**Presentation**

- **Introduction**
  - Outcomes of childhood epilepsy
  - Epilepsy and Special Educational Needs
- **Academic achievement in childhood epilepsy**
  - Extent of the problem?
  - Profiles on measures of academic achievement
  - Factors associated with academic achievement/underachievement
- **Academic achievement in epilepsy - are adolescents more at risk?**
- **Interventions to improve academic performance**
- **Conclusion**

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**What is the purpose of education?**

- To ‘educate’ - To bring out or lead forth, to bring up, to rear.
- Are children with epilepsy reaching their potential in educational settings?
  - What do we mean by potential?
  - Is underachievement equivalent to not reaching potential?

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**Educational and Employment Outcomes of Childhood Epilepsy**

- Population based studies
- UK Study (Chin et al. 2011)
  - 31% of adults who had childhood epilepsy reported that they achieved A level/Higher education - less likely than rest of population (48%).
  - 77% of adults who had childhood epilepsy reported they had been in paid employment compared with 91% of rest of population.
- Dutch Study (Geerts et al. 2011)
  - Adults with childhood onset epilepsy more likely to have been in special education particularly those not in remission or with symptomatic aetiology.
- Finnish study (Silanpaa and Schmidt, 2010; Jalava et al. 1997)
  - Better employment chances for those with onset of epilepsy after 6 years of age, normal intelligence and vocational education
  - Only 50% of those with childhood epilepsy had upper secondary school compared with 77% of controls and 26% of individuals with childhood epilepsy did not have vocational education compared with only 5% of controls.
- Japanese study (Wakamoto et al. 2000)
  - More children with epilepsy had attended specialised educational settings compared with controls and fewer were employed compared with controls.

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**Special Educational Needs and Childhood Epilepsy**

- US
  - Berg et al. (2005) – 58% of parents reported that child with epilepsy had received special education services.
- UK
  - Tidman et al. (2003) 30 of 67 children with epilepsy were attending special schools
  - Swiderske et al. (2010) – 35% of children with epilepsy had a Statement of special educational needs
  - Children with Epilepsy in Sussex Schools (CHESS) study
    - of 85 children with ‘active’ epilepsy 53% had a Statement of Special Educational Needs and 72% were on special educational needs register.
    - 79% of parents and 67% of teachers reported that child had problems with academic progress (i.e., cognitive or school achievement problems)

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**Reasons for school-based problems**

- **Global Cognition**
  - 21-40% of children with epilepsy have IQ below 70
  - memory and processing speed scores below mean and assessed IQ
- **Behavioural Difficulties**
  - 37% of children with had emotional/behavioural difficulties epilepsy compared with 9% of general population (Davies, Heyman & Goodman, 2003)
- **Academic underachievement?**

- Heslop et al. (2002), McCallum et al. (2002), Unwin et al. (2008), Selkirk et al. (2002), Selkirk et al. (2002), Heslop et al. (2002)
**Academic Achievement**

- Children with difficulties in academic achievement may present with ‘underachievement’ or ‘low achievement’ across a range of academic subjects.
- ‘Underachievement’ occurs when a child’s performance in an academic subject is significantly discrepant from that expected based on their IQ score.
- ‘Low achievement’ on the other hand is independent of IQ and is performance below the mean for that particular academic area.
- Fastenau et al. (2008) found that more children reached the criteria for an ‘Specific Learning Difficulty’ (SLD) when low achievement criteria were used.

**Extent of the problem**

- The rates of difficulties in academic achievement experienced by children with epilepsy vary significantly in fifteen reviewed studies (Reilly & Neville, 2011) - Why?
  - Academic achievement has been measured in different ways in the published studies with some studies reporting teacher reports of academic performance, some reporting on school records of academic achievement, and some on individual assessments of children with epilepsy.
  - Studies have focussed on academic achievement at or close to the time of epilepsy onset whereas others have included children who have epilepsy over varying periods of time.
  - But - A number of studies have included control children (e.g. siblings, children with asthma) and in these studies the mean achievement scores for the group of children with epilepsy is lower than those of controls.
- There appears to be a significant problem

**Fastenau et al. (2008)**

- N=164 - All children all had IQ >70
- 48% met criteria for an SLD (1SD) below IQ in at least one area using IQ discrepancy model
- 62% met criteria using low achievement model (1SD below mean for test)
- Greatest area of difficulties were Maths and Writing
- Concluded that All children with epilepsy are vulnerable for difficulties in school performance
- NB -us rates vary considerably depending on definitions but circa 5% in public school is US

**Harrison et al. (2012)**

- Childhood onset Focal epilepsy n=390
- Impaired scores (Standard score less than 80) on WORD/WIAT-II
  - Word reading (38%)
  - Spelling (43%)
  - Numerical Operations (54%)
  - Reading comprehension (51%)
- Scores on all academic areas lower than that predicted by IQ
- No significant effects of epilepsy variables once IQ controlled for
- Memory deficits appear to predict reading comprehension problems in context of average IQ

**Mitchell et al. (1991)**

- 40% below 10th percentile on reading comprehension
- 16% to 50% underachieving based on ½ SD below IQ criteria for underachievement
- Most problems in general Knowledge and Reading Comprehension

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<th>CHESS STUDY (n=65)</th>
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Profile of Academic Achievement

- Aldenkamp et al. (1999) children with epilepsy had better reading/spelling than arithmetic and difference was greater than IQ matched controls.
- Fastenau et al. (2008)—most difficulty in calculation, dictation and writing samples.
- Harrison et al. (2012)—Word reading and spelling least impaired and reading comprehension most impaired.

Factors associated with difficulties in academic achievement

- Factors associated with lowered IQ (e.g., early onset seizures, symptomatic cause) also associated with lowered scores on academic achievement (e.g., Aldenkamp et al. 2004)
- Seizure severity/frequency, polytherapy and duration of epilepsy linked with lowered scores on some but not all studies
- Difficulties with attention only factor after IQ controlled for (Williams et al. 2001)
- Neuropsychological deficits but also disorganised/home environments are risk factors (Fastenau et al. 2004)
- Lower parental education more likely to be underachieving and other family difficulties (Mitchell et al. 1991)
- Fastenau et al. (2008)—after IQ controlled for, seizure type only significant predictor (non-absence generalised seizure) and only for computational maths skills.
- Other factors—Attendance affected by epilepsy (Serdari et al. 2009; Aguiar et al. 2007) but no studies of relationship with academic achievement

CHESS Study—Factors associated with difficulties in academic achievement

- Significant predictors in all 4 areas of achievement—FSIQ, more frequent seizures, polytherapy, duration of epilepsy, scores on memory subtests, presence of ADHD.
- But after controlling for IQ—Youngest age of onset (word reading), auditory working memory (reading comprehension) only significant predictors.

Age and Academic achievement

- Is adolescence a particularly high risk time for academic problems? Yes
  - Mitchell et al. (1991)—older children more likely to be underachieving
  - Harrison et al. (2012) older children show more delay and negative association with age and performance.
- But- Age not a predictive factor
  - (McNelis et al. 2005) (Fastenau et al. 2004)(CHESS study)
- And- Fastenau et al (2008)—younger children show more underachievement.
Comparison of primary and secondary-CHESS study

Time and Academic Achievement
- Fastenau et al. (2009) Academic achievement is not below average at onset although some aspects of neuropsychological status is affected.
- Jones et al. (2010) – No significant change in academic performance after 2 years.
- Dunn et al. (2010) - At baseline reading and maths scores were similar to siblings but writing was lower. However, at 36 months children with epilepsy had lower scores in all 3 domains.

Support in academic areas?
- Humphries et al. (2005)- Direct instruction improves academic performance of children with epilepsy.
- There is strong evidence for the effectiveness of phonological-based reading interventions in supporting children with dyslexic difficulties but do many children with epilepsy have dyslexia?
  - CHESS Study – 2 definite and 3-4 more possible.
- Reading comprehension - Vocabulary instruction and inference training (Duff and Clarke , 2011)
- Maths - Interventions for dyscalculia are being developed focusing on early numeracy (e.g. Butterworth et al. 2011) but do children with epilepsy have increased rates of dyscalculia?

Support in other areas contributing to academic problems
- Working memory training? Evidence?
- Supporting families?
- Psychological support for the young person?
- Teacher training? - improving awareness of epilepsy and child’s learning profile

Case study 1
- Female -10 years, Epilepsy and hemiplegia
- Cognition
  - FSIQ 83 (PIQ Average VIQ Borderline)
  - Memory Auditory Short Term Memory 73
  - Visual Short Term Memory 81
  - Auditory Working Memory 75
- School Achievement
  - Reading 79
  - Maths 55*
  - Spelling74
  - Reading Comprehension 75
- Attention and Anxiety issues
- Lack of school recognition?
- Intervention –Sandwell Early Numeracy Test – Revised, Every Child Counts programme an intensive numeracy teaching programme via Intensive one to one support

Case study 2
- Male 12 years - Focal seizures currently well-controlled on Lamotrigine
- Cognition
  - FSIQ (106) VIQ PIQ in Average range
  - Memory scores
    - Short Term Auditory Memory 89
    - Short Term Visual Memory 85
  - Auditory Working Memory 78
- Academic Scores
  - Word reading 92, Reading Comprehension 85.
  - Spelling 98 Maths 104
- Behavioural/Psychiatric –No issues
- Intervention?
  - Memory and Reading comprehension strategies
- Teacher understanding of working memory problems
Consequences of underachievement?

- **Dyslexia literature** - The academic and later vocational success of these children is likely to be reduced if they do not receive extra support (Maughan, 1995).
- Dyslexia also has been found to have a negative effect on children's social and emotional development (Edwards, 2003).
- Dyslexia children showed a wide range of behaviour problems that could not be attributed to social or developmental background variables (Heiervang, Stevenson, Lund, & Hugdahl, 2001).
- Another study showed that children's aggressive behaviour and reading difficulties during early elementary school are risk factors for adolescent problem behaviours such as delinquency, academic failure and substance use (Barrera et al., 2002).

Hence, no or ineffective treatment of dyslexia will generate extra cost to society, for example increased healthcare costs and costs due to special education and/or remedial teaching. Furthermore, dyslexia will decrease quality of life.

Epilepsy in Adolescence and school achievement?

- Challenges include leaving school, or college and starting employment, increases in the amount and complexity of social activities, driving, building new relationships, and physiological and psychological changes (Khan et al. 2012).
- Do young people with epilepsy who display underachievement in academic area underachieve with respect to employment, third level education?

Conclusion

- There is a high risk of low and underachievement.
- Very important to identify that there is a problem at school and to clarify nature of the problem.
- While it can prove difficult to disentangle factors that contribute most to academic difficulties in adolescents with epilepsy it should be possible to identify likely contributors which may be multiple.
- Comprehensive psychological (cognition, achievement, behaviour-emotional including family functioning, school relationships/attitudes) evaluation can help pinpoint the nature of the academic difficulty and point to the possible contributors.
- Interventions need to be tailored to individual children and areas of need prioritised.
- Things can and do improve!