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# A Descriptive Study on Visual Performance of Children with Seizure Disorders

KEYWORDS: Seizure disorders, visual characteristics and visual performance

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**ABSTRACT**

***Aim:*** *To describe the ophthalmic conditions, visual characteristics and visual performance of children with seizure disorders aged 1-5years and suggest appropriate vision rehabilitation programme.*

***Method:*** *Forty seven children (30 boys & 17 girls) with seizure disorders and visual*

*complaints were selected for the study from the Vision Rehabilitation Department of Frontline Eye Hospital, Chennai. The ophthalmic and neurological conditions of the children were compiled from their medical reports. LEA Gratings were administered to assess the Grating Acuity, Lea Distant and Near Vision cards were used to assess the visual acuity in a clinical setting.*

***Result:*** *28% of children responded to Distant and Near Vision Acuity, 9% responded to Grating tests and 64% children never responded to both grating as well as acuity testing. Vision Rehabilitation services were planned for these children. 28 children underwent training in vision stimulation, 21 received training in visual perceptual, 8 benefitted through special skill training, 29 kids availed special education and 14 were advised environmental modifications.*

***Conclusion:*** *As the results revealed 64% children never responded to any vision testing, it is very important to provided vision stimulation and other vision related services to these kids to enhance their vision as well as cognition.*

**Introduction:**

Children with seizure disorders and associated impairments are noticed with global developmental delay. In therapy centres or Early Intervention centres these children are addressed in the areas of motor, sensory, speech and language. Children with delay in vision development are referred to Vision Rehabilitation Centres by Paediatricians, Paediatric Neurologists, Paediatric Ophthalmologists and other developmental therapists.

It is extremely important to assess the functional vision of these children at the right pace with required intervals. Every visual response of the child should be recorded and should be translated to their functional relevance. Non verbal children need training in the concepts of matching, sorting or pointing before going for visual assessment.

Study on visual cognitive function in infants with intractable epilepsy before and after surgery by Ohashi T[1], Kobayashi I, Ooe H, Nakagawa E [1] showed improvement in vision. Battery of tests include Erhardt Developmental Vision Assessment (EDVA), ocular pursuit evaluation for a flashing LED toy, preferential looking procedure with three visual acuity tests, optokinetic nystagmus, Sheridan's Test for Young Children and Retarded balls vision test; and existing developmental test.The result signified EDVA scores and ocular pursuit score with a flashing LED toy showed the same trends with developmental age as the existing developmental tests. However, in some patients, the EDVA score and ocular pursuit score improved greatly, whereas the developmental age changed very little. Study concluded that patients with intractable epilepsy and severe developmental delay showed some cognitive changes before and after the surgery may be detected. In recommended vision stimulation programme- visual awareness, reach, behaviours, skills of the children are trained with flashing LED with cards, toys and objects.

Studies by Jones K, Minassian BA [2] identify 13q chromosomal deletion and retinoblastoma in infantile spasms. During infancy the insults to the developing brain result in infantile spasms and epileptic encephalopathy. In this study the hemizygous loss in chromosomal region 13q13 to 13q21.3 leads to infantile spasms. Mutation responsible for retinoblastoma was discovered by copy number variation testing for cryptogenic infantile spasms. Early diagnosis, treatment of life-threatening cancer was possible in chromosomal testing. The study revealed molecular diagnosis improves health care and reduces medical expenses.

Study on deficits in oculomotor performance in paediatric epilepsy by Asato MR[1], Nawarawong N, Hermann B, Crumrine P, Luna B [3] probed components of cognition includes speed of processing, response inhibition, and spatial working memory - supporting executive function in paediatric epilepsy patients and matched controls. Patients showed slower reaction time to initiate a saccadic response compared to controls but had intact saccade accuracy. Epilepsy type and medication status were not predictive of outcome. More complex neuropsychological performance was impaired in tasks requiring visual memory and sequential processing, which was correlated with inhibitory control and antisaccade accuracy. This particular profile of abnormalities may be associated with seizure-mediated compromises in brain maturation early in development.

Visual milestones of children with seizure disorders are recorded, scientifically assessed, suggested training in visual cognitive, visual motor, visual spatial areas.

**Methods and Materials:**

Forty seven children who had seizure disorders were selected for the study. The age of the subjects is from 1-5years and it consists of 30 boys and 17 girls. The mean age of the subjects is $\pm$3.2 years. The information on their

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neurological evaluation, ophthalmic evaluation and other disabilities was collected from the individual records of these children maintained in the Rehabilitation Centre.

**Results:**
Their neurological reports revealed conditions like seizure disorders, hypoxic ischemic injury, hypoxic encephalopathy, anoxic hypoxic ischemia, birth asphyxia, delayed myelination, diffuse cerebral atrophy, hydrocephaly, microcephaly, cerebral palsy, hormonal disorder, juvenile diabetes, protein and CS deficiency, etc. Speech, language and cognitive impairments, learning disability, Down syndrome and congenital rubella syndrome were commonly noticed additional disabilities of these kids.

Their ophthalmic conditions revealed Optic nerve disorders (pallor of disc, optic disc pallor, Temporal pallor, Optic nerve pallor, Post neuritic optic atrophy), Retinal detachment, Retinopathy of Prematurity, Foveal hypoplasia, Hyperopic fundi, hypomyelination, Lid entropion LXR with blepharophimon, Amblyopia, Cortical Visual Impairment, Nystagmus, Strabismus, Aphakia, Myopic degeneration, Myopic astigmatism, Delayed visual maturation, Delay in visual response, and Delay in fixation.

Infants and toddlers visual performance were assessed by LEA grating acuity. In the grating acuity test, the subject is expected to detect the presence of stimuli with parallel lines of decreasing width. This is ideal and easy to assess infants, toddlers and young children who haven't learnt concept of shapes/numbers. GOOD – LITE's test instruction flier mentioned that the gratings are defined by the frequency of the number of black pairs and white stripes or cycles, within one degree of visual angle. The printed grating on a surface can be defined as (CPCM) number of cycles per centimetre of surface. The standard test distance is 57cm. Vision of the subjects is measured in (CPD) cycles per degree. Printed grating paddles in 0.25, 0.5, 1, 2, 4, 8 cycles per centimetre along with the grey paddle were sequentially presented to the eye level of the subject and measured results. When paddles were presented, it's the vital role of the professional to observe and record the ocular movements of subjects. Poor visual responses of the subjects were elicited when the child could not perform beyond .25 and .5 CPCM. Assessment was administered in well illuminated room which is free from distractions. Few subjects required assessments for multiple times in short intervals due to their health and medical conditions.

Distance visual acuity was tested through LEA Symbols single test type book at 3 meters distance. Subjects were seated comfortably; room was well illuminated and free from distractions. Test proceeded with demonstration and initial training to perform the test. Later they communicated by pointing or matching. Subject's response was observed by their accuracy in pointing the four shapes (circle, apple, house, and square). The symbol expected to be pointed was exposed and the rest were covered to avoid distraction for the child. The visual acuity was recorded in which the subject responded 3 of the 5 symbols correctly. Monocular and binocular testing was administered. Few subjects elicited response after two sittings.

LEA Near vision card with 40cm Measuring cord was used to assess the near vision of subjects. As per GOOD-LITE flier instructions, in the life of young child near vision is functionally important than distant vision. It insisted to place the cord at preferred distance and head posture in first testing for children with visual impairment, and if the child performs tasks at 40 cms test can be repeated at the same level. As the subjects were familiarised with the four shapes tests were administered till the threshold level and recorded accurate responses. The study was approved by the Review Board of Frontline Eye Hospital and it followed the principles of Helsinki Declaration.

28% of children responded to Distant and Near Vision Acuity, 9% responded to Grating tests and 64% children never responded to both grating as well as acuity testing. Vision Rehabilitation services were planned for these children. 28 children underwent training in vision stimulation, 21 received training in visual perceptual, 8 benefitted through special skill training, 29 kids availed special education and 14 were advised environmental modifications.

**Discussion:**
In a study by Salati R[1], Borgatti R, Giammari G, Jacobson L[4] on oculomotor dysfunction in children with cerebral visual impairment and perinatal hypoxia assessed gaze behaviour under conditions – scanning, fixation, execution of saccades and pursuit. Strabismus, nystagmus, ocular deviations and ocular mobility in orthoptic examination were evaluated and recorded. Alterations in pattern were revealed in each individual. Lack of gaze coordination was characterised among children with brain damage. It also emphasised that early evaluation of ocular motility is vital in rehabilitation intervention. In our study also, the subjects were observed with lack of gaze coordination and visual skill training was recommended for further improvements in fixation, scanning and other visual skills.

Van Hof-van Duin J, Mohn G [5] studied the visual defects in children after cerebral hypoxia. The subjects were survivors with perinatal hypoxia/ischemia between 3months-17years from mild to severe category and postnatal hypoxic events from 8-13 years.

Study revealed visual deficits in two patients in visual acuity, visual field, optokinetic nystagmus to blindness. Neonatal seizures, gestational age at birth were related to the severity of visual defects after perinatal hypoxia. As the subjects in our study are from 0-5years the risk factor of having visual deficits can be intervened early.

The appropriate testing tool was prioritised and administered with few criteria's – sleep pattern, behaviour state, medical history, positioning of the child. Evaluation of vision for few children required re-testing, and the testing was planned accordingly. Limitation of the study is time factor to reach too many schools and identify the visual deficits.

**Conclusion:**
Present study compiled information on visual performance of children with seizure disorders which plays a crucial role in designing vision rehabilitation services for these children. Vision Rehabilitation at the earliest would really avoid the chance of developing secondary disabilities in future. Scientific Vision Assessment precisely help the professionals to present the size, angle, distance of visual stimuli for eliciting better visual response.

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**REFERENCE**

1. Ohashi T1, Kobayashi I, Ooe H, Nakagawa E Visual cognitive function in infants with intractable epilepsy before and after surgery. Childs Nerv Syst. 2013 Feb;29(2):255-61. doi: 10.1007/s00381-012-1944-0. Epub 2012 Oct.24. 2. Jones K1, Minassian BA2 Genetic testing in infantile spasms identifies a chromosome 13q deletion and retinoblastoma. Pediatr Neurol. 2014 May;50(5):522-4. doi: 10.1016/j.pediatrneurol.2013.11.018. Epub 2013 Dec 4. 3. Asato MR1, Nawarawong N, Hermann B, Crumrine P, Luna B Deficits in oculomotor performance in pediatric epilepsy. Epilepsia. 2011 Feb;52(2):377-85. doi: 10.1111/j.1528-1167.2010.02787.x. Epub 2010 Nov 18. 4. Salati R1, Borgatti R, Giammari G, Jacobson L. Oculomotor dysfunction in cerebral visual impairment following perinatal hypoxia. Dev Med Child Neurol. 2002 Aug;44(8):542-50. 5. Van Hof-van Duin J, Mohn G. Visual defects in children after cerebral hypoxia. PMID: 6525237b [PubMed - indexed for MEDLINE] Behav Brain Res. 1984 Nov;14(2):147-55.