

**IQ findings in epileptic children
and how it relates to Learning disorders**

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Abstract:

Objective to evaluate the relation between epilepsy, IQ measurements and how it is related to Learning disorders.

Methods:

(Case control study), 50 epileptic patients aged from 7 to 12 years and 50 control children at the same age were subjected to IQ Wechsler Intelligence scale for children III WISC III, test for learning disorders Kamel test for learning disorders 2001. Epileptic children were diagnosed according to ILAE 2006.

Results:

28% of epileptic cases had LD compared to 16% of controls. Discrepancy between verbal& performance IQ did not show any correlation to Learning Disorders.

Conclusion:

LD in epileptic children affects full scale IQ, verbal and performance IQ. Discrepancy between verbal& performance IQ did not show any correlation to Learning Disorders.

Introduction:

Although the distribution of intelligence quotient (IQ) scores of children with epilepsy is skewed toward lower values. (Neyens, et al., 1999).

Various factors are considered likely to induce cognitive disabilities: the age of onset, period of time since onset, the type of epilepsy, the nature and frequency of the seizures, and the effects of antiepileptic treatment. (Aldenkamp, et al., 1999).

Epilepsy is one of the most common serious neurological disorders in childhood. Learning disorders are more common in children with epilepsy than in the general population. As a consequence, the risk of cognitive impairment in children with epilepsy is high, and a review of the literature needs to be fully presented. (Pavlou& Gkampeta, 2011) .

Although the cognitive deficits may be influenced by multiple factors, it seems that seizure

frequency has a significant impact on their progression and may restrict children's academic skills and daily life activities.(Kramer, et al., 2006).

Recurrent seizures can modify a wide range of cerebral processes during development that are essential for the correct formation and functioning of brain circuits. (Engelberts, et al., 2002) .

Therefore, there is solid evidence that patients with intractable epilepsy have more diffuse and severe cognitive deficits than patients with good seizure control. Furthermore, periods of seizure remission were associated with better cognitive performance, thus showing the adverse impact of seizures on cognition. (Cormack, et al., 2007).

Methods:

This study was conducted at Ahmed Maher Teaching Hospital (Psychiatry Department) for one year from May 2008 till May 2009. It is a case control study. 50 epileptic patients and 50 controls were assessed, their age range was from (7-12) years.

Subjects:

Subjects were randomly selected over one year from follow up epileptic patients who were currently on antiepileptic drugs. Control cases were healthy children accompanying their parents in various hospital clinics.

All sample children were interviewed clinically with their parents to take a full developmental history, examined clinically using psychiatric hospital sheet, full neurological assessment to exclude any problem.

Both groups were assessed and investigated to rule out any medical or psychiatric disorder. All epileptic patients were subjected to complete blood picture and liver enzymes assessment to asses any side effect such as anemia, elevated liver enzymes and four cases were excluded. Epileptic cases were diagnosed according to ILAE 2006 classification.

Also during this study all patients or controls

that had IQ less than 90 total score were excluded as by definition, Learning disorders are diagnosed in the presence of normal range of IQ.

Both groups were assessed using:

1. Wechsler Intelligence scale WISCIII Wechsler intelligence scale for children III (WISCIII) a scale that measures intelligence from (5- 15) years which consists of:
 - a. Verbal skill assessment (VIQ) through testing information, comprehension, arithmetic, similarities, digital span and vocabulary.
 - b. Performance skill assessment (PIQ) through testing picture completion, block design, picture arrangement, object assembly, and digit span. (www.learninginfo.com).

Wechsler test was performed by certified clinical psychologist.

2. Kamel test for learning disorders, It Consists of:
 - a. Understanding meaning of words and memory
 - b. Spoken Language
 - c. Visuo-Spatial Assessment
 - d. Coordination
 - e. Social& Behavioral Attitude.

Verbal score: consists of oral understanding, memory, and spoken language. If the child scores less than 20, he or she is considered having learning disorder.

Non verbal score: consists of time, place recognition, motor coordination, and social and behavior. If the child scores less than 40, he or she is considered having learning disorder.

Total score consists of verbal and non verbal scores if less than 65, the child is considered having learning disorder. (Kamel, 2001).

All cases were subjected to written informed consent signed by the accompanying parent.

2 groups were matched according to El Shaks, 1995. Questionnaire to classify the socioeconomic socio factor. The data had been coded and entered on the computer using the statistical package SPSS 17.0. The data were summarized using the mean and standard deviation. The level of significance for all the above mentioned tests was at $P < 0.05$.

Results:

Table (1) Percentage of LD in both case& control

| | Cases (N=50) | | Controls (N=50) | |
|-------|--------------|-----|-----------------|-----|
| | N | % | N | % |
| LD | 14 | 28% | 8 | 16% |
| No Ld | 36 | 72% | 42 | 84% |

Table (3) Distribution of sample according to discrepancy between verbal and performance IQ

| | | Group | | | | Total |
|----------------|----------------|---------------|------------------|------------------|---------------------|-------|
| | | Cases With LD | Cases With No LD | Controls With LD | Controls With No LD | |
| Discrepancy IQ | No Discrepancy | 10 | 21 | 5 | 24 | 60 |
| | Discrepancy | 4 | 15 | 3 | 18 | 40 |
| Total | | 14 | 36 | 8 | 42 | 100 |

7% of sample (cases& controls) had LD with discrepancy between verbal and performance IQ

Table (4) Difference between cases (according to discrepancy between verbal and performance IQ)

| | | Group | | Total cases |
|----------------|----------------|---------------|------------------|-------------|
| | | Cases With LD | Cases With No LD | |
| Discrepancy IQ | No Discrepancy | 10 | 21 | 31 |
| | Discrepancy | 4 | 15 | 19 |
| Total | | 14 | 36 | 50 |

8% of epileptic cases (LD) had discrepancy between verbal and performance IQ while 30% of no LD epileptic cases had discrepancy

Discussion:

In current study, 14 (28%) epileptic cases had LD and 36 had no LD, where in controls 8 (16%) had LD and 42 had no LD, (Table 1). Fastenau, et al., 2008 found that 48% of epileptic cases had exceeded the cutoff for LD in at least one academic area and these rates were fairly compared to those obtained by Seidenberg et al., 1986.

Fastenau, et al., 2003 presented a multifactorial

28% of epileptic cases had LD compared to 16% of controls

Table (2) Difference between epileptic cases(LD& NO LD) in IQ scale

| Group | Epileptic cases (N=50) | | t | P |
|----------------|------------------------|---------------|------|-------|
| | Ld (N=14) | No Ld (N=36) | | |
| Full Scale I.Q | Mean ±Sd | Mean±Sd | | |
| I.Q | 97.43±7.653 | 110.81±12.881 | 3.63 | <0.01 |
| Verbal | 95.14±7.113 | 108.33±14.515 | 3.23 | <0.01 |
| Performance | 91.36±11.304 | 101.14±13.417 | 2.41 | <0.05 |

*significance p value <0.05,

* high significance p value <0.01

Epileptic cases with LD showed statistical difference in full scale, Verbal and Performance IQ

model of childhood epilepsy that had direct, mediating, and moderating relationships among neurological and seizure variable neuropsychological functioning, child and family psychosocial variables to help explain why some of these children had more difficulty in school than others.

Statistical difference in full scale IQ, verbal and performance score showed that LD epileptic children scored lower than epileptic with no LD. (Table 2). LD was an added stress on top of epilepsy. Home environment and stress might affect IQ of epileptic children as Mitchell, et al., 1991 found that seizure variables were unrelated to IQ in most domains however family environment (e.g., emotional climate, stimulation, parental involvement) accounted for a significant amount of variance in IQ adjusted academic achievement in reading and general information. IQ itself was strongly associated with epilepsy variables (Bulteau, et al., 2000). It could also be related to behavioral problems. In fact, intellectual difficulties had been reported to be

associated with increased risk of psychopathology (Herman, 1982& Perrine, et al.,1999) and significant cognitive impairment to be correlated with elevated behavioral scores. (Kenene, et al., 2005).

Hermann, 2010 found that abnormalities in cognition were commonly reported in people with epilepsy. Problems with cognition could be manifested as reduction in attention, IQ, language and perceptual skills, executive functions including problem solving, verbal and visual memory.

Discrepancy between verbal and performance IQ was measured in all subjects (Table 3). Thirty one of epileptic children had no discrepancy while nineteen had discrepancy. Controls, twenty one children had discrepancy while twenty nine had no discrepancy (discrepancy is considered if the difference is more than 15 points). These findings had no statistical significance to LD. Despite the widespread clinical practice of VIQ-PIQ score interpretation, the validity of VIQ-PIQ score use as an indicator of cognitive dysfunction was controversial. Numerous studies have found no relation between VIQ-PIQ scores and a variety of studies found the direction of the VIQ-PIQ score discrepancy to have less lateralizing potential than previously thought. (Moffit& Silva,1987).

Discrepancy between verbal& performance IQ and its relation to LD (Table 4). where epileptic cases with no LD showed more discrepancy between verbal& performance IQ, and this goes with work of (Stuebing et al., 2002) who stated little evidence supporting the validity of the IQ discrepancy classification fundamental to public policy concerning students with learning disorders and put doubt on the need for IQ tests in identifying these students.

It had also been demonstrated that psychologists hold the false belief that a difference in Verbal and Performance IQ scores of more than 15 points was

clinically significant and highly indicative of a LD. As had been repeatedly demonstrated differences of this or greater magnitude were not exclusively found in persons with an underlying LD, and hence, differences were also quite normative in certain populations. For instance, in the entire standardization sample of the WAIS-R, the range of differences between VIQ and PIQ scores was from (-43 to +49). In addition, greater VIQ-PIQ discrepancies were more typical in persons of higher overall IQ. Hence, VIQ-PIQ scatter was not necessarily pathognomonic when it constituted the only evidence of impairment. Unfortunately, such unfounded beliefs were quite resistant to corrective interventions. (Harrison, 2005).

In the case of the PIQ>VIQ discrepancy, Kavale& Forness, 1984 conducted a meta-analysis involving 94 studies and did not find a significant PIQ-VIQ discrepancy in LD subjects. Hence the diagnostic value of the PIQ-VIQ discrepancy is in serious doubt. Likewise, despite widespread support pattern by practitioners, research has led to its decline as a diagnostic tool. (McDiarmid, 1993).

A correlation was encountered between epilepsy and performance in the performance and full-scale IQ, and also with processing speed and perceptual organization (WISC-III). One hypothesis that might explain this correlation was that an earlier start to epilepsy could coincide with the period in which certain abilities were starting to be acquired. One factor affecting the finding of a correlation between age for the first seizure and performance IQ, but not with verbal IQ, could be the fact that the verbal tasks making up the verbal IQ use material that was learnt and highly consolidated, which was less vulnerable to brain alterations, whilst the non-verbal tasks used in the performance IQ use material that demanded strategy formulation to emit an adequate response. (Mayes& Calhoun, 2004).

This was in accordance with the findings of Selassie, 2010 who reported that lower performance IQ than verbal IQ, found in children with epilepsy.

Also Weglage et al., 1997 showed a reduction in performance IQ in children with epilepsy, but not in verbal IQ.

References:

1. Aldenkamp AP, Overweg J, Diepman Lam, 1999: Factors involved in learning problems and educational delay in children with epilepsy. **Child Neuropsychol** 1999; 5:130-6
2. Allyson G Harrison 2005: Diagnosis of specific LD in children, **Canadian Journal of school psychology**, 2005, Vol. 88, No. 5, 844-855
3. Bulteau C, Jambaque I, Viguier D 2000: Epileptic syndromes cognitive assessment and school achievement A study of 251 children with epilepsy. **Developmental Medicine & Child Neurology** 2000 (42) pp 319-327
4. Cormack F, Cross JL, Isaacs E, Harkness W, Wright I, Vargha Khadem F 2007: The development of intellectual abilities in pediatric temporal lobe epilepsy. **Epilepsia**. 48:201-4.
5. ElShaks, A 1995: **Socio-economic family level**. Anglo Book shop. 2nd Edition.
6. Engelberts NH, Klein M, van der Ploeg HM, Heimans JJ, Jolles J, Kasteleijn-Nolst Trenité DG 2002: Cognition and health-related quality of life in chronic well-controlled patients with partial epilepsy on Carbamazepine monotherapy. **Epilepsy Behav.** 2002; (3): 316-21.
7. Fastenau PS, Sten J, Dunn DW, Austin JK 2008: Academic underachievement among children with epilepsy proportion exceeding psychometric criteria for Learning Disorders and associated risk factors. **Journal of Learning Disorders** (41) pp195-207
8. Fastenau PS, Dunn DW, Austin JK, Rizzo M, Eslinger PJ, 2003: **Principles and practice of behavioral neurology and neuropsychology**. New York: Saunders/ Churchill Livingstone/ Mosby; 2003. pp. 965-982
9. Selassie GR 2010: **Speech and language dysfunction in childhood epilepsy and epileptiform EEG activity**. University of Gothenburg
10. Herman B 1982: Neuropsychological functioning and psychopathology in children with epilepsy. **Epilepsia** 1982 23 pp 545-554
11. Hermann BA, Kimford J. Meador B, William D. Gaillard C, Joyce A. Cramer D 2010: Cognition across the lifespan: Antiepileptic drugs, epilepsy, or both? **Epilepsy & Behavior** 17 (2010) 1-5
12. ILAE 2006: **International League against epilepsy**.
13. Kamel, M 2001: **Test for Learning Disorder**.
14. Kavale, KA 1995: Setting the record straight on learning disabilities and low achievement: The tortuous path of ideology. **Learning Disabilities Research & Practice**, (10)145-152.
15. Kenene DL, Manion I, Whiling S 2005: A survey of behavioral problems in children with epilepsy. **Epilepsy & Behavior** 2005 (6) pp 581-586
16. Kramer U, Kipervasser S, Neufeld MY, Fried I, Nagar S, Andelman 2006: Is there any correlation between severity of epilepsy and cognitive abilities in patients with temporal lobe epilepsy? **Eur J Neurol**. (13):130-4.
17. McDiarmid M 1993: **Assessment Profiles of Children and Adults Identified as Learning Disabled**. Illinois Wesleyan University Digital Commons @ IWU
18. Hitti M 2004: **Factors affecting learning disabilities risk**. Epilepsy Health Center, WebMed

19. Mitchell WG, Chavez JM, Lee H, Guzman BL1991: Academic underachievement in children with epilepsy. **J Child Neurol**, (6):65-72.
20. Moffitt TE.& Silva P.A 1987: WISC-R Verbal and Performance IQ Discrepancy in an Unselected Cohort: Clinical Significance and Longitudinal Stability **Journal of Consulting and Clinical Psychology**. 1987, Vol. 55. No. 5.768-774
21. Neyens LG, Aldenkamp AP, Meinardi HM.1999: Prospective follow-up of intellectual development in children with a recent onset of epilepsy. **Epilepsy Res** 1999 (34):85-90
22. Pavlou E, Gkampeta A2011: Learning disorders in children with epilepsy **Childs. Nerv Syst**. 2011 Mar; 27(3):373-9
23. Perrine K, Kolbasa T 1999: Cognitive deficits in epilepsy and contribution to psychopathology. **Neurology** (53) pp 539-548
24. Seidenberg M, Beck N, Geisser M1986: Academic achievement of children with epilepsy. **Epilepsia** 1986, (27) 753-759.
25. Stuebing K, Fletcher JM, Le Doux, JM, Lyon GR, Shaywitz SE, 2002: Validity of IQ discrepancy classification of reading disabilities. A meta analysis, **American Educational Research Journal** 39 469-518
26. Wechsler, D 1944: **The measurement of adult intelligence**. Baltimore William& Wilkins
27. Weglage J, Demsky A, Pietsch M, Kurlemann G 1997: Neuropsychological, intellectual and behavioral findings in patients with centrotemporal spikes with or without seizures. **Dev Med Child Neurol** 1997;39: 646-651.
28. www.Learning_info.org 2008: **Assessment of IQ test**.

المخلص

معدلات ذكاء الاطفال المصابين بالصرع ومدى ارتباطها بصعوبات التعلم

كان الهدف من الدراسة تقييم العلاقة بين الصرع وقياسات معدل الذكاء وكيفية ارتباطها بصعوبات التعلم.

مادة وطرق البحث:

أستخدمت الدراسة (دراسة مراقبة الحالات) ٥٠ مريضاً بالصرع تتراوح أعمارهم من (٧-١٢) سنة وعينة ضابطة مراقبة ٥٠ طفل تخضع لمقياس "الذكاء ويكسلر" الأطفال في نفس الفئة العمرية للأطفال الثالث، واختبار صعوبات التعلم كامل. تم تشخيص الصرع وفق للرابطة الدولية ضد أمراض الصرع تصنيف عام ٢٠٠٦.

النتائج:

٢٨% من حالات الصرع تعاني من صعوبات التعلم مقارنة بنسبة ١٦% من العينة الضابطة. التناقض بين الدرجة اللفظية والاداء لم تظهر أى علاقة باضطرابات التعلم.

الاستنتاج:

وجود صعوبات التعلم لدى الاطفال المصابين بالصرع يؤثر على معدل الذكاء، الدرجة اللفظية والاداء. التناقض بين الدرجة اللفظية والاداء لم تظهر أى علاقة بصعوبات التعلم.