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Ocena czynników wpływających na skuteczność terapii integracji sensorycznej u dzieci w wieku przedszkolnym i wczesnoszkolnym

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Sensory processing abilities in relation to motor capabilities in children with different types of cerebral palsy

Zdolności przetwarzania sensorycznego w odniesieniu do zdolności motorycznych u dzieci z różnymi rodzajami mózgowego porażenia dziecięcego

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Abstract

Background and purpose. Children with cerebral palsy have sensory processing issues as well as motor problems, which lead to severe developmental disability. In this study, we aimed to assess correlation between sensory processing abilities and motor capabilities in children with cerebral palsy and assess the effect of cerebral palsy types on sensory processing abilities and motor capabilities.
Materials and methods. One hundred cerebral palsy children of both sex were included in the study; their age ranged from 4-10 years old were selected from pediatric rehabilitation out clinic of faculty of Physical Therapy Cairo University, fulfilling inclusion criteria. All children were assessed by Short sensory profile: to measure sensory processing ability, Gross Motor Function Classification System: to measure the gross motor skills and Manual Ability Classification System: to measure the fine motor skills.
Result. there was a significant correlation between GMFCS, MACS and the total score of SSP as well as Low energy weak, tactile sensitivity score, taste smell sensitivity, Movement sensitivity, and Under-responsive seeks sensation ($P \leq 0.05^*$). There was no significant correlations between both auditory filtering and Visual-auditory sensitivity with GMFCS and MACS ($P = 0.676$ and 0.266, respectively). There was statistical variation among different CP types regarding SSP and motor assessment ($P \leq 0.05^*$).
Conclusion. the study showed: sensory processing abilities effect on motor capabilities in children with cerebral palsy.

Keywords

sensory processing abilities, motor capabilities, cerebral palsy

Streszczenie

Tło i cel. Dzieci z mózgowym porażeniem dziecięcym mają problemy z przetwarzaniem sensorycznym oraz z motoryką, co prowadzi do poważnych niepełnosprawności rozwojowych. W niniejszym badaniu naszym celem było ocenienie korelacji między zdolnościami przetwarzania sensorycznego a zdolnościami motorycznymi u dzieci z mózgowym porażeniem dziecięcym oraz ocena wpływu rodzajów mózgowego porażenia dziecięcego na zdolności przetwarzania sensorycznego i zdolności motoryczne. Materiały i metody. W badaniu wzięło udział sto dzieci, obu płci, z mózgowym porażeniem dziecięcym w wieku od 4 do 10 lat, wyselekcjonowanych z ambulatoryjnej kliniki rehabilitacji pediatrycznej na Wydziale Fizjoterapii Uniwersytetu Kairskiego, spełniających kryteria włączenia. Wszystkie dzieci zostały ocenione za pomocą krótkiego profilu sensorycznego: aby zmierzyć zdolność przetwarzania sensorycznego, Systemu Klasyfikacji Funkcji Motorycznych: do mierzenia umiejętności motorycznych ogólnych oraz Systemu Klasyfikacji Zdolności Manualnych: do mierzenia umiejętności motorycznych precyzyjnych. Wynik. Stwierdzono istotną korelację między GMFCS, MACS a całkowitym wynikiem SSP oraz słabą energią, wrażliwością dotykową, wrażliwością na smak i zapach, wrażliwością na ruch oraz poszukiwaniem wrażeń przy zaniżonej reaktywności ($P \leq 0,05^*$). Nie stwierdzono istotnych korelacji między filtrowaniem słuchowym oraz wrażliwością wzrokowo-słuchową a GMFCS i MACS ($P = 0,676$ i $0,266$, odpowiednio). Stwierdzono statystyczne zróżnicowanie między różnymi typami MPD pod względem SSP i oceny motorycznej ($P \leq 0,05^*$). Wnioski. Badanie wykazało: wpływ zdolności przetwarzania sensorycznego na zdolności motoryczne u dzieci z mózgowym porażeniem dziecięcym.

Słowa kluczowe

zdolności przetwarzania sensorycznego, zdolności motoryczne, mózgowe porażenie dziecięce

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Introduction

Cerebral palsy (CP) is the most common disability of childhood that affects motor function as a result of injury to the developing brain. Expert executive panel defined CP as a group of permanent disorders of the development of movement and posture, causing activity limitation, which is attributed to non-progressive disturbances occurring in the developing fetal or infant brain [1].
The function of movement all over the day is affected in CP patients due to many motor problems they are suffering from. The primary problem in CP is gross motor dysfunction, Gross motor function refers to body alignment and postural control against gravity in a given context. We can judge and make assessment of the smooth co-ordinated performance between hand and upper extremity via accurate notice of fine motor manipulation when a child is involved in daily living activities, for that reason most of rehabilitation programmers and interventions are focused on motor skills [2].
A lot of problems of posture control and postural imbalance then abnormal movements those related to the CP patients are a corner stone in lack of normal sensory inputs that pass to the normal body sensory system. These restrictions build up an improper proprioceptive sense and further incorrect movement feedback; these outcomes limit the motor planning and learning of children with cerebral palsy [3].
Now years, process of sensory functions in cerebral palsy is a focused important issue to study. Blanche states that the traditional classification of cerebral palsy is based on motor dysfunction, Current theories of motor behavior support the notion that movement and sensation are related to each other, investigators now recognize that children with cerebral palsy exhibit sensory as well as motor deficits [4], thus, sensory processing skills and motor skills are relatively important for functional performance in daily tasks and participation [3].
In clinical practice, assumptions are often made that sensory processing problems contribute to difficulties in functional performance at home, school, or other community settings. However, little evidence is available in the literature regarding the relationships between behaviors associated with sensory processing abilities and functional skills [5].
Therefore, this study investigates the difference and relationship between sensory processing abilities and motor capabilities in children with cerebral palsy.

Materials and methods

This correlation study design was conducted in pediatric rehabilitation out clinic of faculty of Physical Therapy Cairo University. Short sensory profile questionnaire (SSP), Gross motor functional classification system (GMFCS) and manual ability classification system (MACS) were used to measure sensory and motor abilities.

Participants

Using the G*power version 3.1.9.7 to identify the sample size. A prior type of power analysis was used with α error probability of 0.05 and power (1-β error probability) equal to 0.95. A total of 100 participants was the minimum sample size for the investigation.
One hundred cerebral palsy children of both sex were included in the study; their age ranged from 4-10 years old. Any participant was excluded if she/he had any other comorbidities besides CP as mental health diagnosis, had chronic lung disease (CLD), had any physical malformation, had cardiac failure, had convulsions, had hydrocephalus and drug withdrawal, had visual, auditory and behavioral defect and Children with Uncooperative/ Unresponsive caregivers (Parents and family members).

Ethical consideration

The study was approved from the ethical committee of the faculty of physical therapy Cairo university 2018 (No (P.T.REC/012/002144).All child's parents enrolled in the study were informed about the study; all expected benefits of the study were explained before participation. Confidentiality was assured and a written informed consent was assigned prior to participation.

Instrumentation

Short sensory profile (SSP): The caregiver questionnaire provides a standard method for professionals to measure the sensory processing abilities of children and to profile the effect of sensory processing on functional performance in the children's daily lives [4].
The SSP is a 38 item caregiver report. There are seven sections on the SSP. They are - Tactile sensitivity, Taste/smell sensitivity, Movement sensitivity, Under-responsive/seeks sensation, Auditory Filtering, Low energy/Weak, Visual/Auditory sensitivity. 38 questions are framed under these seven sections [6], these items include functional behavior in daily activities that are symptoms of sensory processing disorders.

The scoring system

Using a five point likert scale, the parents responded to each behavior statement. It was graded under the heading of always, Frequently, Occasionally, Seldom and never.

Score frequency of behavior

1 always: when presented with the opportunity the child responds in the manner described every time or 100% of the time.
2 Frequently or 75% of the time.
3 Occasionally or 50% of the time.
4 Seldom or 25% of the time.
5 Never: When presented with the opportunity, the child never responds in the manner or 0% of the time.

Sensory category and factor scores are interpreted based on the normative data as being either "typical performance" A total score of 155 to 190 points is normal, 142 to 154 points mean a potential change, and 38 to 141 points mean a specific change in sensory processing [7]. The normal level coincides to the definite sensory processing capacities, while the probable difference and definite difference levels correspond to atypical sensory processing abilities.

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Table 1. Scoring system of SSP [7].

Section	Section Raw Score Total	Typical Performance	Probable Difference	Definite Difference
Tactile Sensitivity	/35	35 ------ 30	29 ------ 27	26 ------ 7
Taste/Smell Sensitivity	/20	20 ------ 15	14 ------ 12	11 ------ 4
Movement Sensitivity	/15	15 ------ 13	12 ------ 11	10 ------ 3
Underresponsive/Seeks Sensation	/35	35 ------ 27	26 ------ 24	23 ------ 7
Auditory Filtering	/30	30 ------ 23	22 ------ 20	19 ------ 6
Low Energy/Weak	/30	30 ------ 26	25 ------ 24	23 ------ 6
Visual/Auditory Sensitivity	/25	25 ------ 19	18 ------ 16	15 ------ 5
Total	/190	190 ------ 155	154 ------ 142	141 ------ 38

Gross motor functional classification system (GMFCS)

The GMFCS is a simple, 5-levels, ordinal grading system established to discuss the gross motor ability to do function of a patient with CP. The GMFCS explains self-started movement and usage of assistive devices such as (walkers, crutches, canes and wheelchairs) for move during an individual's daily activity. This classification system had been initially established to deal with children 2–12 years of age. [8].

The GMFCS assorts a child's movement capability into 5 levels: level 1: walks with no restrictions; level 2: walks with no restrictions, but there are limitations walking outdoors and in the community; level 3: walks with assistive devices, but with limitations when walking outdoors and in community; level 4: self-mobility with limitation; and level 5: self-mobility which is severely restricted, although the use of assistive technology [9].

The Manual Ability Classification System (MACS)

The MACS covers the age group between 4 and 18 years, The MACS levels of the children were determined by means of observation and parent reports.

MACS provides a systematic method to classify how children with CP use their hands when handling objects in daily activities. The MACS is used according to self-initiated manual capability, with accurate assurance on handling objects in an individual's personal space (the space immediately close to one's body, as distinct from objects that are not within reach).The Manual Ability Classification System (MACS), which classifies the child's ability to handle objects into five levels: level 1: handles objects easily and successfully; level 2: manipulate most objects but with slightly decreased quality and/or speed; level 3: handles objects with difficulty, so it is a must to make a change in activities; level 4; handles a limited selection of easier objects to manage in adapted situations; level 5: absolute handle objects [10].

Procedures

• Firstly, explain to the parent the purpose of the study and what is going to do in the session.
• The parent will be invited to sign a consent form for participation in the study.
• Upon obtaining the written consent form, the therapist evaluate sensory processing abilities through parent interview using the short sensory profile questionnaire.
• Observe the child's behavior during the assessment process and apply notes about it.
• Once data were collected, SSP sub items were scored and can detect the level of sensory abilities according to normative data as describe previously.
• The therapist classify the children gross and fine motor function according to the GMFCS and MACS as previously describe.
• MACS levels are determined by therapist observation and parent reports.
• After observing the child, also obtained additional information from the parents concerning the typical performance of the children at home and school, in relation to the use of their hands, such as playing, feeding, and using materials at school.

Statistical analysis

All statistical analyses were conducted using SPSS software version 22. A Comparison between the different CP types concerning the SSP assessment of the patients was conducted utilizing MANOVA, and post hoc tests were utilized to perform multiple comparisons between groups. In addition, pairwise comparisons were conducted between groups. Associations between SSP, GMFCS, and MACS were examined by calculating Spearman's Rho correlation coefficients (rs). Spearman's Rho coefficient (rs) was interpreted using the following criteria: $rs \geq 0.8$ very strong relationships; $0.6 \leq rs < 0.8$ strong relationships; $0.4 \leq rs < 0.6$ moderate relationship; $0.2 \leq rs < 0.4$ weak connections; $rs < 0.2$ very weak relationship Mean ± standard deviation (± SD) and percentage expressed the data. The significance level for all statistical tests was set at $P < 0.05$.

Results

General characteristics of the subjects

A total of 100 children were included in the investigation, and their mean age was 7.4 years old and ranged from 4 to 10 years. The participants were separated into six CP types, including, Spastic diaplegia (46 patients), spastic quadriplegia (13 patients), spastic hemiplegia| (17 patients), dyskinesia (9 patients), ataxia (7 patients), and mixed (8 patients) (Table 2).

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Table 2. The patient's characteristics

CP type (n = 100)	Spastic diaplegia	Spastic quadriplegia	Spastic hemiplegia	Dyskinesia	Ataxia	Mixed
N = 100	N = 46	N = 13	N = 17	N = 9	N = 7	N = 8
Age [yrs; mean ± SD]	7.3 ± 1.9	7.6 ± 2.2	7.3 ± 2.2	7.9 ± 2.1	7.7 ± 1.9	7.8 ± 1.6

SD: Standard deviation

Relation between sensory and motor assessment
Associations between SSP, GMFCS, and MACS were examined by calculating Spearman's Rho correlation coefficients (rs). A significantly correlation at ($P \leq 0.05$). (Table 3).
A significantly strong correlation between GMFCS, MACS and SSP total as well as Low energy weak, a moderately significant correlation was identified between GMFCS, MACS and Tactile sensitivity score. Significant weak relation between GMFCS, MACS and scores of Taste smell sensitivity, Movement sensitivity, and Under-responsive seeks sensation, there were no significant correlations between both auditory filtering and Visual-auditory sensitivity and GMFCS, MACS.

Table 3. Relation between the sensory screen scores and motor evaluation levels of the patients

	GMFCS		MACS	
	r_s	P-Value	r_s	P-Value
SSP Total score	−0.646	P ≤ 0.05*	−0.963	P ≤ 0.05*
Tactile sensitivity	−0.405	P ≤ 0.05*	−0.471	P ≤ 0.05*
Taste smell sensitivity	−0.341	0.001*	−0.286	0.004*
Movement sensitivity	−0.266	0.007*	−0.323	0.001*
Under-responsive seeks sensation	−0.204	0.042*	−0.17	0.09
Auditory filtering	−0.042	0.676	−0.084	0.405
Low energy weak	−0.748	P ≤ 0.05*	−0.802	P ≤ 0.05*
Visual-auditory sensitivity	−0.112	0.266	−0.135	0.179

*rs: Spearman's Rho correlation coefficients, P-value: Probability value, *: significance*

Comparison between the levels of different motor assessment levels regarding SSP
Post hoc tests indicated that there were statistically significant differences at ($P \leq 0.05$) among different levels of the gross and motor evaluation (GMFCS and MACS) regarding SSP total score in patients with CP (Table 4).

Table 4. Comparison between the levels of fine, gross motor evaluation of the patients in different CP types

Levels	I	II	III	IV
GMFCS SSP Total score	156.1 ± 8.1 (n = 7)	142.9 ± 16.8 (n = 25)	130.5 ± 14.8 (n = 26)	127.2 ± 18.7 (n = 11)
MACS SSP Total score	142.5 ± 3.6 (n = 2)	147.6 ± 15.4 (n = 22)	138.7 ± 9.6 (n = 31)	117.6 ± 8 (n = 21)

Multiple Comparisons between levels	P-Value	F-Value
GMFCS	P ≤ 0.05*	15.532
MACS	P ≤ 0.05*	22.17

Comparisons between the levels	P-Value		F-Value	
	MD	P-Value	MD	P-Value
I vs. II	13.18	0.075	−5.05	0.94
I vs. III	25.64	P ≤ 0.05*	3.82	0.842
I vs. IV	28.96	0.004*	24.74	0.005*
I vs. V	37.9	P ≤ 0.05*	24.88	0.033
II vs. III	12.46	0.068	8.87	0.361
II vs. IV	15.78	0.217	29.78	P ≤ 0.05*
II vs. V	24.67	P ≤ 0.05*	29.92	P ≤ 0.05*
III vs. IV	3.32	1.00.	20.92	P ≤ 0.05*
III vs. V	12.21	0.013	21.05	P ≤ 0.05*
IV vs. V	8.89	0.761	0.14	1

*p-value: Probability value, *: significance*

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SSP sensory assessment outcomes

A Comparison between the different CP types concerning the SSP assessment of the patients was conducted between subjects MANOVA. There were statistical variation among different CP types ($P \leq 0.05$*) the mean SSP score of the included CP types was as follows: Spastic diaplegia: 133.5, Spastic Quadriplegia: 123, Spastic hemiplegia: 151.5, Dyskinesia: 110.1, Ataxia: 131.3, and Mixed: 117.2 (Table 5).

Table 5. The sensory evaluation of the patients (data in Mean ± SD)

CP type (n = 100)	Spastic diaplegia	Spastic quadriplegia	Spastic hemiplegia	Dyskinesia	Ataxia	Mixed
SSP	133.5 ± 16.3	123.9 ± 12.7	151.5 ± 9.4	110.1 ± 11.8	131.3 ± 6.7	117.2 ± 12.3
Tactile sensitivity	26.76 ± 4.9	24.2 ± 3.4	30.2 ± 2.8	20 ± 2.9	21.7 ± 3.1	24.5 ± 1.6
Taste smell sensitivity	14.4 ± 5.03	12.2 ± 5.3	19.4 ± 1.3	14.3 ± 6.8	12.9 ± 4.2	14.5 ± 6.4
Movement sensitivity	10.4 ± 4.5	9.2 ± 3.7	12.2 ± 2.7	5 ± 1.9	11.6 ± 2.1	8.4 ± 5.1
Under-responsive seeks sensation	22.7 ± 5.4	25.1 ± 5.02	25.6 ± 3.1	22.1 ± 4.01	25.6 ± 2.6	22.8 ± 4.6
Auditory filtering	24.8 ± 4.9	25.9 ± 2.2	24.6 ± 3.7	22.7 ± 2.9	24.7 ± 2.1	24.1 ± 3.9
Low energy weak	14.1 ± 5.5	8.7 ± 1.9	21 ± 3.8	8.8 ± 2.2	18.1 ± 5.6	8.9 ± 1.9
Visual-auditory sensitivity	19.5 ± 3.4	20.2 ± 1.4	19.1 ± 2.3	18.4 ± 1.7	16.1 ± 4.5	16.4 ± 4.8

SD: Standard deviation

Post hoc tests were utilized to perform multiple comparisons between groups. statistical significant variation was observed among: Diaplegia vs. Hemiplegia and Dyskinesia, Hemiplegia vs. Quadriplegia, Dyskinesia, Ataxia and Mixed, Dyskinesia vs. Ataxia ($P \leq 0.05$).

Table 6. Comparison between the CP types regarding the sensory evaluation of the patients

	P-Value	F-Value
SSP	$P \leq 0.05$*	14.28
Multiple Comparisons Between Each CP Type	**SSP**	
	MD	**P-Value**
Diaplegia vs. Quadriplegia	9.61	0.252
Diaplegia vs. Hemiplegia	−18.01	$P \leq 0.05$*
Diaplegia vs. Dyskinesia	23.35	0.002*
Diaplegia vs. Ataxia	2.17	0.988
Diaplegia vs. Mixed	16.33	0.055
Hemiplegia vs. Quadriplegia	27.62	$P \leq 0.05$*
Hemiplegia vs. Dyskinesia	41.36	$P \leq 0.05$*
Hemiplegia vs. Ataxia	20.18	$P \leq 0.05$*
Hemiplegia vs. Mixed	34.35	$P \leq 0.05$*
Quadriplegia vs. Dyskinesia	13.74	0.147
Quadriplegia vs. Ataxia	−7.44	0.539
Quadriplegia vs. Mixed	6.72	0.827
Dyskinesia vs. Ataxia	−21.17	0.006*
Dyskinesia vs. Mixed	−7.01	0.829
Ataxia vs. Mixed	14.16	0.123

*P-value: Probability value, *: significance*

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GMFCS and MACS assessment results

The motor assessment outcomes indicated a statistical difference between the different CP types regarding the GMFCS and MACS ($P \leq 0.05$).

Table 7. Illustrates the frequency of the patients in different gross and fine motor levels among the types of CP (data in N (%)

CP type (n = 100)		Spastic diaplegia	Spastic quadriplegia	Spastic hemiplegia	Dyskinesia	Ataxia	Mixed	Total
MACS	I	0	0	7 (41.2%)	0	0	0	7 (7%)
	II	12 (26.1%)	0	9 (52.9%)	1 (11.1%)	2 (28.6%)	1 (12.5%)	25 (25%)
	III	20 (43.5%)	0	1 (5.9%)	0	5 (71.4%)	0	26 (26%)
	IV	7 (15.2%)	2 (15.4%)	0	1 (11.1%)	0	1 (12.5%)	11 (11%)
	V	7 (15.2)	11 (84.6%)	0	7 (77.8%)	0	6 (75%)	31 (31%)
GMFCS	I	2 (4.3%)	0	0	0	0	0	2 (2%)
	II	9 (16.9%)	0	11 (64.7%)	1 (1.11%)	1 (14.3%)	0	22 (22%)
	III	19 (41.3%)	0	6 (35.3%)	0	5 (71.4%)	1 (12.5%)	31 (31%)
	IV	13 (28.3%)	3 (23.1%)	0	1 (1.11%)	1 (14.3%)	3 (37.5%)	21 (21%)
	V	3 (6.5%)	10 (76.9%)	0	7 (77.8%)	0	4 (50%)	24 (24%)

N: Number,%: percentage

Post hoc tests were utilized to perform multiple comparisons between groups. based on the GMFCS assessment results statistically significant variations were determined between: Diaplegia vs. Quadriplegia and Hemiplegia, Hemiplegia vs. Quadriplegia and Mixed, and Quadriplegia vs. Ataxia. ($P \leq 0.05$). Furthermore, depending on the outcomes of the MACS assessment statistical significant was detected between the following CP types: Diaplegia vs. Quadriplegia, and Dyskinesia, Hemiplegia vs. Quadriplegia, Dyskinesia, and Mixed ($P \leq 0.05$).

Table 8. Comparison between the CP types regarding the motor evaluation of the patients

	P-Value
GMFCS	$P \leq 0.05$*
MACS	$P \leq 0.05$*

Multiple Comparisons Between Each CP Type	GMFCS P-Value	MACS P-Value
Diaplegia vs. Quadriplegia	0.002*	$P \leq 0.05$*
Diaplegia vs. Hemiplegia	0.001*	0.136
Diaplegia vs. Dyskinesia	0.099	0.013*
Diaplegia vs. Ataxia	1.000	1.000
Diaplegia vs. Mixed	0.201	0.072
Hemiplegia vs. Quadriplegia	$P \leq 0.05$*	$P \leq 0.05$*
Hemiplegia vs. Dyskinesia	$P \leq 0.05$*	$P \leq 0.05$*
Hemiplegia vs. Ataxia	0.966	1.000
Hemiplegia vs. Mixed	$P \leq 0.05$*	$P \leq 0.05$*
Quadriplegia vs. Dyskinesia	1.000	1.000
Quadriplegia vs. Ataxia	0.014*	0.015*
Quadriplegia vs. Mixed	1.000	1.000
Dyskinesia vs. Ataxia	0.127	0.115
Dyskinesia vs. Mixed	1.000	1.000
Ataxia vs. Mixed	0.196	0.286

*P-value: Probability value, *: significance*

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Discussion

The purpose of this study was to asses: The relationship between the sensory processing abilities (as a total and sub items) and motor capabilities in children with cerebral palsy and asses the sensory processing abilities and motor capabilities based on CP subtypes.

According to previous studies addressing functional deficits in children with CP, reported that muscle strength, trunk control, and postural stability are important factors affecting activity performance [11]. But, functional deficits in individuals with CP might also be related to deficits in sensory processing, defined as impairment- in multisensory integration, necessary to provide adaptive responses to environmental demands [12].

So, this study explore possible links that will help to interpret how different sensory tendencies might influence and relate to motor and process skills associated with occupation.

According to the study outcomes, a significantly strong correlation between GMFCS levels and MACS levels with the total score of SSP, these results mean that children with CP whose gross motor and manipulative functional capabilities in ADL are better; e.g., at level 2 or level 3, their sensory system capabilities are better than the others with MACS and GMFCS levels of 4 or 5.

Myoung-Ok Park [3] showed that MACS and GMFCS variables affected the SSP total score: as MACS level increased and GMFCS level increased, SSP total score also increased.

Durga et al [13] support the result of our study that found a strong correlation between SSP Scores and GMFCS level which indicate children having more sensory processing dysfunction have less functional mobility.

This study identified significant correlations between SSP sub-items and both GMFCS and MACS in children with CP. According to the finding, the SSP sub-items a significantly correlation between GMFCS, MACS levels and the score of Low energy weak, tactile sensitivity score, taste smell sensitivity, Movement sensitivity. However, there were no significant correlations between both auditory filtering and Visual-auditory sensitivity and GMFCS, MACS.Finally significant weak relation between Under-responsive seeks sensation and GMFCS but no significant relation with MACS.

The results of this study showed that gross and fine motor levels were correlated with the SSP sub-items, these items are all influenced by the vestibular system. According to Hosseini et al [14] children with CP with sensory processing problems showed insecurity to antigravity. The ability to integrate gravity is important for the normal improvement process. Various studies have shown that children's vestibular systems are important for postural control and gross motor performance In particular, the vestibular sense is related to balance and motor coordination and is a corner stone for gross motor capability and postural control Østensjø et al [15].

In this study investigated the difference between the gross and fine motor levels on sensory processing total score, The result indicated that there were statistically significant differences among different levels of the gross and fine motor evaluation (GMFCS and MACS) regarding SSP total score in patients with CP as follow: GMFCS level II = III > IV = V MACS level I = II = III > IV = V. The most significance difference among level I and levels IV and V, level II and level V in GMFCS and there was no difference between levels I = II and levels IV = V in GMFCS.

Our result agree with the result of the study done by Durga et al [13] that found there were significant differences between functional performance levels and sensory processing levels in children. The results of post hoc testing showed that GMFCS levels 5 and 1 showed the most significantly mean difference in SSP total score. This means that sensory processing abilities are different for children with severe limitations in self-mobility versus those capable of independent walking without restrictions.

Also The most significance difference among level I and levels IV ,level II and levels IV and V in MACS and there was no difference between levels I = II and levels IV = V in GMFCS.

Myoung-Ok Park [3] concluded in his study a significant change between gross and fine motor skill levels in sensory processing levels in children. The findings after hoc examination explained that GMFCS grades 2 and 3 presented the same in SSP total scores, and GMFCS levels 4 and 5 displayed similar in SSP total scores. On the other side, GMFCS levels 2 and 5 presented the most significantly mean change in SSP total score. This showed that sensory processing capabilities are different for children with severe lowering in self-mobility in comparison to those capable of independent walking with no restrictions. The SSP total scores were the same at levels 2, 2 and 3 compared with 4 and 5 in MACS. The SSP total scores displayed the most significant mean changes between levels 1 and 5 in MACS. These results asserted that the sensory processing capabilities of children with CP differ between good and poor in the manipulation ability of the upper limb and hands.

Some studies have focused on the somatosensory abilities of CP as Jerome and Ashwini [4] identified the sensory processing abilities of cerebral palsy, but these sensory abilities were not compared among subtypes of cerebral palsy. He recommended that future studies should be done to compare sensory processing abilities among subtypes of CP as it would give better explanation sensory processing problems within CP.

So, on the basis of his recommendation this present study aims to recognize various sensory issues in different types of CP. this done by comparing the component and items on sensory profile among different types of cerebral palsy children.

The findings of the study indicated that there was statistical variation among different CP types. According to our result the most type of cerebral palsy had impairment of sensory processing abilities was dyskinesia followed by mixed, quadriplegia, ataxia, diaplegia and finally hemiplegia that have greater sensory processing difficulty than typical children that the finding of SSP score indicate hemiplgic children have probable difference not typical performance as typical children.

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Jovellar-Isiegas et al [16] found out that hemiplegic CP children have greater difficulty in sensory processing than typical development children.
The most significant variation detected between hemiplgic cerebral palsy and all other subtypes of cerebral palsy according to SSP score as a total items. And this may be due to unilateral brain impairment in periventricular white matter, cortex and sub cortex to in hemiplegic cerebral palsy according to Rosenbaum et al [17].
According to our study results for assessment various component of Short Sensory Processing for subtypes of cerebral palsy, the result of diaplegic cerebral palsy indicated probable difference on tactile sensitivity, taste /smell sensitivity and movement sensitivity. On contrary the definite difference was found on Under-responsive seeks sensation and low energy weak, but the typical performance was found on Auditory filtering and visual-auditory sensitivity, this mean that the under responsive seeks sensation and weak muscles and low energy were the most sensory issues in diaplegic cerebral palsy children.
The result of our study supported with the result applied by Kunal et al [18] that stated a sensory-seeking issue (a kind of sensory modulation disorder) was seen most in children with cerebral palsy. It was prevalent in 73.33% (22 children with 18 definite and 4 probable) with DCP. Weak muscles and low energy were the second sensory issue that was seen in the same 73.3% of children (16 definite and 6 probable).
Nabila et al [19] stated that, on under responsiveness / seek sensation diaplegic and quadriplegic lie within definite difference indicative of poor modulation that interfere their daily life functioning.
In this study the most components of SSP affected in the quadriplegic children were movement sensitivity, low energy weak and tactile sensitivity these finding correlates with results of Jerome study[4], That Movement sensitivity was more pronounced in diplegic and quadriplegic indicating discomfort level when being moved.
Wiingert et al [20] reported that children with cerebral palsy frequently have difficulty processing tactile information. Researchers identified that Poor tactile perception results in poor hand functioning.
According to our result sub items of SSP (tactile sensitivity, taste and smell sensitivity, auditory sensitivity, visual – auditory sensitivity and movement sensitivity) in hemiplegic CP children had scoring as typical performance.
This result agreed with Jovellar-Isiegas et al [16], had a sample group of hemiplegic CP participants, all independently mobile. They noted significant differences in body position, oral sensory systems and socio-emotional responses in comparison to their typically developing peers. They found no significant differences in scores between groups in auditory, visual, tactile or movement sub sections of the Sensory Profile.
In dyskinetic children the sub items (tactile sensitivity, under responsive seeks sensation, movement sensitivity and low energy weak) of SSP scoring as different performance this due to The basal ganglia, cerebellum, thalamus, and their connections, coupled with altered sensory input, seem to play a key part in abnormal sensorimotor integration also in ataxic patient the most affected items of SSP was tactile sensitivity.
The result of our study indicated that the highest number of patients at GMFCS 5 and the lowest number at GMFCS level 1.
This result agreed with the result of study by Deepthi et al [21] that told that lowest number at GMFCS level 1 and and the highest number at level 5 reflecting higher morbidity here.
And disagree with Howard et al [22] showed that the Gross motor function varied from GMFCS level I (35%) to GMFCS level V (18%) in CP patients.
Most of patients with spastic diaplegia were at GMFCS level 3and 2 respectively, all patients with spastic quadriplegia were at GMFCS levels 5, 4 respectively Most of the children with hemiplegia were in levels 1 and 2. The majority of the patients of dyskinesia and mixed CP at GMFCS level 5 finally Most of the children with ataxic CP were in levels 3.
On assessing hand function in the 100 children by MACS among the cases with spastic quadriplegia were at levels 5 and 4. Most patients with diaplegia CP were at levels 3, 4. the most patients with hemiplegia at level 2, More than half patients with dyskinesia and Mixed CP at MACS levels 4 finally most of ataxic CP patients at MACS level 3.
This is in line with the findings of the study done by Deepthi et al [21] among the 47 patients with spastic quadriplegia, more than half were in GMFCS levels 5 and none at GMFCS level 1. This shows that most of the quadriplegic patients were unable to maintain antigravity head and trunk postures and could not control their limb and trunk movements. A similar distribution in the GMFCs levels among patients with spastic quadriplegia with none at level 1 has been reported by Gunnel.M.K et al [23].
The majority of the cases with spastic hemiplegia were in GMFCS levels 1 & 2 they had better gross motor function than hand function and most were able to walk without limitation or with the help of a stick Similarly, Deepthi et al [21] did study with the same result.
The result of study about the dyskinetic and mixed patients agree the result of Monbaliu et al [24]. That told, among the cases with dyskinetic CP, more than half had GMFCS level 5 and those with mixed CP, the most were at level 5 indicating severe motor disability Because of the abnormal tone and posture these children are usually severely incapacitated.
According the results of the study the MACS level was most affected in children with more neurological impairment as in spastic quadriplegia, dyskinetic and mixed CP and this come with agreement with Carnahan et al [25] that stated MACS level was most affected in children with more neurological impairment as in spastic quadriplegia, dyskinetic and mixed CP.Upper limb function was least affected in children with spastic dilpegia. As MACS levels assess the overall performance of the child in doing activities with both hands the hemiplegics were at levels 1,2,3 with fewer at higher levels, That limitations in hand function are common in all types of CP with characteristics of the disability varying considerably between different CP subtypes.
Carnahan et al [25] found a greater impairment of manual ability vs. gross motor ability in the hemiplegic group, while the opposite held for the diplegic group. Children with dyskinetic CP showed a global dysfunction profile affecting both manual and functions.

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According to our result the most significant variation determined between hemiplegic patient and the most other types of CP this is may be due to unilateral impairment in the hemiplegic patient.

Limitations

The current academic work has specific limitations. On one level, this study encompassed Small subgroup sample size to give considerably better statistical data analysis, On another level, Short sensory profile was applied by the caregiver and this is subject to sociocultural differences, also some of the items in SSP are poorly worded so it becomes challenging to some caregivers, Finally Sensory responses were considered only in the context of behavioral observations via caregiver's reporting and not indirect observations.

Conclusions

Taking the current study's results into consideration, it is possible to conclude that sensory processing abilities correlated with motor capabilities in children with cerebral palsy, and cerebral palsy type effect on sensory processing and motor abilities.

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Piśmiennictwo/ References

1. Sudip Paul, Anjuman Nahar, Mrinalini Bhagawati, and Ajaya Jang Kunwar. A Review on Recent Advances of Cerebral Palsy. Oxidative Medicine and Cellular Longevity. (2022); 22(4):1-20.
2. Urga Prasad and Mishra Gargi Mishra. Sensory processing/Integration Dysfunction Affects Functional Mobility of Children with Cerebral Palsy. J Neonatol Clin Pediatr. (2020); 7(43): 1-7.
3. Myoung-Ok Park. The Relationship between Sensory Processing Abilities and Gross and Fine Motor Capabilities of Children with Cerebral Palsy. J Korean Soc Phys Med. (2017); 12 (2): 67-74.
4. Jerome Anto Prakash, Ashwini Vaishampayan. A PRELIMINARY STUDY OF THE SENSORY PROCESSING ABILITIES OF CHILDREN WITH CEREBRAL PALSY AND TYPICAL CHILDREN ON THE SENSORY PROFILE. The Indian Journal of Occupational Therapy. (2007); 5 (2): 27-34.
5. Barbara Prudhomme White, Shelley Mulligan, Kristen Merrill, Janet Wright. an Examination of the Relationships Between Motor and Process Skills and Scores on the Sensory Profile. The American Journal of Occupational Therapy. (2007); 61 (2): 154-160.
6. Anita Gupta. Use of Short Sensory Profile to Study the Sensory Pattern of Performance across Various Disability Groups. International Journal of Science and Research. (2016); 5(4):1644-1948.
7. Dunn W. Sensory profile: User's manual. Psychological Corporation, Texas, USA. (1999).
8. Andrea Paulson and Jilda Vargus-Adams. Overview of Four Functional Classification Systems Commonly Used in Cerebral Palsy. Children. (2017); 4(30):1-10.
9. Gunel MK, Mutlu A, TarsusluLivaneliogluA. Relationship among the Manual Ability Classification System (MACS), the Gross Motor Function Classification System (GMFCS), and the functional status (WeeFIM) in children with spastic cerebral palsy. Eur J Pediatr. (2009); 168:477–485.
10. Öhrvall AM, Eliasson AC, Löwing K, et al. Self-care and mobility skills in children with cerebral palsy, related to their manual ability and gross motor function classifications. Dev Med Child Neurol. (2010); 52: 1048- 1055.
11. Burak M, Kavlak E. Investigation of the relationship between,
quality of life, activity-participation and environmental factors in adolescents with cerebral palsy. Neuro Rehabilitation. (2019); 2(7):1-11, http://dx.doi.org/10.3233/NRE-191288.
12. Papadelis, C., Butler, E., Rubenstein, M, et al. Reorganization of the somatosensory cortex in hemiplegic cerebral palsy associated with impaired sensory tracts. NeuroImage Clin. (2018); 17: 198–212. doi: 10.1016/j.nicl.2017.10.021.
13. Durga Prasad Mishra, Gargi Mishra, Sakti Prasad Das, Anurupa Senapati1. Sensory Processing/Integration Dysfunction Affects Functional Mobility of Children with Cerebral Palsy. HSOA Journal of Neonatology and Clinical Pediatrics. (2020);7(43):1-6.
14. Hosseini SA, Ghoochani BZ, Talebian S, et al. investigating the effects of vestibular stimulation on balance performance in children with cerebral palsy: A randomized clinical trial study. JRSR. (2015); 2: 41-46.
15. Østensjø S, Carlberg EB, Vøllestad NK. Motor impairments in young children with cerebral palsy, relationship to gross motor function and everyday activities. Dev Med Child Neurol. (2004); 46 (9):580-9.
16. Jovellar-Isiegas P, Resa Collados I, Jaén-Carrillo D, et al. Sensory processing, functional performance and quality of life in unilateral cerebral palsy children: a cross-sectional study. Int J Environ Res Public Health. (2020); 17 (19):7116.
17. Rosenbaum, P.; Paneth, N.; Leviton, A, et al. The definition and classification of cerebral palsy April 2006. Dev. Med. Child Neurol. Suppl. (2007); 109: 8–14.
18. Kunal Gaurav, Raj Kumar, Ganesh Kumar, et al. Sensory processing issues in children with cerebral palsy: a pilot study in tertiary care institute. Internati+onal Journal of Contemporary Pediatrics |. (2023); 10(8):1253-1257.
19. Nabila Soomro, Brigitte Kamran, RukhsanaBibi and Syed Imran Ahmed. Recognizing the Sensory Abilities in Cerebral Palsy Child. Journal of the Dow University of Health Sciences Karachi. (2011); 5 (2):60-65.
20. Wiingert JR, Burton H, Sinclair RJ, Brunstorm JE. Tactile Sensory Abilities in Cerebral Palsy: Deficits in Roughness and Object Recognition. Dev. Med. Child Neurology (2008); 50:832-838.
21. Dr Deepthi, Dr Parvathi, Dr K.K.Purushothaman. Neurological Subtypes of Cerebral Palsy and Functional Classification. Journal of medical science and clinical research. (2017); 5(4):20306-20310.
22. Howard J1, Soo B, Graham HK, et al. J Paediatr Child Health. (2005); 41(9-10):479-83.
23. Gunel MK, Mutlu A,TarsusluLivaneliogluA. Relationship among the Manual Ability Classification System (MACS), the Gross Motor Function Classification System (GMFCS), and the functional status (WeeFIM) in children with spastic cerebral palsy. Eur J Pediatr. (2009); 168:477–485.
24. Monbaliu E, Peña MG, Ortibus E, et al. J. Functional outcomes in children and young people with dyskinetic cerebral palsy. Feys HDev Med Child Neurol. (2017); 8.
25. Carnahan KD, Arner M, Hägglund G. Association between gross motor function (GMFCS) and manual ability (MACS) in children with cerebral palsy. A population-based study of 359 children. BMC Musculoskelet Disord. (2007); 8:50.

doi.org/10.56984/8ZG2EF88A7