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LANGUAGE DEVELOPMENT & COGNITION DEVELOPMENT IN CHILDREN WITH CEREBRAL PALSY

Aneela Irshad[1], Muhammad Sikander Ghayas Khan[2], Qurrat ul Ain[3], Razia Sultana[4], Maria Sheikh[5] Hamza Khalid[6]

ABSTRACT

BACKGROUND; Cerebral Palsy is most prevalent physical disability in children all over the world. Although with advances in maternity, obstetrics and gynecological sciences worldwide its incidence has been decreased significantly as compared past decade, yet, the developing countries are in a process to adopt such methods. From psychosocial and communication point of view, mainly impaired cognition and language ability are the factors families and people around have to manage with children of cerebral palsy. Even the children may survive to a bigger age but these areas are doubted to remain unchanged.

OBJECTIVES; Therefore, the objectives of this study are to find out relationship or differences among chronological, language and cognitive ages in children with cerebral palsy.

METHODS; This was a cross sectional survey conducted in both government and private sectors. The study was completed in four months after synopsis approval. A sample of convenience consisting 78 children (families) was used. A predefined criterion of eligibility was used. Portage guide was used to collect data. Data was collected as hands out questionnaire or interview interpreter. SPSS 16.0 was used to analyze data, descriptive statistics such as mean, standard deviation, frequency and percentages were calculated. Paired sample t test was used to compare the differences in ages. Whereas the statistics of correlation were used in order to find out relationship between different sorts of ages.

RESULTS; The result showed out of total 78 respondents 49(62.8%) were males and 29(37.2%) were females. Paired sample test results showed comparison between language age and cognitive age of children that mean difference was 0.458 with standard deviation 1.81 and t value 2.237 and degree of freedom 77, significance value 0.028. Paired sample test results showed comparison between actual age and cognitive age of children that mean difference was 2.300 with standard deviation 1.63 and t value 12.389 and degree of freedom 77, significance value 0.000.

CONCLUSION; There was significant difference found in mean ages of cognitive and language ages in cerebral palsy children. Also, there was significant correlation between these ages.

KEYWORDS Cerebral Palsy, Cognitive Age, Chronological Age, Language Age, Speech Therapy

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[1] Speech Therapist (Private Clinic), Anawaisbi@Gmail.Com
[2] Associate Professor, Department of Rehabilitation Sciences, Faculty Allied Health Sciences, Lahore, dr.sikander05@gmail.com
[3] HOD Speech and Language Pathology, Avicenna Medical and Dental college, qurratulain.butt@yahoo.com
[4] Senior Special Education Teacher (Hic) Department of Special Education, Razia.Rano@Gmail.Com
[5] Speech Therapist Department of Special Education Punjab, Mariashiraz11@Gmail.Com
[6] Speech Therapist (Private Clinic), hamzarana67@gmail.com

INTRODUCTION

Cerebral palsy (CP) is the most prevalent physical disability in children worldwide, characterized by a group of non-progressive motor impairment disorders caused by brain abnormalities during early development. It affects different parts of the brain and results in specific movement problems. (1, 2) CP can also lead to disruptions in sensory and cognitive development, including speech, language, and communication difficulties. Impaired cognition and language ability are common challenges for families and individuals with CP. (3-5) The development of cognitive abilities, such as information processing, perceptual skills, and language learning, is crucial. Language development involves acquiring the structures, meanings, and uses of words and phrases. While there is significant knowledge about the impact of early lateralized brain lesions on intelligence and language function, little is known about the development of other cognitive abilities in children with CP. (6, 7) Preterm birth is a risk factor for CP and is also associated with reduced cognitive test scores. CP is a group of permanent movement disorders that appear in early childhood, with symptoms varying among individuals. (8-13) It is caused by abnormal development or damage to parts of the brain that control movement and posture. The exact cause is often unknown, (14, 15) but risk factors include preterm birth, twin pregnancies, certain infections during pregnancy, exposure to methylmercury, difficult delivery, and head injuries during early childhood. (16, 17) CP cannot be cured, but treatments such as physical therapy, occupational therapy, and speech education can help manage the condition. (1, 3, 18) Medications and surgery may also be used to alleviate symptoms. The use of alternative treatments lacks scientific evidence. CP affects approximately 2.1 per 1,000 live births and has been studied extensively since the 19th century. (11, 19, 20) Children with CP often experience cognitive and sensory difficulties alongside motor impairments, including social communication disabilities. (1, 3, 6) Assessing theory of mind abilities in children with CP can be challenging due to physical and cognitive limitations. However, recent research has used new methods such as action anticipation tasks and eye-tracking to study social communication difficulties in children with CP. (20, 21) Physical exercise has been shown to impact postural stability in children with CP, with intense exercise potentially increasing instability. (16, 22, 23) Dribbling is a common issue among children with CP and can have various effects on their daily lives. In summary, cerebral palsy is a complex condition that affects movement, cognition, and communication in children, requiring comprehensive management and support. (9, 15, 24)

The literature review examined various aspects of cerebral palsy (CP) and its associated impairments, including cognitive and motor difficulties, social communication challenges, postural stability, growth parameters, (25-27) and the effects of environmental enhancement. (19, 24, 28-31) The review highlighted the need for more research on social communication difficulties in children with CP and the potential use of new assessment methods such as action anticipation tasks and eye-tracking. It also found that intense physical exercise could impact postural stability in children with CP, potentially increasing the risk of falls and injuries. (6) Furthermore, the review emphasized the high rates of growth parameters below the 10th percentile in children with CP, particularly those with moderate to severe CP, and the importance of close medical and nutrition management for this population. (16, 22, 23) Elevated concentrations of inflammation-related proteins in neonatal blood were found to be associated with an increased risk of cerebral palsy. The review also discussed the potential benefits of environmental enhancement interventions for improving motor outcomes in infants at high risk of CP. Overall, the literature review highlighted the complex nature of cerebral palsy and the need for further research to better understand and address the associated impairments. (1, 3, 18)

MATERIALS AND METHODS

STUDY DESIGN

Cross Sectional Survey

PARTICIPANTS

Previous literature was seen. Total population size found to be visited in last 3 month on average was 90 patients, keeping confidence level 95%, confidence interval 5% sample size found to be 74 or more. Total patients in my study reached however, 78

INCLUSION CRITERIA

Both male and female children with spastic, or dyskinetic and/or mixed type cerebral palsy from 2 years to 6 years of age were included in the study

EXCLUSION CRITERIA

All children of cerebral palsy with any comorbid medical conditions were excluded

DATA COLLECTION PROCEDURE

Portage guide was used to assess the cognitive and language development among children with cerebral palsy. The procedure and application of scale was self-supervised.

DATA ANALYSIS PROCEDURE

SPSS was used. Frequency percentages were calculated for categorical variables, mean standard deviation for continuous. Mean score of chronological age, cognitive and language age were compared in pair using Paired Sample t test.

RESULTS

The result showed out of total 78 respondents 49(62.8%) were males and 29(37.2%) were females. The result showed regarding fathers' educational level, out of total 78 respondents 23(29.5%) were at matric level, 22 at intermediate level, 17 at bachelor level and 16 were at master level. The results showed regarding type of cerebral palsy, 37 respondents were spastic, 24 were dyskinestic and 17 were having mixed type of cerebral palsy. The results showed that regarding mothers' educational level 19 mothers were at matric level, 8 were at intermediate level, 20 were bachelor and 31 were at master level. The results showed that regarding socioeconomics of families, 32 were belonging to upper class, 42 were middle class and 4 were lower class

The results showed that 57 respondents' families were living at urban areas and 21 were living at rural areas. The histogram with normal curve about chronological age of children showed that mean age 4.90 with standard deviation of 1.399, while curve was skewed positively towards higher values. The histogram with normal curve showed mean language age of children was 2.14 with standard deviation of 1.455, while curve was skewed negatively towards lesser values.

The histogram with normal curve showed mean cognitive age was 2.60 with standard deviation 1.167 while curve was normally distributed. The histogram with normal curve showed that mean hours of children's stay at educational institute were 5.45 with standard deviation 0.989 while curve was normally distributed.

Upon pairwise comparison between different sorts of ages, it was found that mean age difference was 2.75 actual age and cognitive age with p value 0.000, while difference between ages was language age and cognitive age 2.30 with p value 0.000. Paired sample statistics language age and cognitive age mean difference was 2.14 with significance level 0.540. Paired sample test results showed comparison between language age and cognitive age of children that mean difference was 0.458 with standard deviation 1.81 and t value 2.237 and degree of freedom 77, significance value 0.028.

Paired sample test results showed comparison between actual age and cognitive age of children that mean difference was 2.300 with standard deviation 1.63 and t value 12.389 and degree of freedom 77, significance value 0.000. Paired sample test results showed comparison between chronological age and language age of children that mean difference was 2.75 with standard deviation 1.788 and t value 13.624 and degree of freedom 77, significance value 0.000.

TYPE OF CEREBRAL PALSY					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Spastic	37	47.4	47.4	47.4
	Dyskinetic	24	30.8	30.8	78.2
	Mixed	17	21.8	21.8	100.0
	Total	78	100.0	100.0	

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Language Age of Children - Cognitive Age of Children	-.45897	1.81211	.20518	-.86754	-.05041	-2.237	77	.028

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Chronological Age of Children	4.9000	78	1.39879	.15838
	Cognitive Age of Children	2.6000	78	1.18738	.13444

P value .073

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Chronological Age of Children - Cognitive Age of Children	2.30000	1.63961	.18565	1.93033	2.66967	12.389	77	.000

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Chronological Age of Children	4.9000	78	1.39879	.15838
	Language Age of Children	2.1410	78	1.45508	.16476

P value .059

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Chronological Age of Children - Language Age of Children	2.75897	1.78845	.20250	2.35574	3.16221	13.624	77	.000

DISCUSSION

Cerebral palsy continues to be a challenge that has not been completely overcome despite decades of research. Impaired cognition and language abilities are key factors that families and individuals have to manage when dealing with children with cerebral palsy. Although children with cerebral palsy may survive to a ripe age, these areas of functioning are often affected and do not improve significantly over time. (6)

A study examined different age categories in children with cerebral palsy, including actual age (biological age) and chronological age (measured based on the number of

years lived with cerebral palsy). In most cases, these ages were the same, as cerebral palsy is often present from birth. However, when cerebral palsy was acquired later in life, the interpretation of chronological age differed. (1, 3, 18) Language age and cognitive age were also measured, reflecting the child's language and cognitive abilities. The study found a direct association between language age and the severity of the disease, with more advanced stages of cerebral palsy being associated with greater language impairments. Cognitive age was measured based on the complexity of tasks the children could understand and perform, reflecting their brain processing abilities. All these ages were directly related, meaning that changes in one age category often affected the others. (16, 22, 23)

The study focused on children under the age of 10, which may be influenced by socioeconomic factors. Most of the respondents belonged to upper-middle-class or middle-class families, indicating their access to resources and willingness to address their children's problems. It's worth noting that the data was collected from private institutions, where families with higher socioeconomic status typically seek treatment. This could be due to the costliness of treatments in the area and long waiting times in government sectors.

Another study explored the use of a new action anticipation task and eye-tracking method to assess theory of mind abilities in children with quadriplegic cerebral palsy. The findings indicated that some children with cerebral palsy demonstrated an ability to attribute false beliefs, similar to a child with Down syndrome who had less severe motor impairment. This research highlights the potential of action anticipation and eye-tracking techniques in understanding cognitive abilities in children with cerebral palsy. (2, 17, 32-34)

Additionally, a study examined the effects of intense physical exercise on postural stability in children with cerebral palsy. The results showed that children with cerebral palsy had higher levels of postural instability compared to typically developing children, both before and after the exercise. This reduced postural stability could increase the risk of falls and injuries in children with cerebral palsy. (35-37)

In summary, the studies discussed the challenges faced by children with cerebral palsy in terms of impaired cognition and language abilities. They highlighted the differences between different types of ages (actual age, chronological age, language age, and cognitive age) and their associations. The research also emphasized the importance of addressing both language and cognitive functions in rehabilitation, as focusing solely on language skills may leave children with cerebral palsy with significant cognitive impairments.

CONCLUSION

There was significant difference found in mean ages of cognitive and language ages in cerebral palsy children. Also, there was Signiant correlation between these ages.

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