

# Effectiveness of environmental enrichment techniques on spastic diplegia and behavioral modulation of three cerebral palsy Pakistani children.

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**Abstract**— It is an observational study to monitor the effect of environmental enrichment techniques on spastic diplegia and behavioral modulation of three cerebral palsy Pakistani children. This one-month observational study was conducted at Al Umeed Rehabilitation Association and it focused three hyperactive children: one male with mild spastic diplegia, the other male with moderate spastic athetoid and the third female child with mild spastic diplegia. The interventions like a hydrotherapy pool, physiotherapy, wall therapy, and abductor bench were used to reduce spasticity whereas; counseling, platform swing, ball pool, and hammock were used to reduce autism and hyperactivity respectively. The observations revealed remarkable improvement in modulating their behaviors, spasticity, and cognitive skills.

**Index Terms**— Cerebral Palsy, Spastic Diplegia, Behavioral Modulation, Periventricular Leukomalacia.

## 1 INTRODUCTION

Environmental Enrichments (EE) refer to those interventions that are intended to upgrade at least one of the cognitive, motor, sensory, or social aspects of the infant's environment with apparent cognitive or motor deficits. These interventions can help in building up a good interaction between parents and infants, educating the concerned parents, or providing a suitable physical and play environment for active motor learning across several domains in a Cerebral Palsy affect-

ed infant. As stated in the earlier studies that EE inter-

ventions showed significant progress in motor skill acquisition in Cerebral Palsy affectees [1].

Cerebral Palsy (CP) is a non-progressive motor and cognitive disorder that may emerge from an insult to the developing brain during prenatal, perinatal or postnatal period [2]. It manifests motor and cognitive deficits through disturbances in coordination, sensation, sensory perception, cognition, communication, swallowing difficulties, and very rare kind of behaviors [3].

Recently, there is a paucity of reported literature about the benefits of Environmental Enrichment (EE) inter-

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ventions. However other than physiotherapy or occupational therapy few numbers of researches on enriched environment techniques reported the favorable influence on brain functions and motor development in CP affected infants, such as massage [4], music [5], and other individualized care programs.

This one-month observational study was conducted at Al Umeed Rehabilitation Association (AURA). The observation focused three hyperactive diplegic pa-

## 2 MATERIAL AND METHODS

The general characteristics and the behaviors of three hyperactive diplegic patients were observed before and after the providence of enriched environment techniques to study the effect on spastic diplegia and behavior in three cerebral palsy children. The data regarding general characteristics and behaviors of the three patients before the interventions were collected through their respective assessments mentioned in Table.1 to categorize the patients.

### PATIENT A

Patient A is a male, who was born in January 2000, 2<sup>nd</sup> in birth order and was born prematurely with lower segment cesarean section mode of delivery. The child's mother suffered from sinus and chest congestion during pregnancy. The child suffered from high-grade fever along with fits at the age of three months and exhibited the delay in acquiring normal developmental milestones. At the age of 7 months, mild diplegia with hyperactivity was diagnosed in the patient after which he could not even sit or walk independently and thus was admitted to AURA at the age of 7 years. The primary aim of the interventions was to normalize the muscle tone, to increase attention span to reduce his autistic behavior and hyperactivity.

### PATIENT B

Patient B is also a male, who was born in September 1997, 1<sup>st</sup> in birth order and his mother had a low blood pressure problem during pregnancy. The child was delivered normally and cried after a few minutes of his

TABLE 1

GENERAL CHARACTERISTICS AND BEHAVIORS THROUGH ASSESSMENT FORMS BEFORE INTERVENTION

	Patient A	Patient B	Patient C
<b>General Characteristics</b>	Mild spastic diplegia. Lower body affected.	Moderate spastic diplegia. Lower body affected and athetoid movement.	Mild spastic diplegia. Adducted hips and knee flexion.
<b>Behavior</b>	Doesn't speak. Hyperactive. Autistic behavior. Low concentration span. Bites in hyperactive condition.	Can speak. Hyperactive with athetoid. Superiority complex and hatred behavior towards his fellows. Good concentration span. Get super excited in hyperactive condition.	Can speak. Hyperactive. Self-lover. Fair concentration span. Pluck hairs and eat them, destroys the toys around her in aggression.

tients to observe the effects on their motor movements and behaviors by the provided environment enrichment interventions at the institution.

birth. The child suffered from diarrhea and general weakness at the age of 3 months and exhibited the delay in acquiring normal developmental milestones. He was admitted to AURA at the age of 10 years. The primary goal of the rehabilitation was to reduce high muscle tone in his lower limbs, attenuation of athetoid movements and to normalize muscle tone to make him ADL independent. Counseling was conducted to reduce his superiority complex.

### PATIENT C

Patient C is a female who was born in June 1999, 2<sup>nd</sup> in birth order whose mother had gestational diabetes and low pressure during pregnancy. The child was delivered normally and cried immediately after birth. The child suffered from high-grade fever and blue spots on her whole body at the age of 4.5 months. The patient exhibited delays in acquiring developmental milestones with neck control was in 8 months and sitting in 2.5 years. Initially, the parents did not consult any doctors and took her to saints and Hakeem. She was admitted to AURA at the age of 6.5 years. The interventions were aimed to prevent W sitting, adducted pattern and hyperactive condition to make her ADL independent.

### 3. RESULTS

The EE interventions provided to Patient A, B and C are mentioned in Table.2, Patient A showed EE helped in decreasing spasticity and intensity of behaviors like autistic, hostility, and hyperactivity. The interventions offered to patient B presented reductions in spasticity

**TABLE 2**  
**INTERVENTIONS OFFERED AND THEIR POSITIVE OUTCOMES ON THE PATIENTS**

	Interventions offered	Outcomes
<b>Patient A</b>	Hydrotherapy.	Decreased spasticity.
	Abductor bench.	Attenuated hyperactivity.
	Platform swing.	Autistic behavior is controlled.
	Wooden bars.	His biting behavior is controlled.
	Elbow gators..	The hostile attitude was decreased.
	Pictures and duplicates.	He responds to toy sounds or teachers when she calls his name.
	Music player.	
<b>Patient B</b>	Physiotherapy.	Decreased high muscle tone in the lower limb.
	Hydrotherapy pool.	
	Ball therapy.	Reduced spasticity.
	Platform Swing.	Attenuation of hyperactivity.
	Wooden bars.	Counseling reduced his superiority complex.
	Counseling.	
<b>Patient C</b>	Hydrotherapy pool.	Transformed into semi ADL (the activity of daily living) skills.
	Swing board.	
	Ball therapy.	She has less effect on rehabilitation. Her hyper activeness is increasing with an increase in her age.
	Ball pool.	
	Wooden bars.	

and superiority behavior. The interventions provided to the patient C also showed significant semi-independence in the acquisition of daily life activities but the behavioral outcomes are not as satisfactory because there might be a temporary effect of rehabilitation on her mind.

### 4 CONCLUSION

Appropriate enriched environment interventions may help in enhancing behavioral activity and plasticity in Cerebral Palsy affectees.

### ACKNOWLEDGMENT

We would like to thank Al Umeed Rehabilitation Association authorities for their allowance and provi-

dence of the required data for the acquaintance of this observational study.

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