38	Cover eyes or squints to protect eyes from light	4.2	1.5	2.6	1.7	3.0	1.9	0.03

Movement sensitivity was more pronounced in diplegic and quadriplegic indicating discomfort level when being moved. These finding correlates with results of Jerome study (2007).⁶

Additionally, on under responsiveness / seek sensation diaplegic and quadriplegic lie within definite difference indicative of poor modulation that interfere their daily life functioning. However, Quadriplegic children suffered from more auditory problems as compare to hemiplegic and diaplegic that is reason these children are unable to concentrate on task.

Moreover CP children exhibit poor endurance that causes inability to sustain on daily life rituals and play.

However it was difficult to differentiate that this problem was either because of neuro-motor deficit or their sensory processing problems.

In addition to it, on visual/auditory sensitivity component diaplegic and quadriplegic were more prone to face difficulty while perceiving auditory and visual stimuli that is needed to make an appropriate contact with each other. Blanche (1995), in his study also identified visual deficits among cerebral palsy,¹⁸ while Ayres (1965) signifies the importance of visual perception as bases for tactile discrimination.¹³

Though the results analysis indicate only significant difference on 8 items however on component of sensory profile children are classified according to Dunn criterion perhaps not significant variation was observed on these components. Hence this can be attributed to the inclusion criteria where CP children were selected without mental retardation. Researches indicate that CP with Mental retardation suffered various sensory disorders.²³⁻²⁴

As per author knowledge so far studies were done on the somatosensory aspect of cerebral palsy. However current work is more focused on sensory integration intervention. Previous studies only emphasized on application of sensory integrative therapy without identifying the sensory problems. This present study describes the nature of sensory processing problem among CP children that is a significant aspect in a research program and would be helpful for efficacy of intervention for sensory disorders. It also contributes to the continuous efforts toward parents awareness and health professionals so that they could adopt a new perspective in therapy for more accurate assessment and rehab intervention planning.

LIMITATION

The following are the limitation of the study:

More comprehensive results can be obtained with large sample size.

RECOMMENDATION

Further research with larger population is recommended to set up a more precise data and should include other remaining types of cerebral palsy children.

CONCLUSION

The sensory profile tool provides valuable information regarding the child's sensory experience by understanding a child sensory processing deficits in relation to his/her performance. This enables the therapist and parents to understand child's behaviors that contribute in planning an effective rehab treatment plan.

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