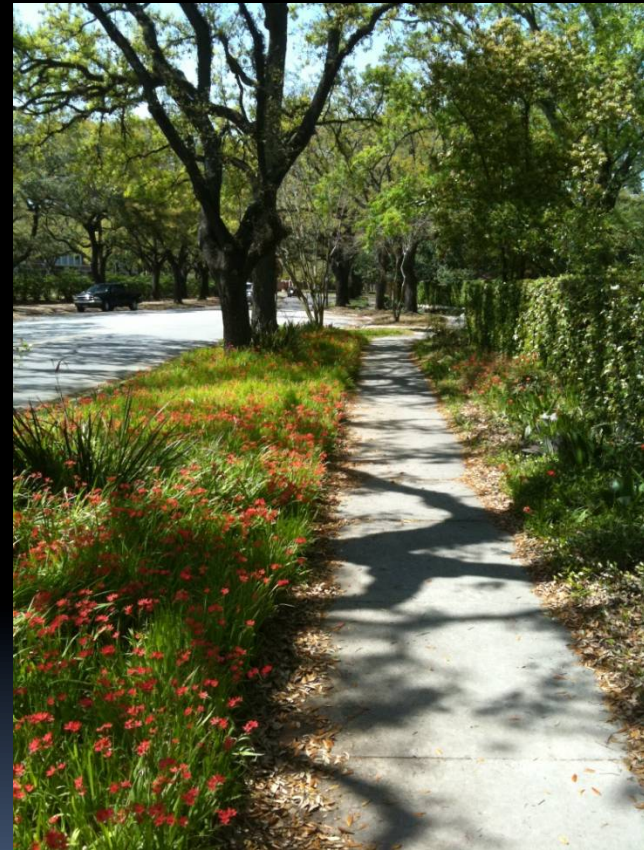




COGNITIVE FUNCTION AND BEHAVIORAL IN CHILDREN WITH EPILEPSY:

Çiğdem İ. Akman, MD



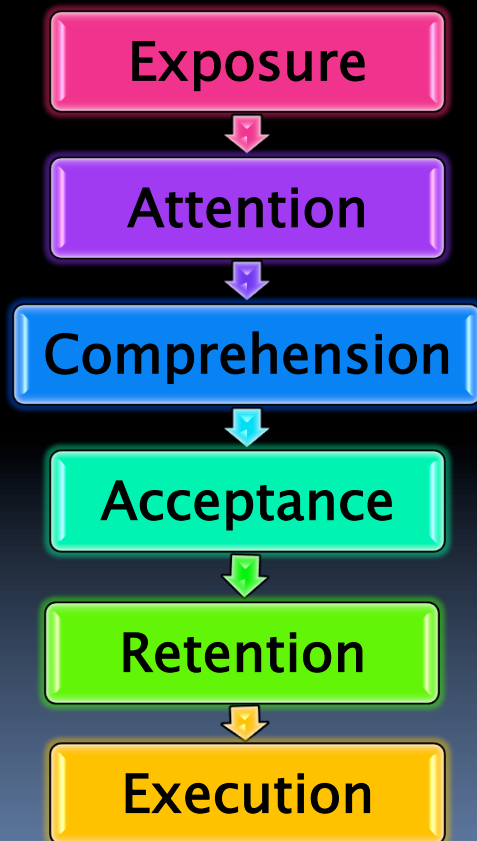


Cognition:

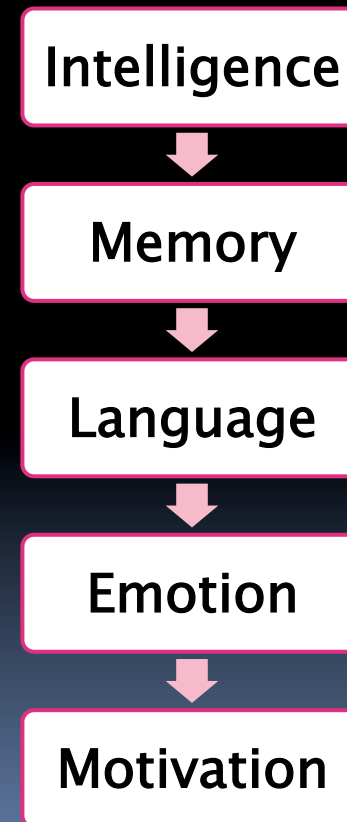
- Cognition is a term referring to the mental processes involved in gaining knowledge and comprehension, including thinking, knowing, retaining, remembering, judging and problem solving.
- These are higher-level functions of the brain and encompass language, imagination, perception and planning.

Steps for Gaining Knowledge:

Physiological functions



Individual variables





Cognitive dysfunction and Epilepsy

- Specific problems affecting Cognition
- Factors play a role for Cognitive dysfunction

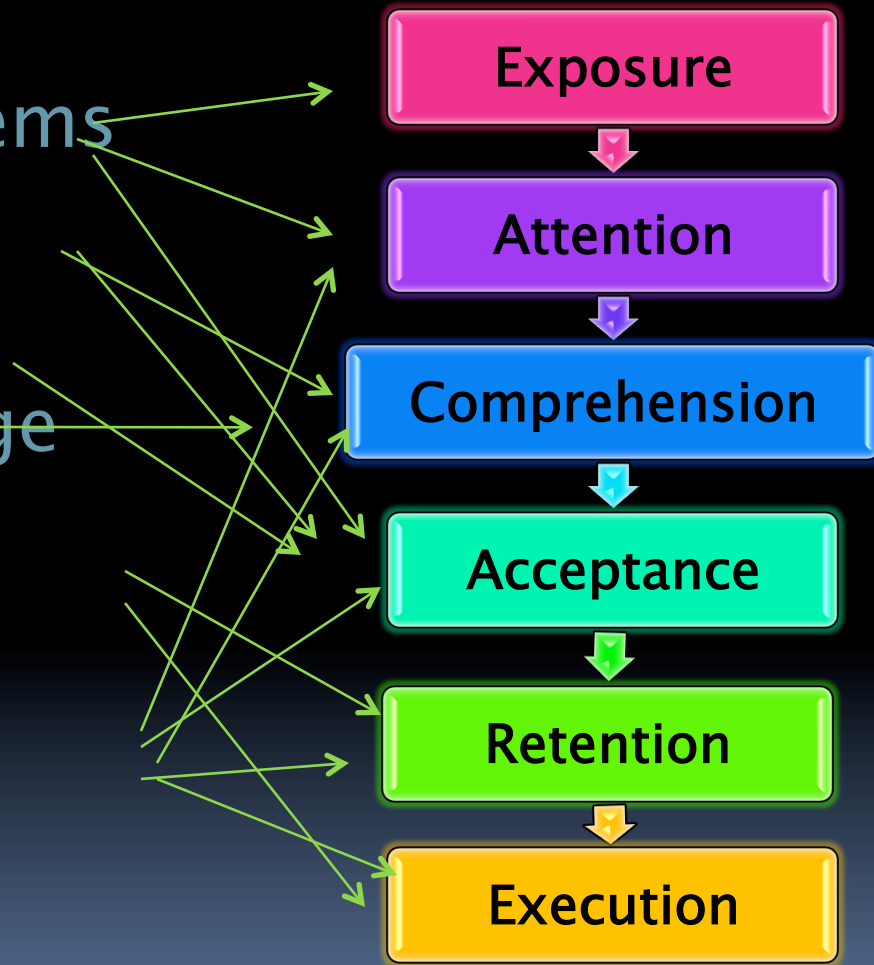
Prevalence of Disability and Handicap in Children with Epilepsy

Sillanpää Epilepsia 1992;33:3

- Population based study (Turku, Finland)
- Age 4–15 years
- Life time prevalence: 143 /21,104 (0.68%)
 - Mental retardation 31.4%
 - Speech disorder 27.5%
 - Reading disorder 18.6%
 - Specific learning disorders 23.1%
 - Communication disabilities 27.6% (7.3% control)
 - Social integration handicap 12.1% (1.0% control)

Neuropsychological dysfunctions associated with epilepsy:

- Attention problems
- Memory impairment
- Speech / Language impairment
- Executive dysfunction
- Psychological – psychiatric symptoms



Comparison of two chronic medical problems: Epilepsy versus Asthma

Epilepsy

- N:136
- Age 8–12 y
- Age onset: 5.1 year
- 1–9 episodes/past month–19.9%
- Episode free >1 year–32%
- Psychological domains of QOL
 - Anxiety
 - Behavioral problems

Asthma

- N: 134
- Age 8–12 y
- Age onset:3.1 year
- 1–9 episode /past month–41.4%
- Episode free >1 year–2.3%
- Physical domain of QOL
 - School absences
 - Side effects of medication
- Frequency of episodes

	Epilepsy	Asthma	Significance
Physical			
School absences	47	52	P<0.01
Frequency of episodes	44.9	55.1	P<0.05
Psychological/Behavior			
Anxiety	52.4	47.7	P<0.001
Externalizing behavior	56.5	52.4	P<0.01
Social			
Peer relations	48.5	51.4	P<0.01
School			
School progress	47.6	52.7	P<0.001
School achievements	48.5	51.6	P<0.01

Learning and memory problems in school age children with epilepsy.

Schouten et al 2002

- Children with 'epilepsy only' (age 5–16y): recently diagnosed epilepsy (n:72) , >2 seizure, idiopathic epilepsy compared with their class mates
- Repeat testing was performed at 3mo and 12 mo in follow up
- Registration, learning, and retention was normal, and remained unchanged over time
- Tasks requiring "increased demand" on working memory were associated with the lower scores.
- Seizure free state was correlated with better performance for specific tests such as "word span, backward".

Duration of epilepsy and ADHD

Newly diagnosed 'epilepsy only' and ADHD
Does the epilepsy duration matter?

- New onset children with idiopathic or cryptogenic epilepsy n:51
- Generalized or focal
- Control: age matched
- Test at 2 days, 3 mo and 12 mo after the diagnosis
- No difference in reaction time, motor speed between control and epilepsy
- Previous history of school or behavioral problems associated with attention problem

Ostrom et al 2002

- New onset seizures n:224
- Generalize and focal
- Control: siblings
- Behavioral check lists (6 months earlier)
- Scores were higher than siblings
 - Behavioral problems
 - Internalizing problems
 - Attention
 - Thought problems

Austin et al 2001

ADHD and clinical features of seizures

- n:175 children
- LRE 54%
- GE 30%

Not predictors for ADHD

- Sex
- Seizure type
- Location

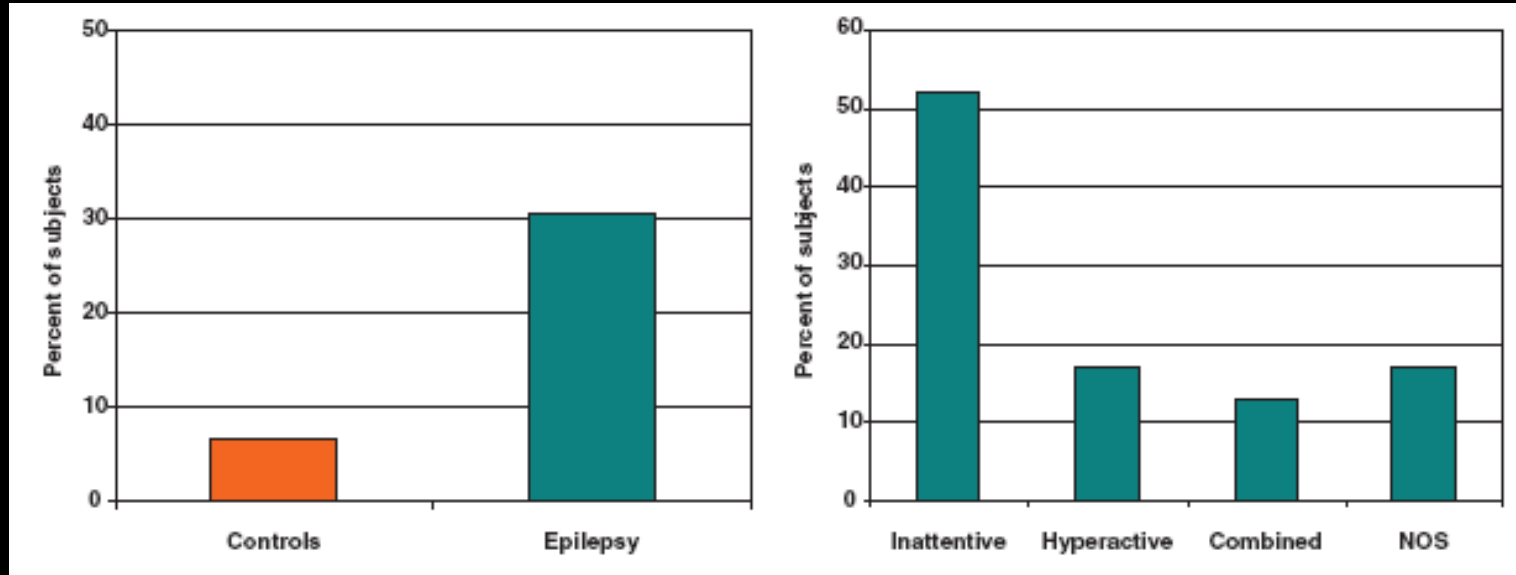
	Hyperactive %	Inattentive%	Combined %
Child (F/M)	3.1	22.8	13.5
Adolescent	1.3	25	8.9
Absence seizure	0	39.3	14.3
Complex partial	39	19.6	0
Simple partial	0	40	10
Generalized tonic-clonic	3.6	17.9	21.4
Frontal lobe	0	27.3	9.1
Temporal lobe	0	23.1	11.5
Central –vertex	5.6	22.2	5.6
Generalized epilepsy	2.9	20.6	14.7

ADHD and newly diagnosed epilepsy

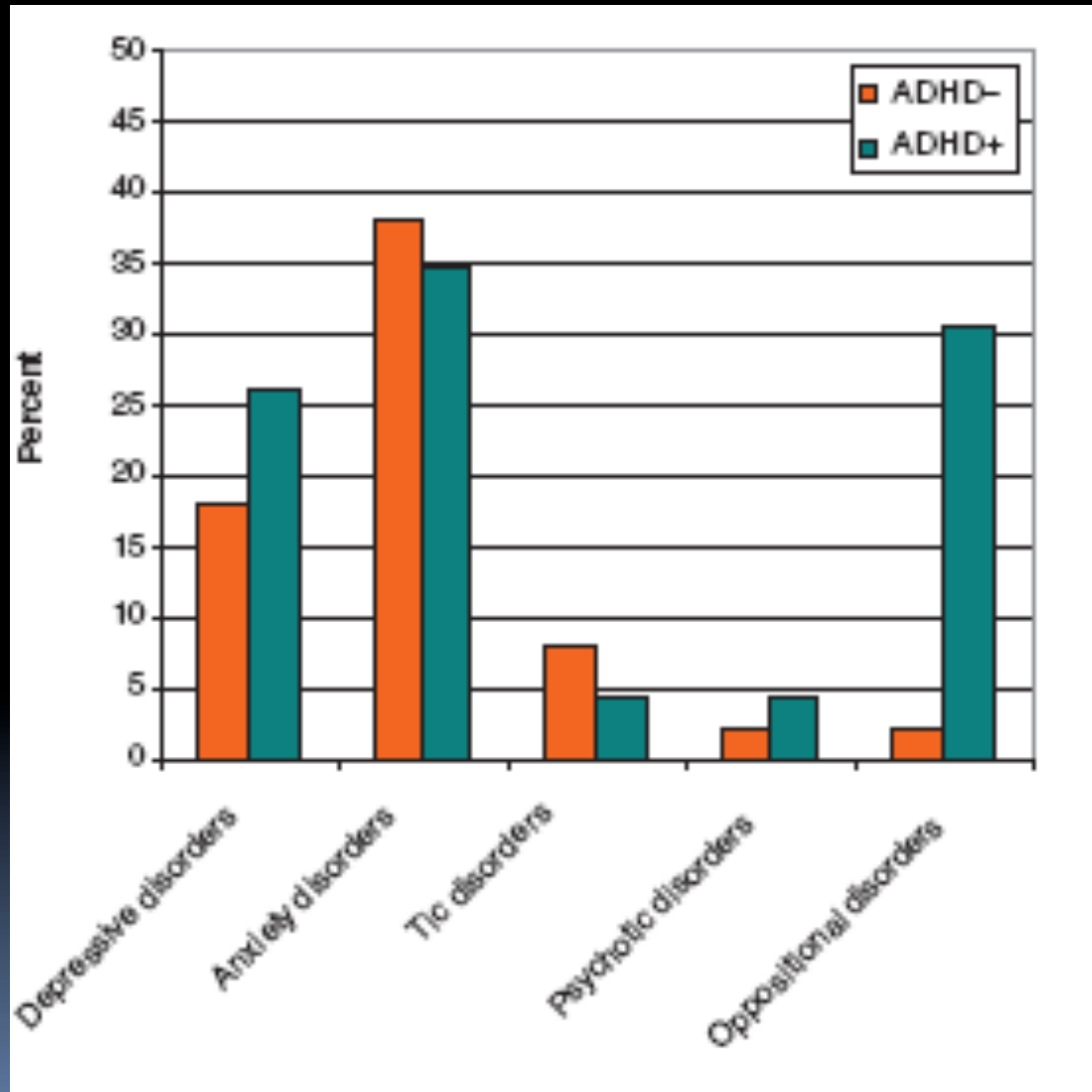
- *New onset idiopathic epilepsy in children (age 8-18years)*
- *Evaluated for ADHD*
- *ADHD was found 36% of children with epilepsy compared to 6% in control*
- *ADHD antedated the Epilepsy diagnosis*

Hermann et al: Brain,2007

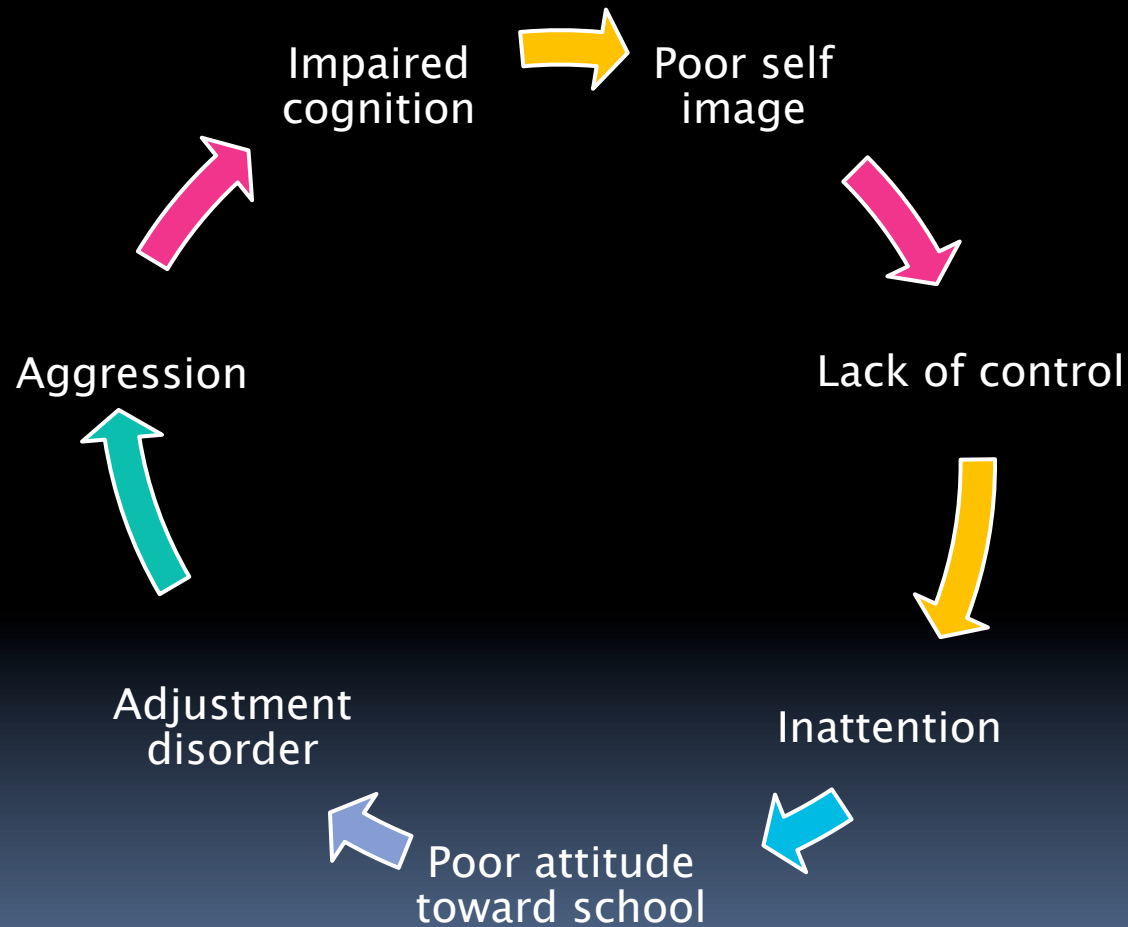
ADHD in Newly diagnosed Epilepsy



Other problems with ADHD



Why is important to identify and address the behavioral problems?



Emotional and Behavioral Problems in Children with Drug resistant Focal Epilepsy

- Chart review was performed on 56 children (age:5–19 years) with drug resistant FE (2001–2007).
- A standard battery of neuropsychological tests was performed for each child.
- Child Behavioral Check List (CBCL) and Student Behavioral Survey (teacher's report) were used to assess behavioral and emotional problems.
- Test scores of CBCL and intelligence quotient were compared in children grouped based on the localization of seizure focus or etiology.

Clinical features of cohort

N:56	Average \pm SE(range)
Age (years)	11.8 \pm 3.4 (1-15)
Age onset (weeks)	78 \pm 52 (1-168)
Gender (F/M)	27/29
Causes	
Dysplasia	41%
Mesial Temporal Sclerosis	12.5%
Brain Tumor	21%
Location	
Frontal lobe	21%
Temporal lobe	61%
Others locations	18%

Based on parents and teachers report

	CBCL# (by parent)	SBS# (by teacher)
Inattention	0.02*	NS
Anxiety	0.042*	NS
Aggression	0.07*	NS
ADHD	NS	0.07*

Predictors for Behavioral problems: Parent's report

Type of problem	Predictors	<i>P</i> value
Aggressive behavior	Intelligence score (FSIQ) Seizure frequency	0.032 0.031
External behavior	Intelligence score Seizure frequency	0.005 0.003
Depression	Intelligence score	0.005
Social Problems	Intelligence score	0.009

Executive dysfunction and epilepsy in Children:



- Planning, problem solving, shifting focus and attention or inhibition of non-significant stimuli
- Involvement of FRONTAL lobe circuits
- Children newly diagnosed with EPILEPSY compared with control:
- Behavior Rating Inventory of Executive Function (BRIEF) showed:
- Executive dysfunction in children (n: 53) with epilepsy than control (n:50)
- (*Parish 2007, Dev Med Child Neurol 2007,49;6:809-19*)

Psychiatric co-morbidity in Children with Epilepsy

- Children with newly diagnosed epilepsy (n:53) versus control (n:50)

	Epilepsy	Control
Depression	22.6%	4%
Anxiety	35.8%	22%
ADHD	26.4%	10%

- Jones et al, Dev Med Child Neurol 2007,49;9:493*



Contributors for Cognitive Dysfunction in Children with Epilepsy




Factors Affecting Cognition with Epilepsy

- Non-seizure related factors
- Co-morbid diseases
- Seizure related factors
- Treatment related factors




Non-seizure related factors

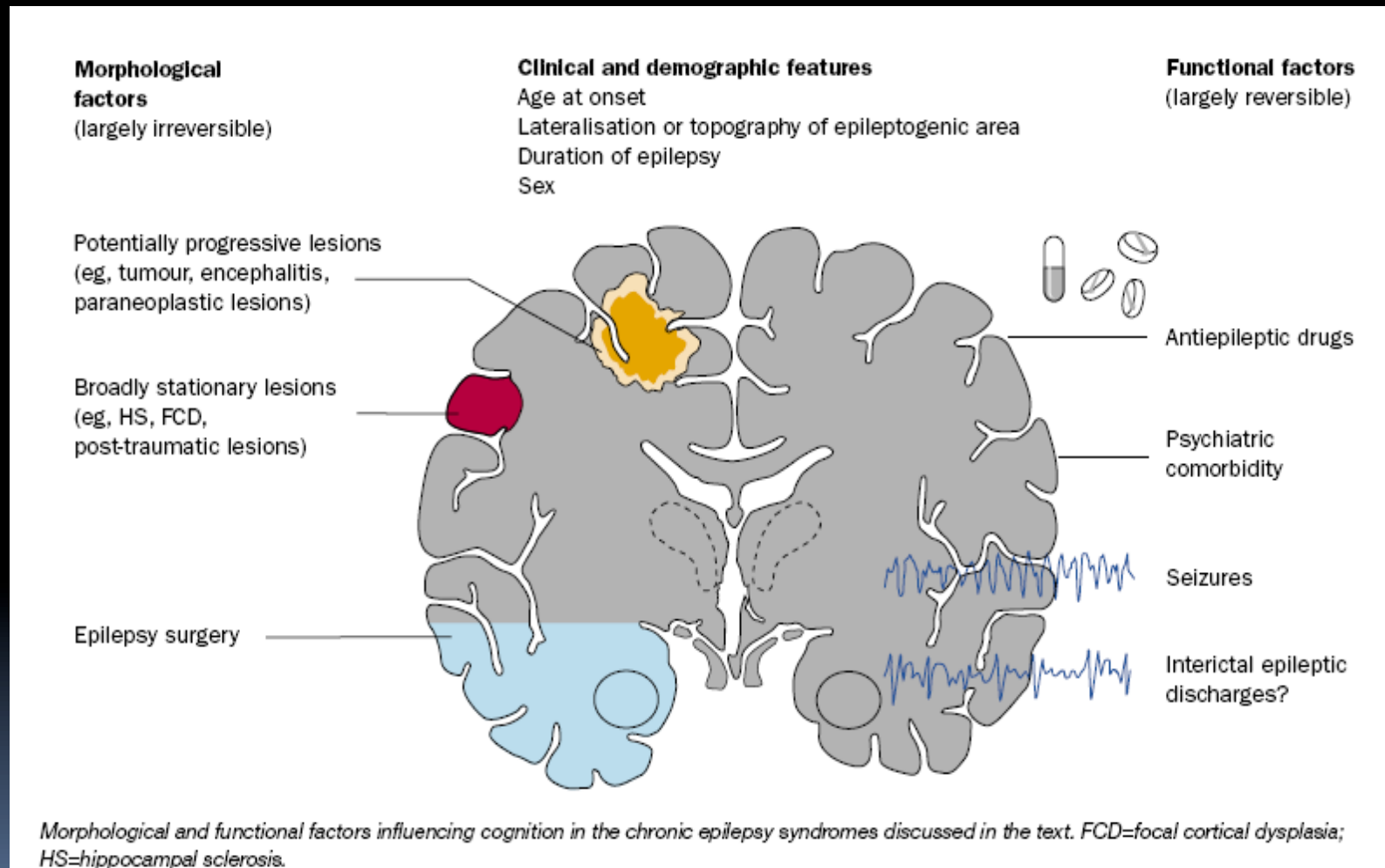
- Age, gender, socioeconomic status
 - Other neurological problems
Cerebral palsy, mental retardation etc.
 - Psychosocial factors
Family, environment, and child factors
- 



Seizure related factors:

- Seizure onset
 - Seizure types and severity
 - Duration and frequency
 - Prolonged or repetitive seizures
 - EEG findings without clinical seizures
- 

Seizure related factors:

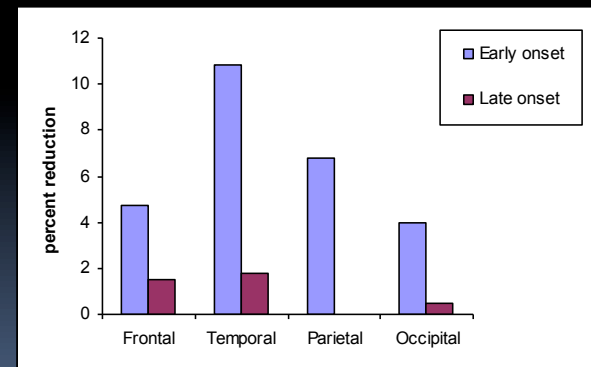
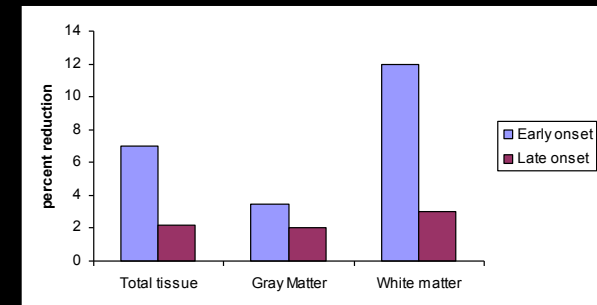


Adapted from: Elger et al, Lancet neurology 2004 3:663

Age of epilepsy onset?

Childhood onset of Epilepsy and cognition

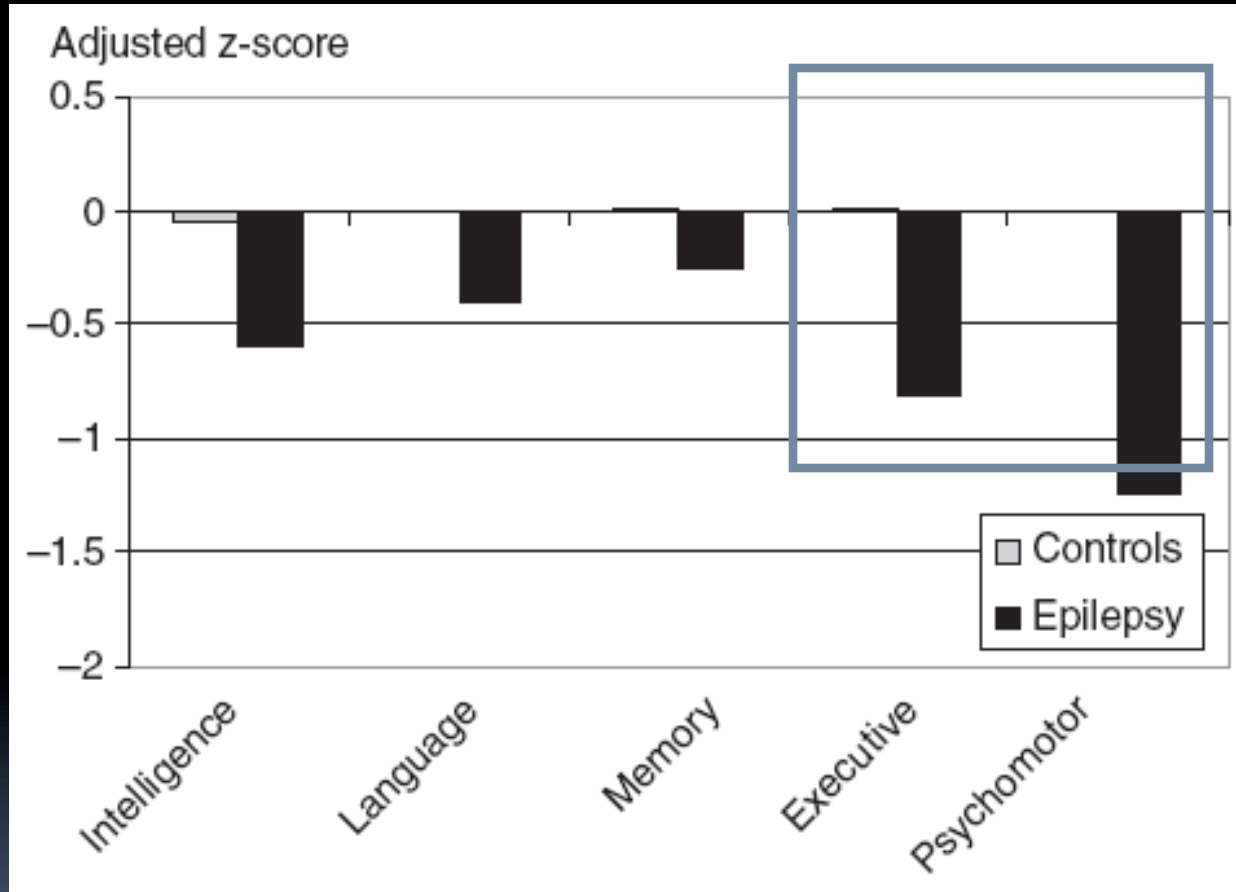
- Early onset n:37 Temporal lobe epilepsy (TLE), age onset= 7.8y
- Late onset n:16 TLE (age onset=23 y)
- Volumetric analysis of brain structures and neuropsychological performance
- Childhood onset TLE associated
 - Reduction in brain volume
 - All cognitive domains, intelligence, memory, language, executive function, visuo-perception **IMPAIRED** compared to control



Bruce Hermann, *Epilepsia* 2002;43:1062

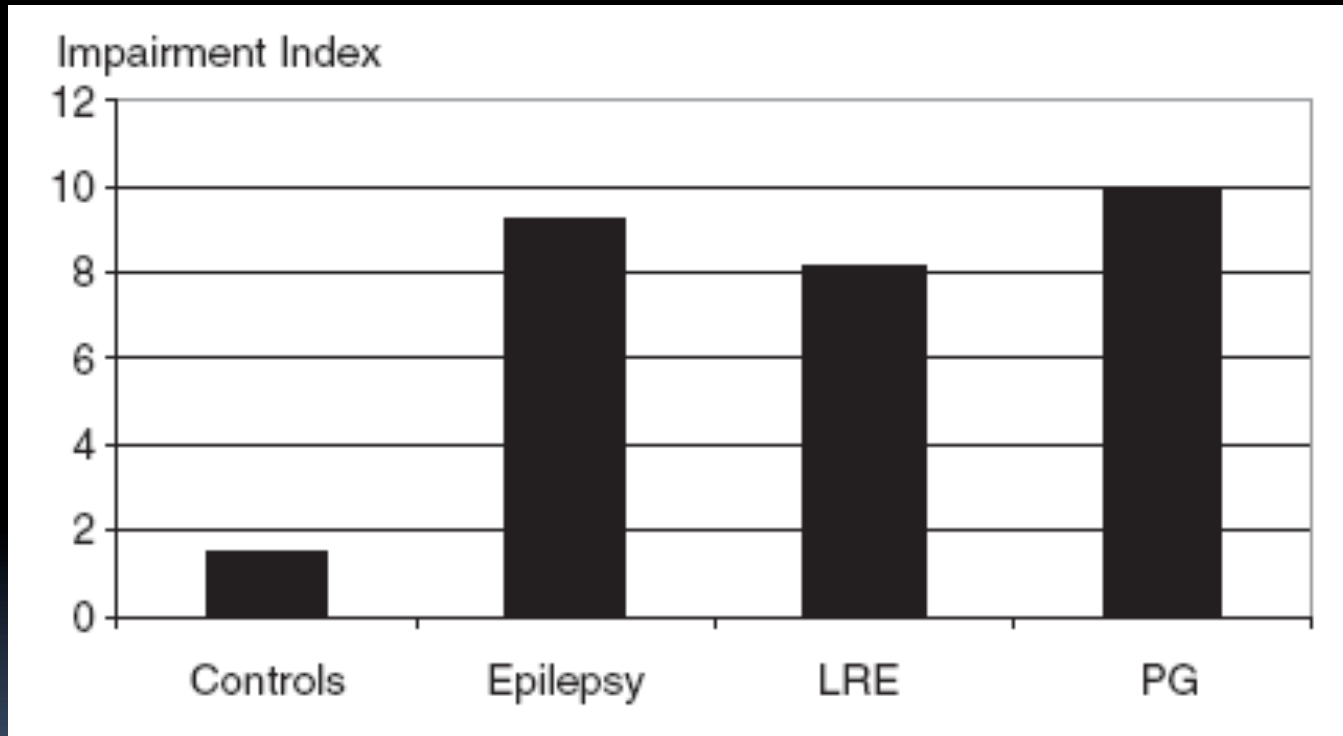
Duration of epilepsy?

Children with new-onset epilepsy

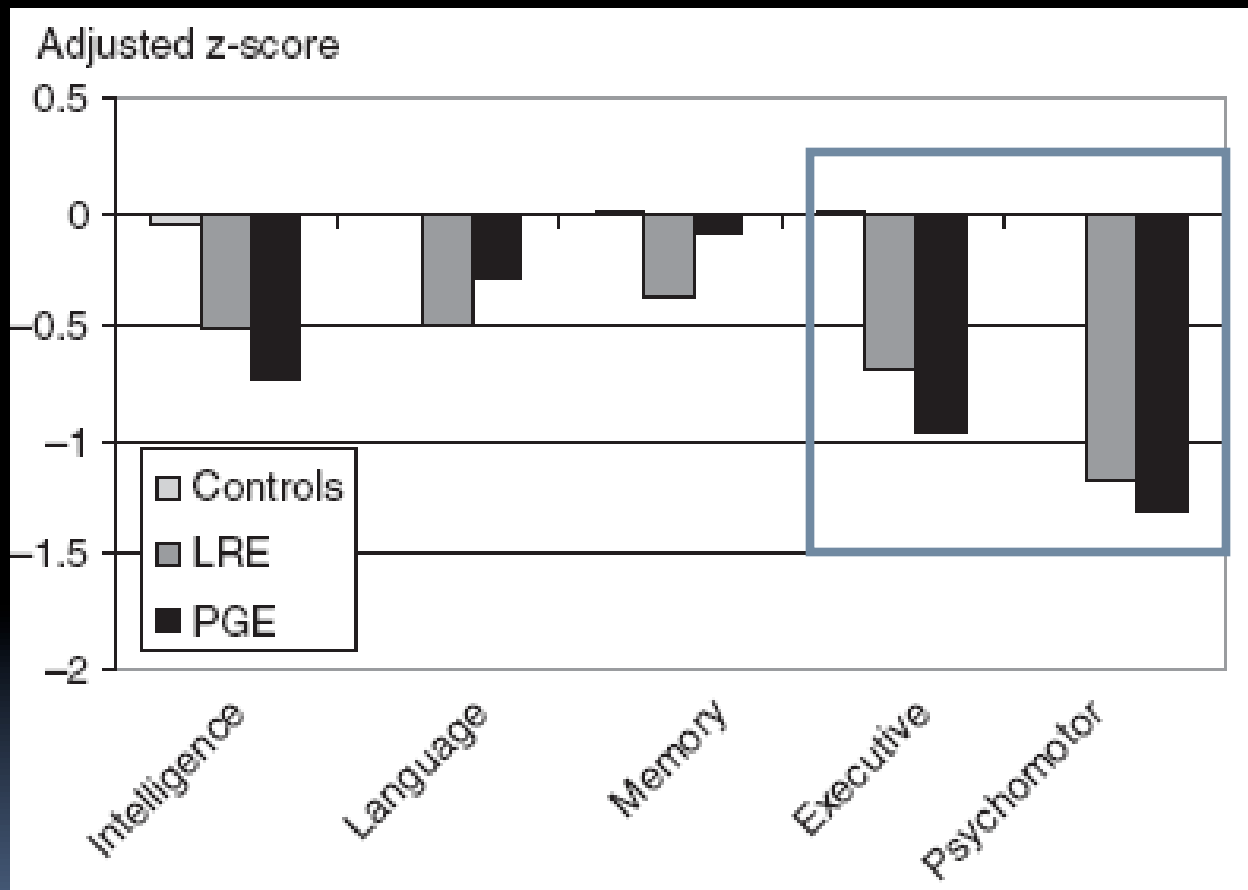


Hermann et al: Brain 2006, 129:2609

Impairment index based on Epilepsy type



Specific areas of impairments: Focal versus Generalized Epilepsy



Hermann et al: Brain 2006, 129:2609



Presence of neurological problems

- Developmental brain abnormality
- Infection (meningitis, encephalitis)
- Hypoxic event
- Progressive neurologic disease
- Genetic syndromes with epilepsy (Fragile X, Rett , Angelman syndromes etc.)
- Autism

Idiopathic Epilepsy:

Benign Rolandic Epilepsy and intelligence

	BECTS		Control	
T1	T0	T1	T0	
FSIQ	94.2	110.5	104.0	107.1
VIQ	93.5	105.	104.2	
	106.1			
Non-VIQ	96.3	114.2	105.1	
	107.1			

- Intelligence below than control
- Difficulty at onset (T0) with BECTS
 - Memory
 - Visuo-spatial skills
 - Visuo-motor coordination
 - Speech
 - Attention span
- Improvement with remission at follow up (T1)

Location of Epilepsy?

Frontal lobe epilepsy

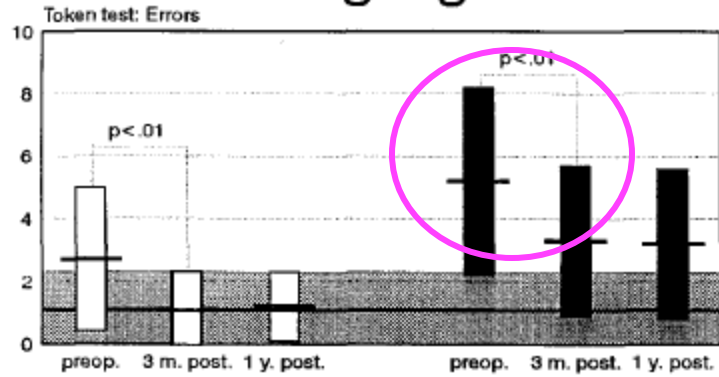
- Riva–2005
 - Non–lesional Frontal lobe epilepsy(FLE) (n:23) age 6–13y on single AED, duration 1–123mo
 - Global intelligence did not impair
 - Phonemic verbal fluency, design fluency, motor coordination was impaired
 - Age onset and duration of epilepsy correlated with impairment
- Prevost–2006
 - Non–lesional FLE (n:21), 47% seizure free, age onset 6.7y, 57% >1 /day seizure at the onset
 - Seizure control did not guarantee learning dissability
 - Early age of onset, persistent seizures predicted impaired cognition
 - ADHD, or other behavioral problems were frequent

Temporal lobe epilepsy and cognition:

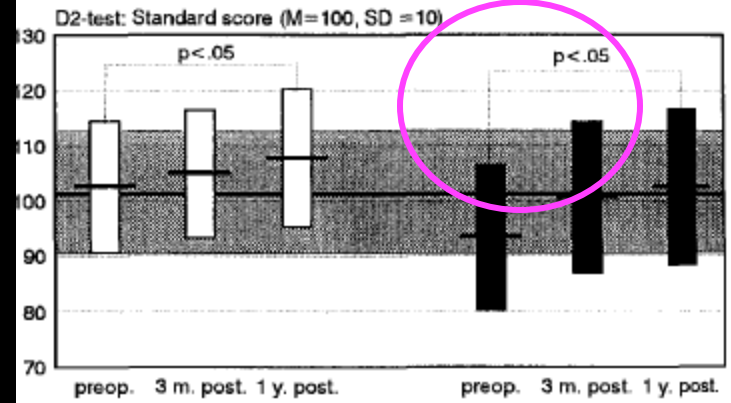
- Symptomatic TLE refractory, n:20, (RTLE 10, LTLE 10) after epilepsy surgery
 - 16/20 –Standard temporal lobectomy
 - 4/20 –Selective temporal lobe surgery
 - 70% –Seizure free in each group
 - No change in average memory scores at follow up,
 - Language & attention improvement after surgery

Michael Lendt, Christoph Helmstaedter, and Christian Erich Elger

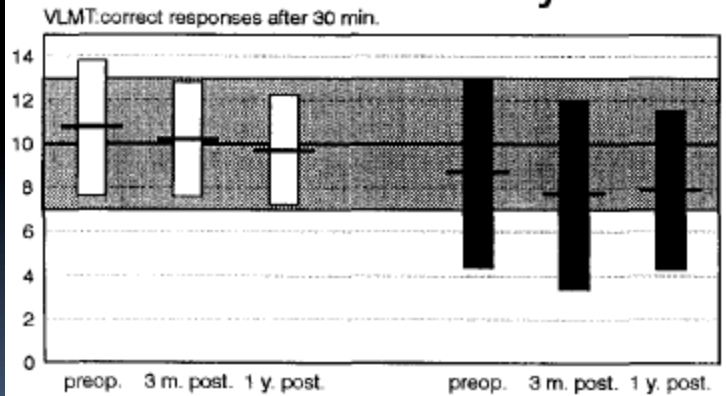
Language



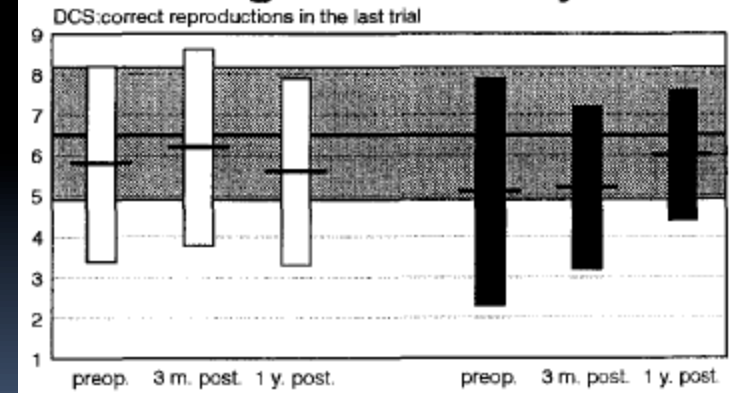
Attention



Verbal memory



Figural memory



Conclusion: Cognitive problems

- Not uncommon in children with Epilepsy
- May antedate the Epilepsy diagnosis
- Early recognition depends on increasing awareness, screening and monitoring by care givers (all of us!)
- Team approach is needed
 - to optimize the best care
 - improve the quality of life



Thank you!

