

Attention-Deficit/Hyperactivity Disorder (ADHD): Disease or Educational Problem?

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Kiel

5000 miles away



Definitions ...




Attention-Deficit/Hyperactivity Disorder (ADHD)


- **Attention-Deficit-Syndrome (ADS)**
- **Hyperkinetic Syndrome (HCS)**
- **Attention-Deficit/Hyperactivity Disorder (ADHD)** by DSM IV-Classification (USA) and ICD 10

Overview

- **ADHD – in Germany and US?**
- **ADHD – controversies?**
- **ADHD – etiopathogenesis?**
 - The neurobiopsychological models
 - The behavioral medicine model
- **ADHD - treatment approaches?**

Prevalence in Germany and US

Studies	Features/Sample	Prevalence	
Wolraich et al. (1998)	N=4313 Kindergarten; DSM IV Basics	Total 6.8%	
Cuffe et al. (2005)	N=10367 children Age 4-17	4.19% boys 1.77% girls Mean: 3.06%	

Schlack et al. (2007)	N=7569 boys and 7267 girls Age 3-17	Mean 4.8% boys 4.3 times more	
Huss (2008)	N=2585 Healthy Controls	Total 3.9%	

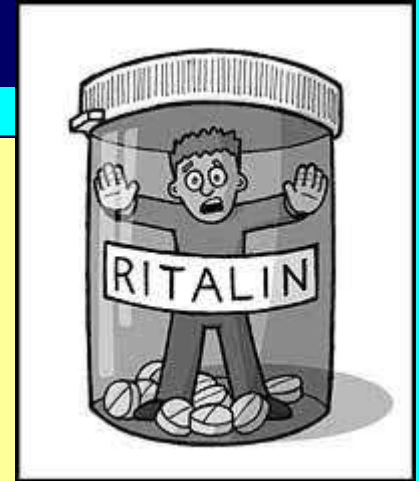
The German „Transparent Study“

N=150,000 pupils (S.-H.)

- Nearly **60%** of all Kids in Germany up to the age of 16 suffer from chronic diseases
 - ➔ Mental & behavioral disorders (22%)
 - ➔ Chronic headaches (about 20%)
 - ➔ **ADHD: 3-10% in school age (33% girls, 10% boys)**
 - ➔ Allergies 16.7% (Food; Asthma; Neurodermatitis, etc)
 - ➔ Obesity (15%); Anorexia (8%)
 - ➔ Smoking: 12% (age 12-15) & 41% (age 16-19)

Overview

- ADHD – in Germany and US?
- **ADHD – controversies?**
- ADHD – etiopathogenesis?
 - The neurobiopsychological models
 - The behavioral medicine model
- ADHD - treatment approaches?



Controversies and Myths

Biological Perspective

- ADHD = inherited disease (is not treatable)
- ADHD = brain damage (→ lack of intelligence → school problems)
- ADHD = metabolic disorder (← allergies, triggered by food)

Educational Perspective

- ADHD = not a disease, but a problem of the present time (a social phenomenon)
- ADHD = only is an educational problem (parental)
- ADHD ←→ from the teachers

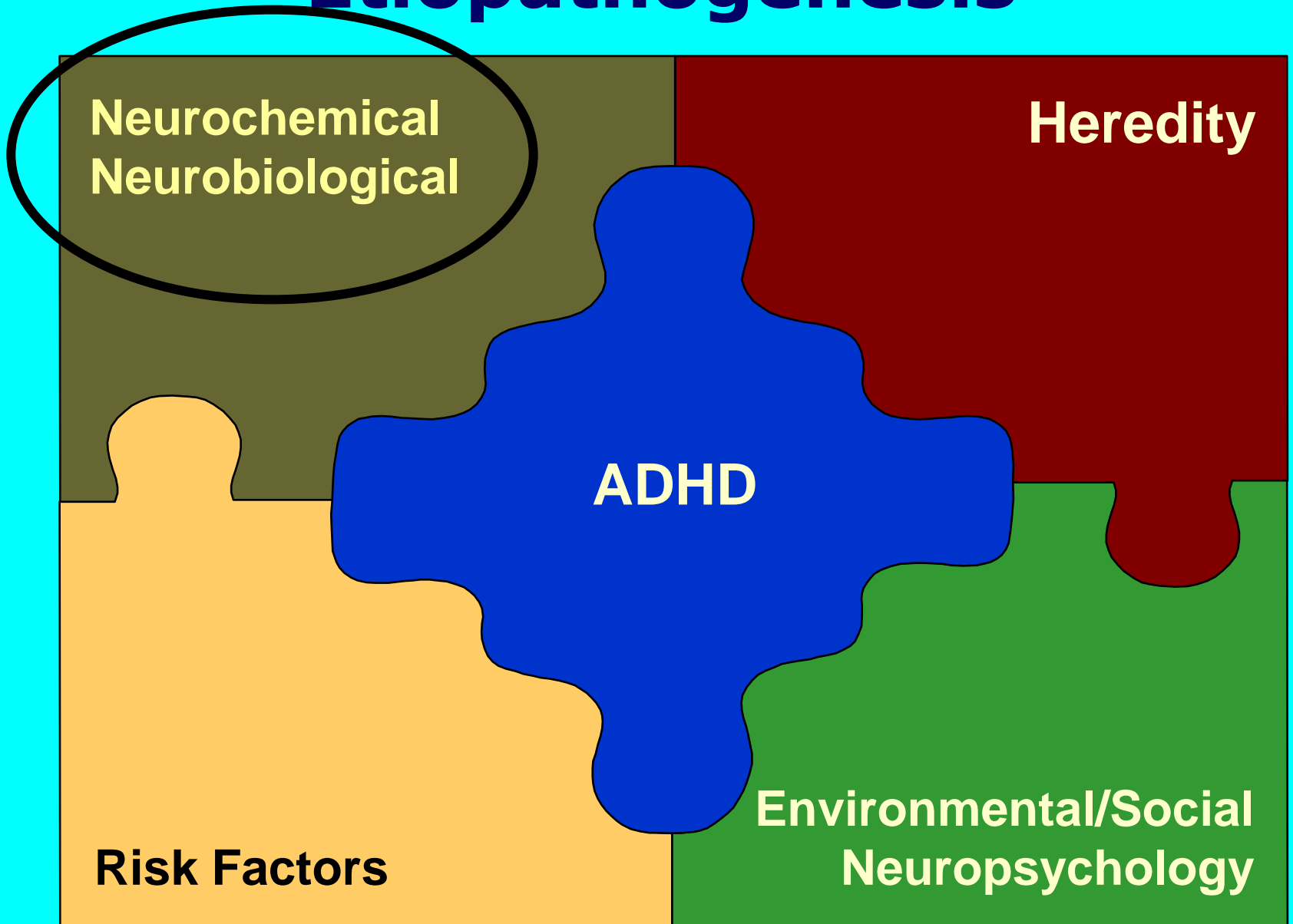
Pros and Cons

Inherited versus **Learned**
Biological versus **Psychological**
Medication versus **Behavioral Training**

Overview

- ADHD – in Germany and US?
- ADHD – controversies?
- **ADHD – etiopathogenesis?**
 - Complexity – the puzzle
 - The neurobiopsychological models
 - The behavioral medicine model
- ADHD - treatment approaches?

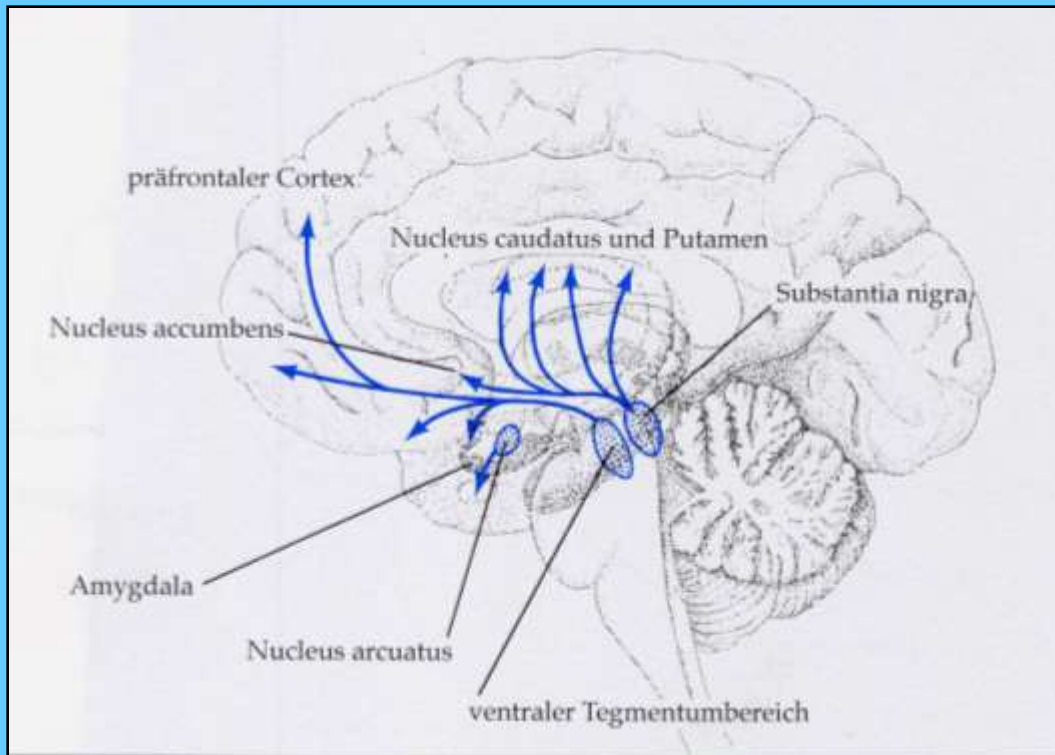
Etiopathogenesis



The „Facts“ of the Pathophysiology of ADHD

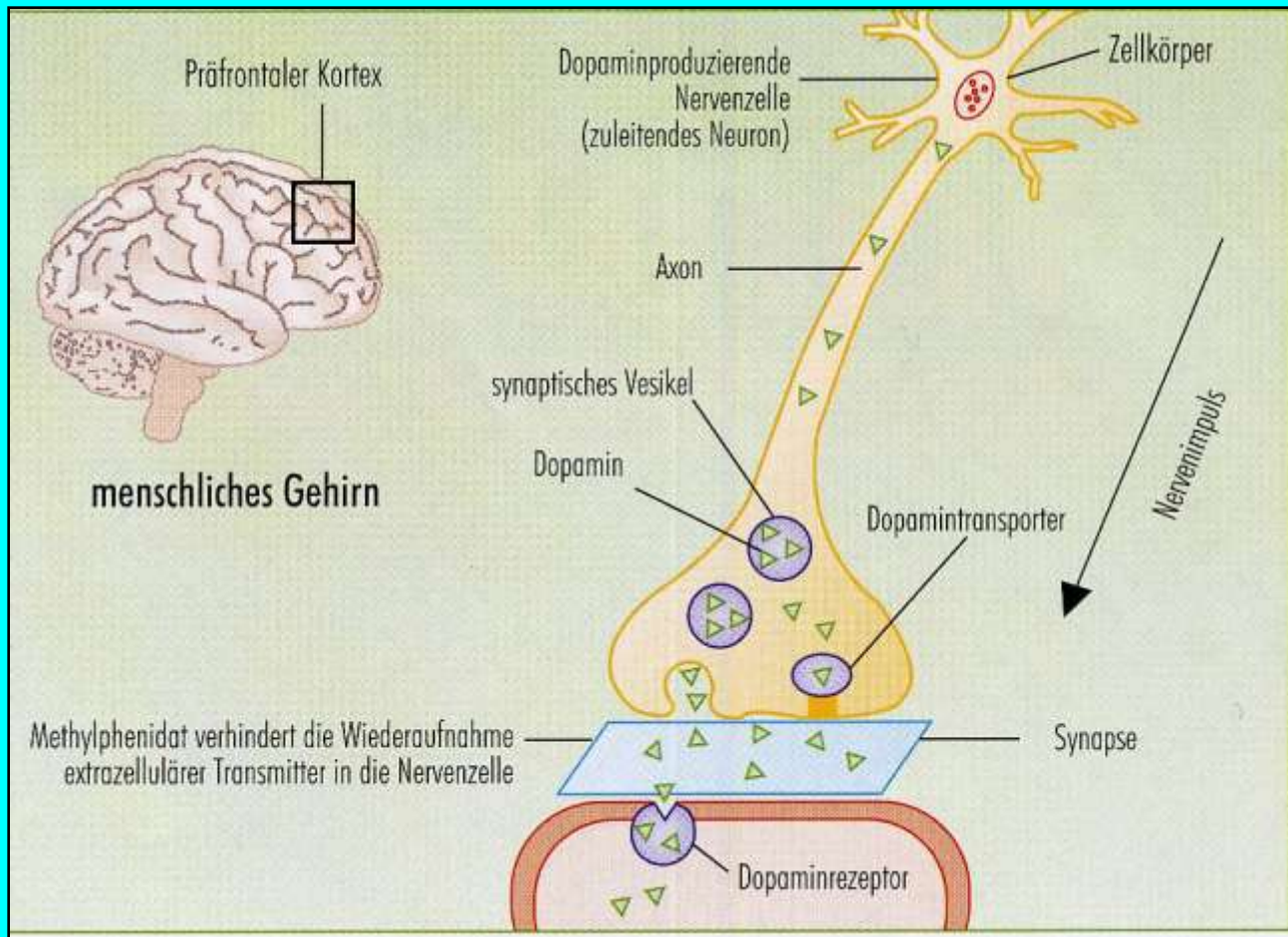
ADHD - Lack of Dopamine?

Location	Hypothalamus N. caudatis Brain Stem Substantia nigra	Dopamine makes: \uparrow Motor Activity; \uparrow Learning, Memory, Attention, \uparrow Self Reward System
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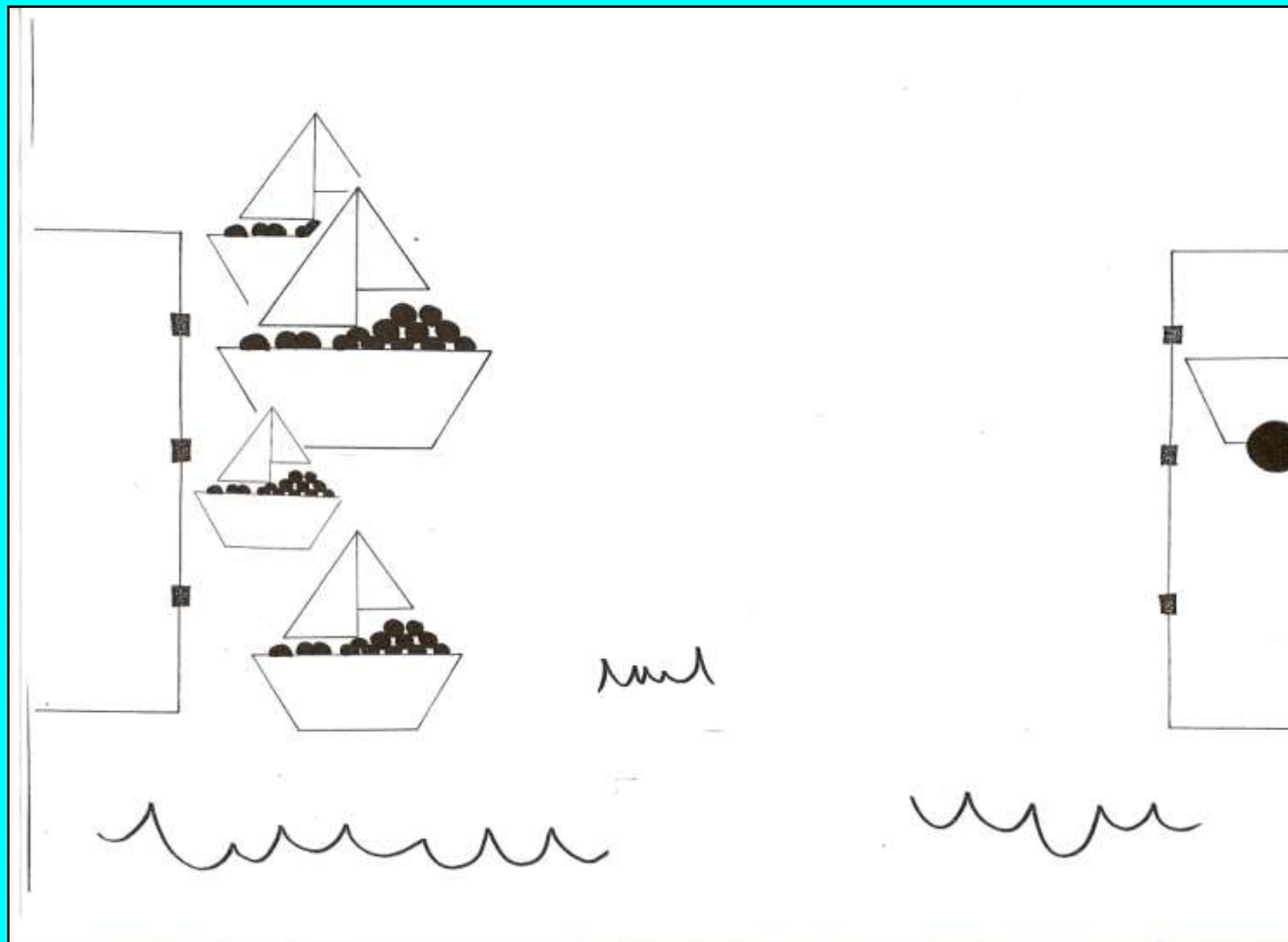


Too much \rightarrow Addiction
Too little \rightarrow M. Parkinson

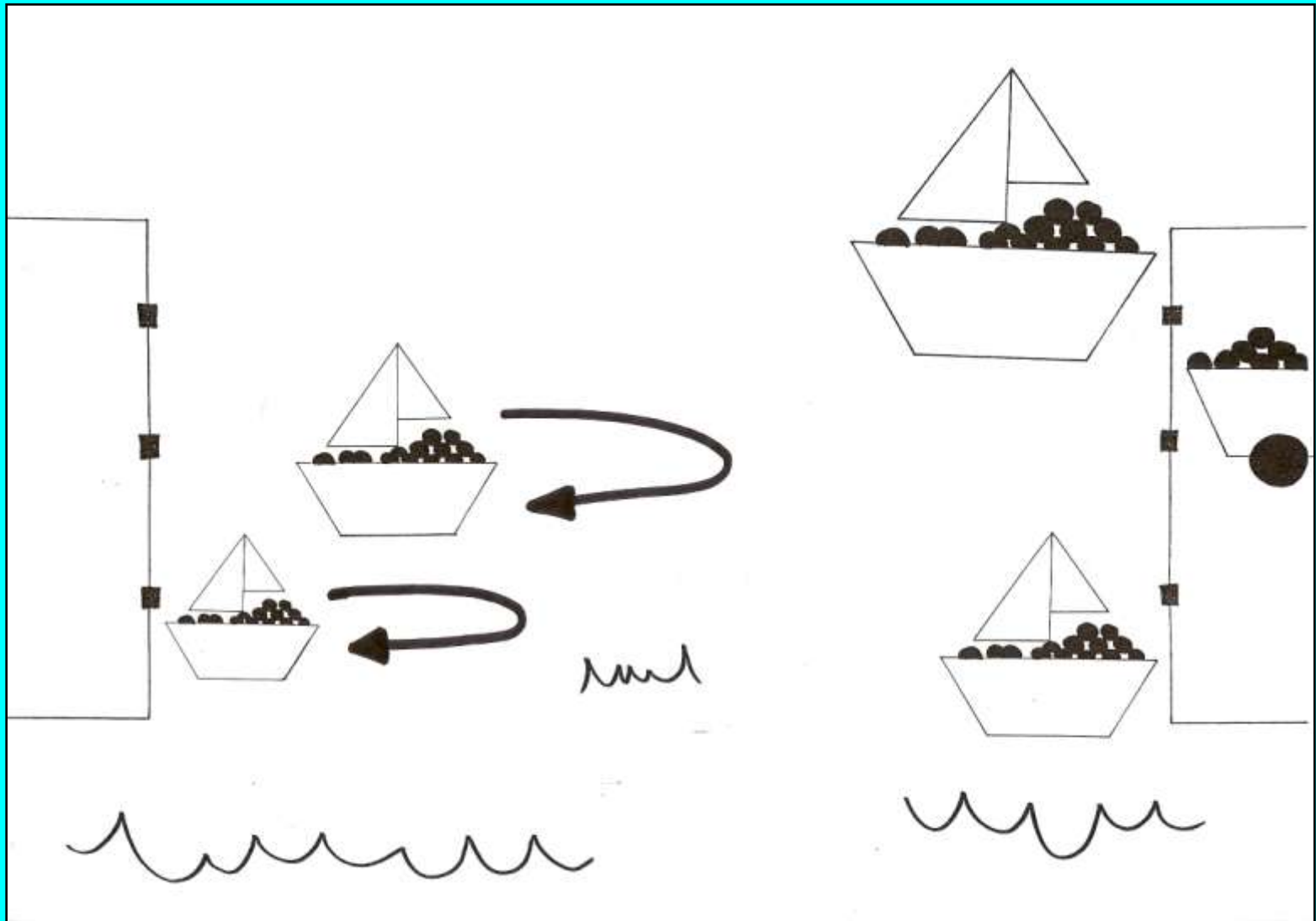
ADHD is a Disturbance of the Dopamine Transmission - Transport



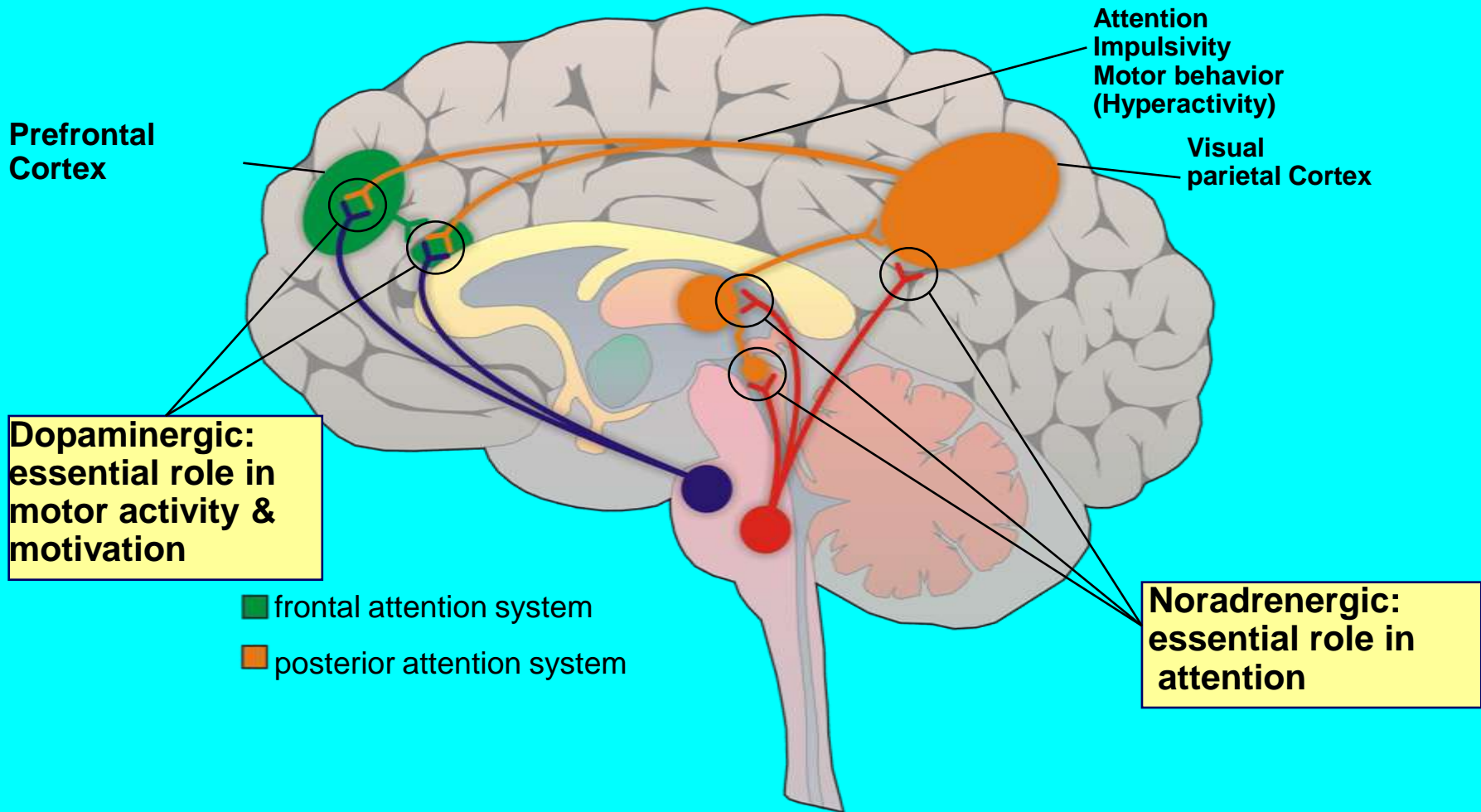
Descriptions of ADHD-Kids



Descriptions of ADHD-Kids



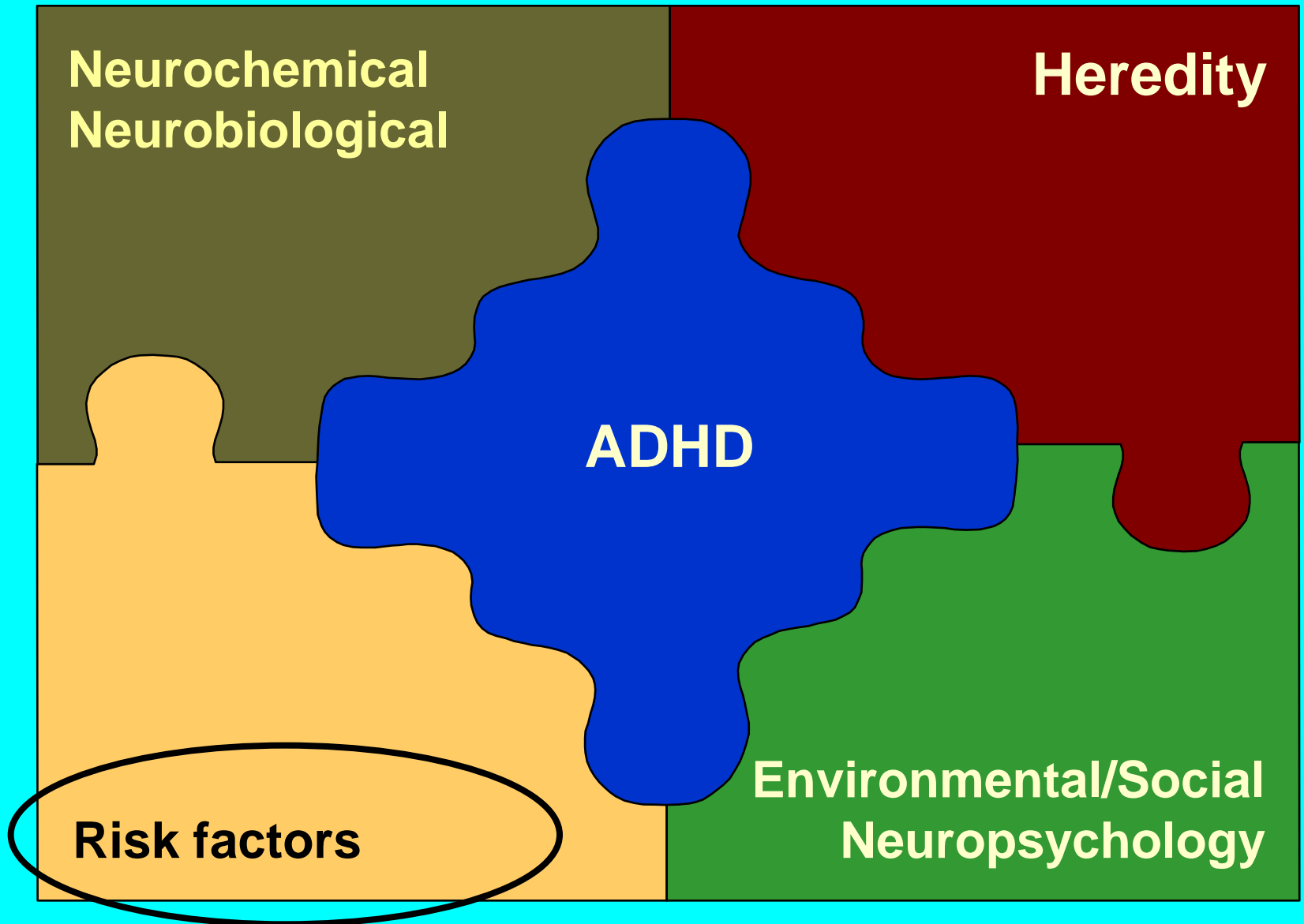
Neurobiological Background



Noradrenaline and Dopamine both play an essential role in ADHD

Modified from Manor I et al.: Family-based association study of the serotonin transporter promoter region polymorphism (5-HTTLPR) in ADHD. Am J Med Genet 105 (1):91-5, 2001.

Etiopathogenesis



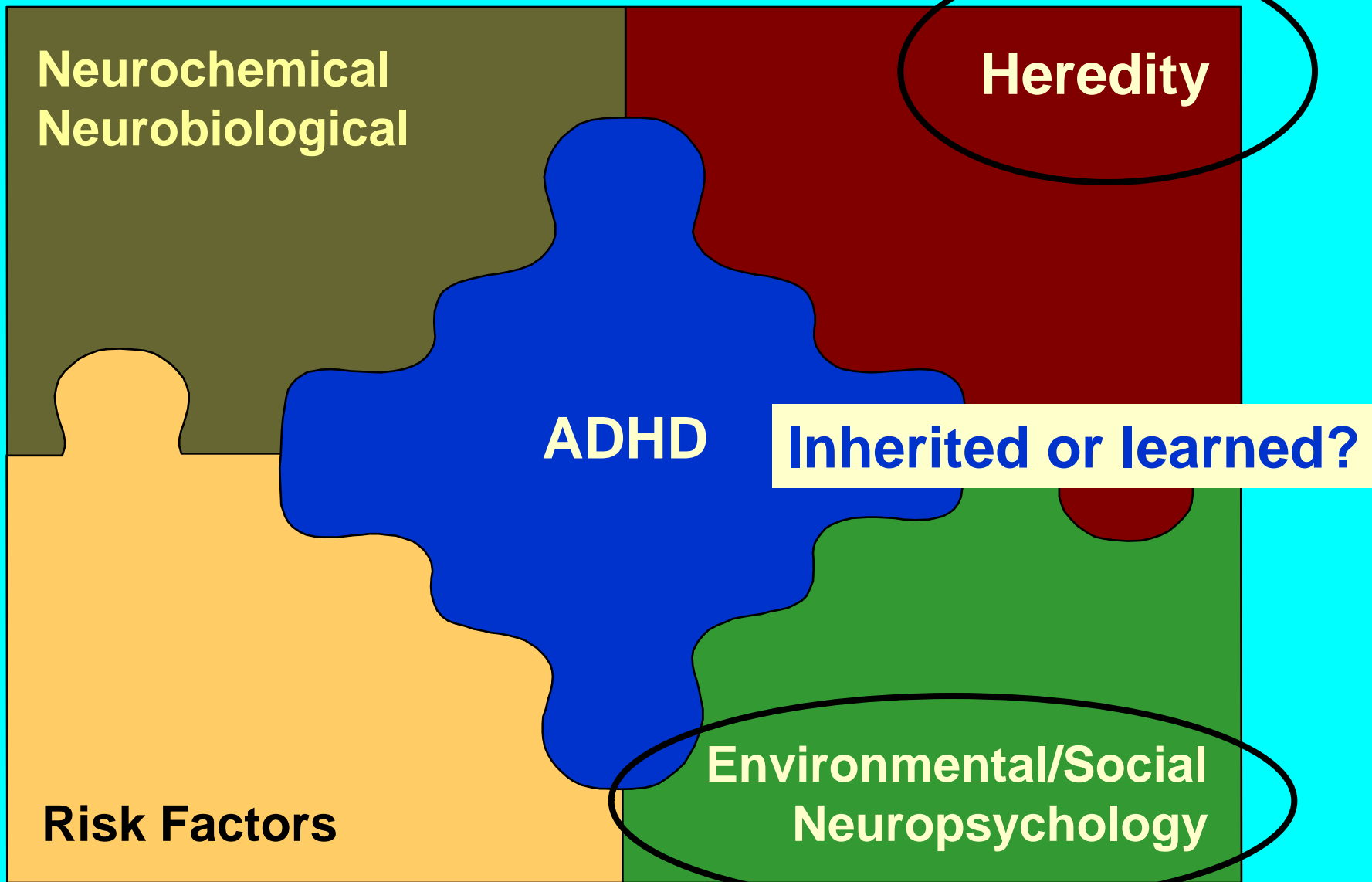
Risk Factors?

- ⤵ Brain damages, CNS-Infections during pregnancy → No
- ⤵ Reduced volume of the right hemisphere → +
unspecific
- ⤵ Prenatal alcohol and drug abuse → + unspecific
- ⤵ Reduced birth weight (fetal programming) → + unspecific
- ⤵ Psychosocial influences (e.g. lower attachment; less
warmth; deprivation) → important
- ⤵ Allergies, food → no evidence

However, again

**Biological or Psychological?
Inherited or learned?**

Etiopathogenesis





ADHD is a polygenetic disease (several genes and phenotypes)

Heredity?

- Penetrance in ADHD in Families (60%; parents)
- Other behavioral disturbances in the families (up to 40%)
- Twins: **MZ: 81%; DZ:27%** (Hyperactivity & Impulsivity)
- Genes: Dopamine-D2-D4-D5-Genes → Dopamine Transport-Gene Defect (Serotonine, Noradrenaline, GABA; > 15 genes)

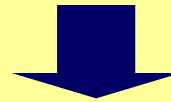
Cave: Attention Deficit \leftrightarrow environmental!

red blue orange purple

orange blue green red

blue purple green red

Interference Disturbance



Executive Dysfunction

green red blue purple

orange blue red green

green purple orange red

Measure your brain age

Please say the
color of the words
you are about to
see.



Neuropsychological Models

- ▶ **Working Memory Impairment Model**
- ▶ Response Inhibition Deficit Model
- ▶ Delay Aversion Model

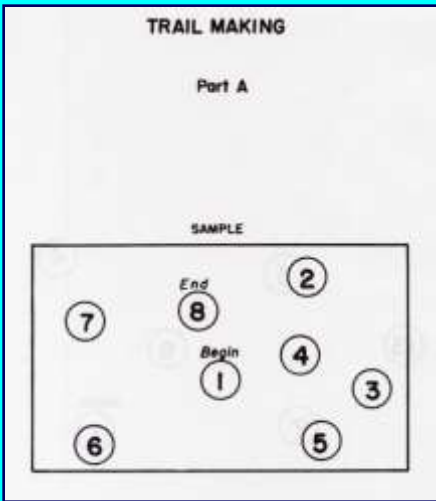


Neuropsychological Models of ADHD (I)

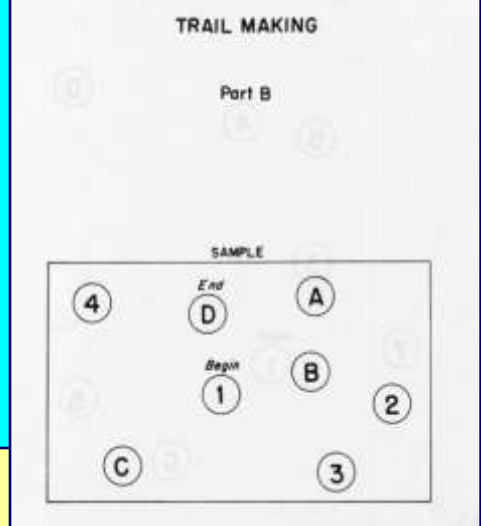
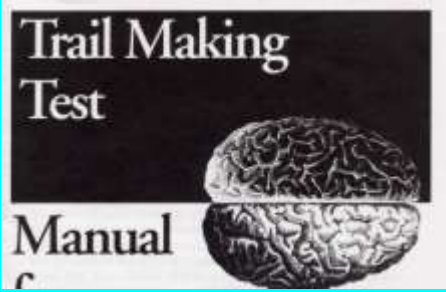
➤ Working Memory Impairment:

- ADHD-children suffer from a dysfunction of the **working memory** (executive functions), i.e., difficulties in short-term memory, manipulation (handling) and planning of information (mediation of memory and action) (Pennington & Ozonoff 1996)
- Example: Boy returns from school; mother instructs to bring his school bag to his room, wash his hands, and also collect the letters.....



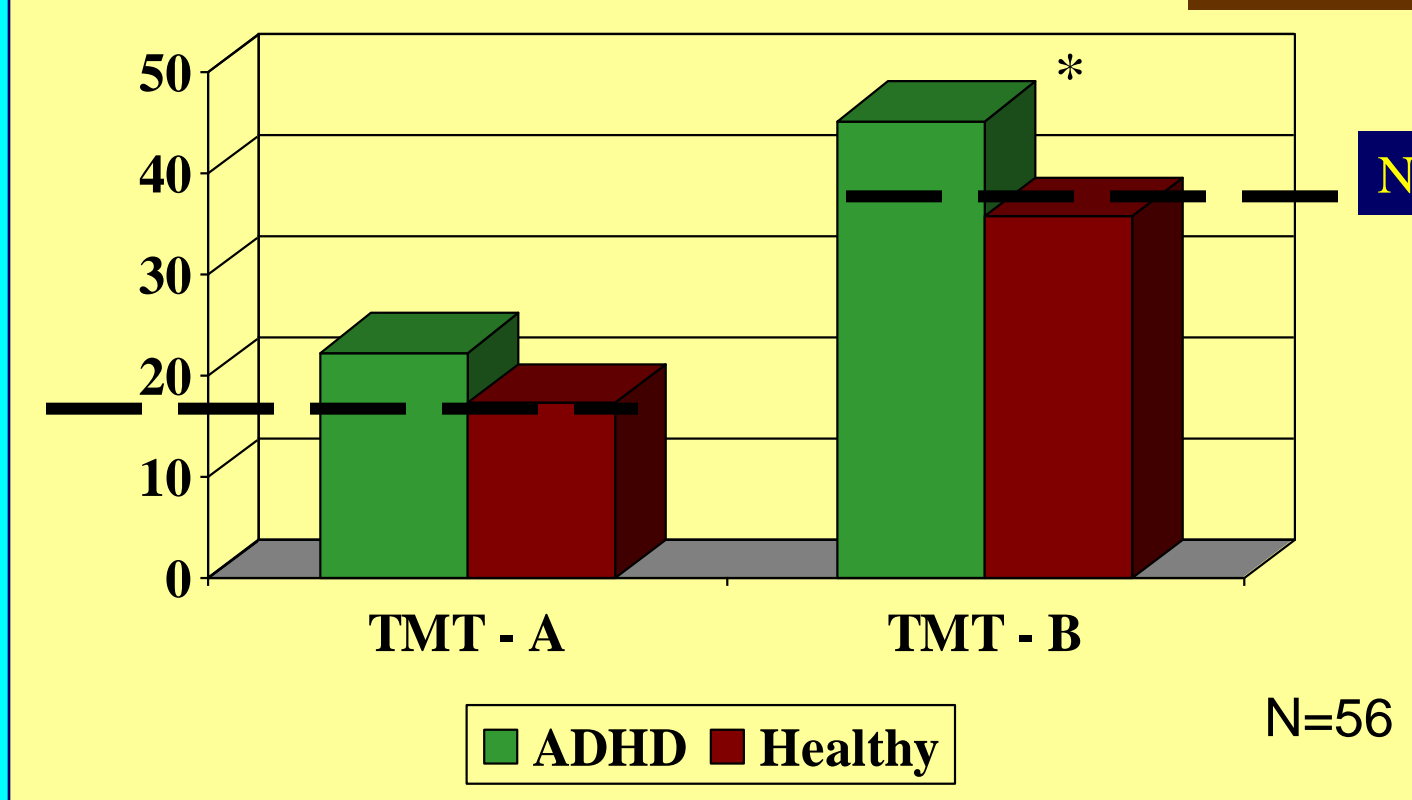


Cognitive Velocity



Executive Functions

Mean Values in sec.



Normal

Normal

I. Response Inhibition Deficit Model

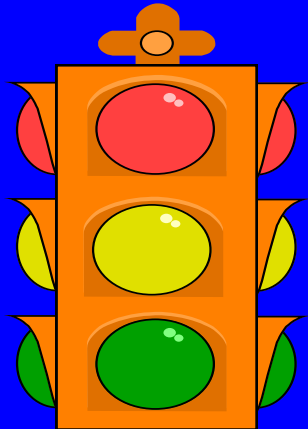
- Decreased control of stimuli
- Children with ADHD are **unable to suppress a reaction** in a Two-Reaction-Time-Task
- (Barkley 1997 et al.); and → are generally slow, high variability (Sergeant et al. 1999)
- ←→ noradrenergic and dopaminergic systems related to inhibition
- Example: You will listen to a tone which announces a second tone three seconds later. If this 2nd tone is high pitched you should push a button. If the tone is low you should not push.

Measured by slow cortical (or evoked) potentials

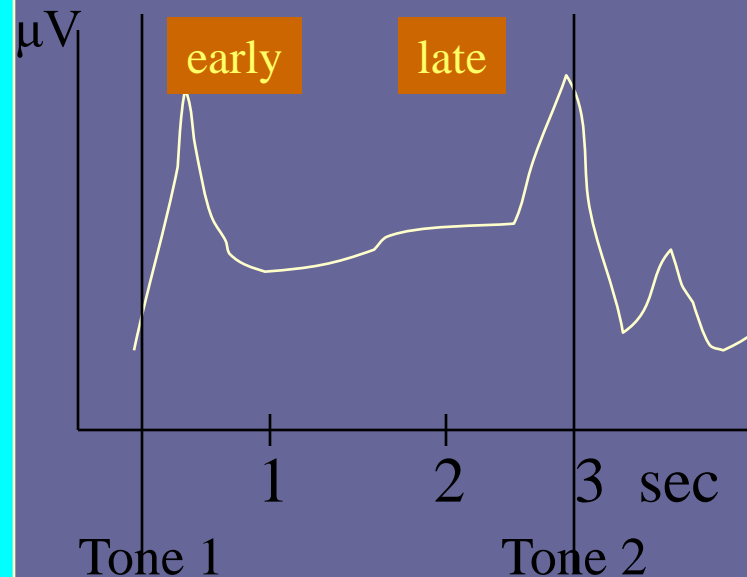
Cortical Attention (information) processes

The investigation by
Evoked potentials

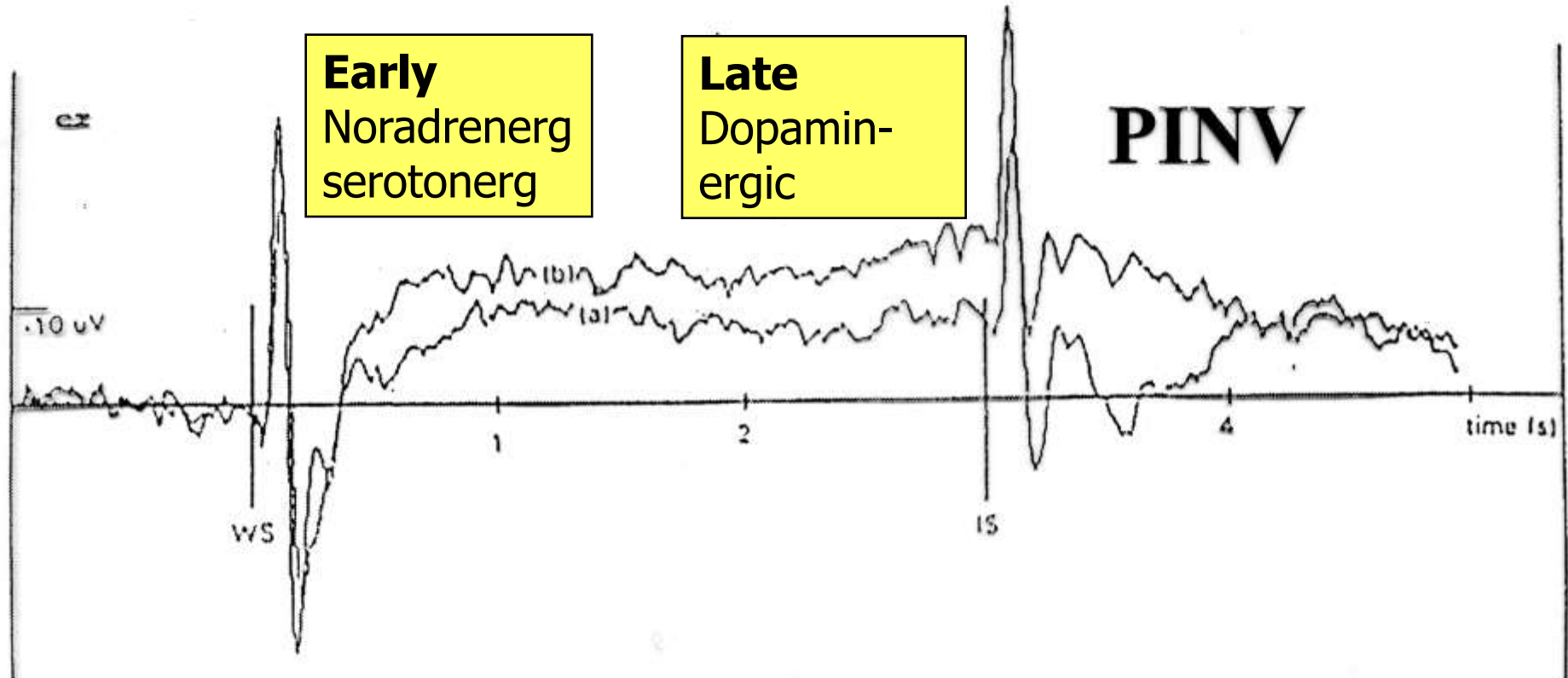
- Contingent Negative Variation (CNV)



Contingent Negative
Variation (CNV)



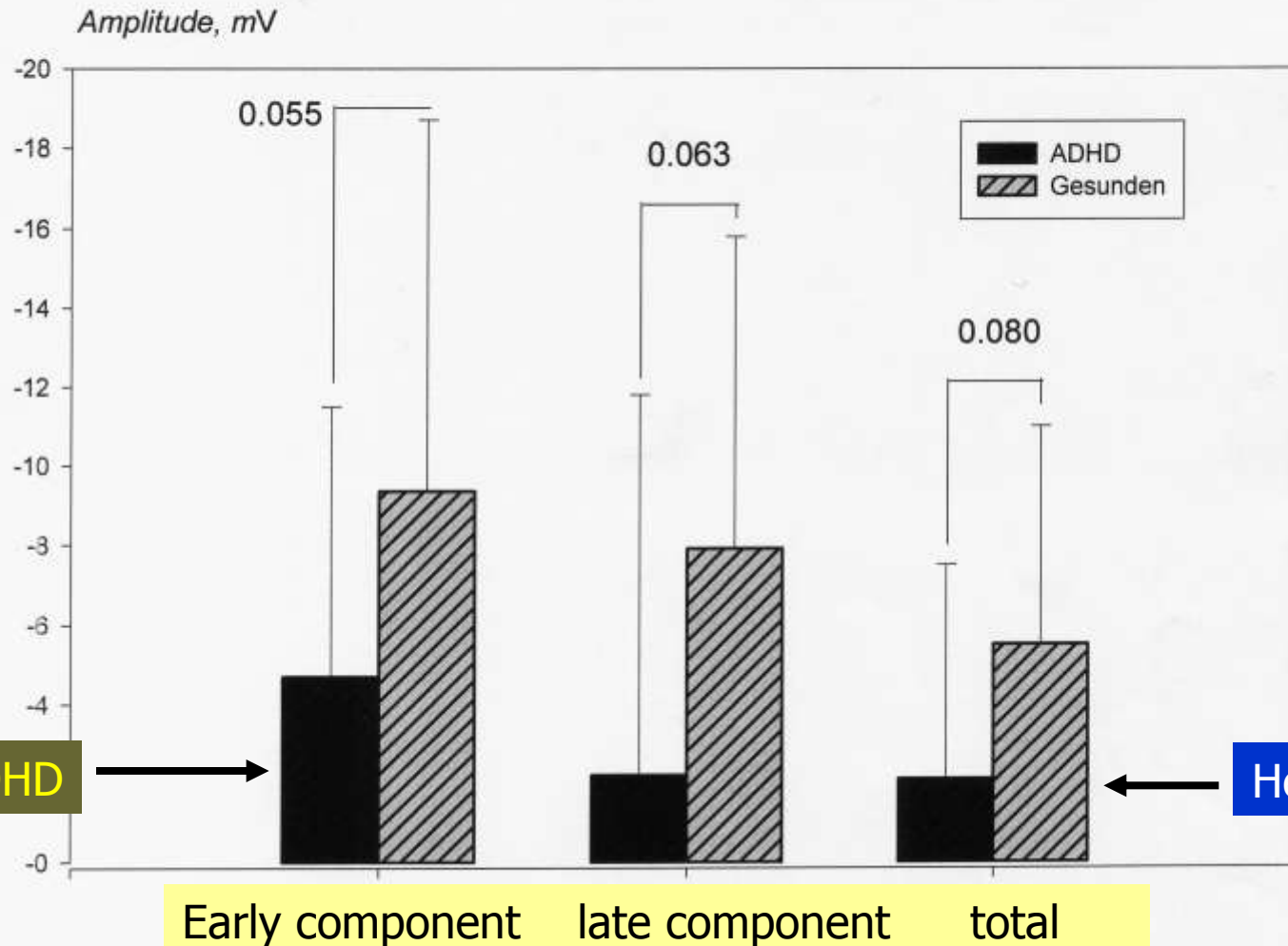
Contingente Negative Variation (CNV)



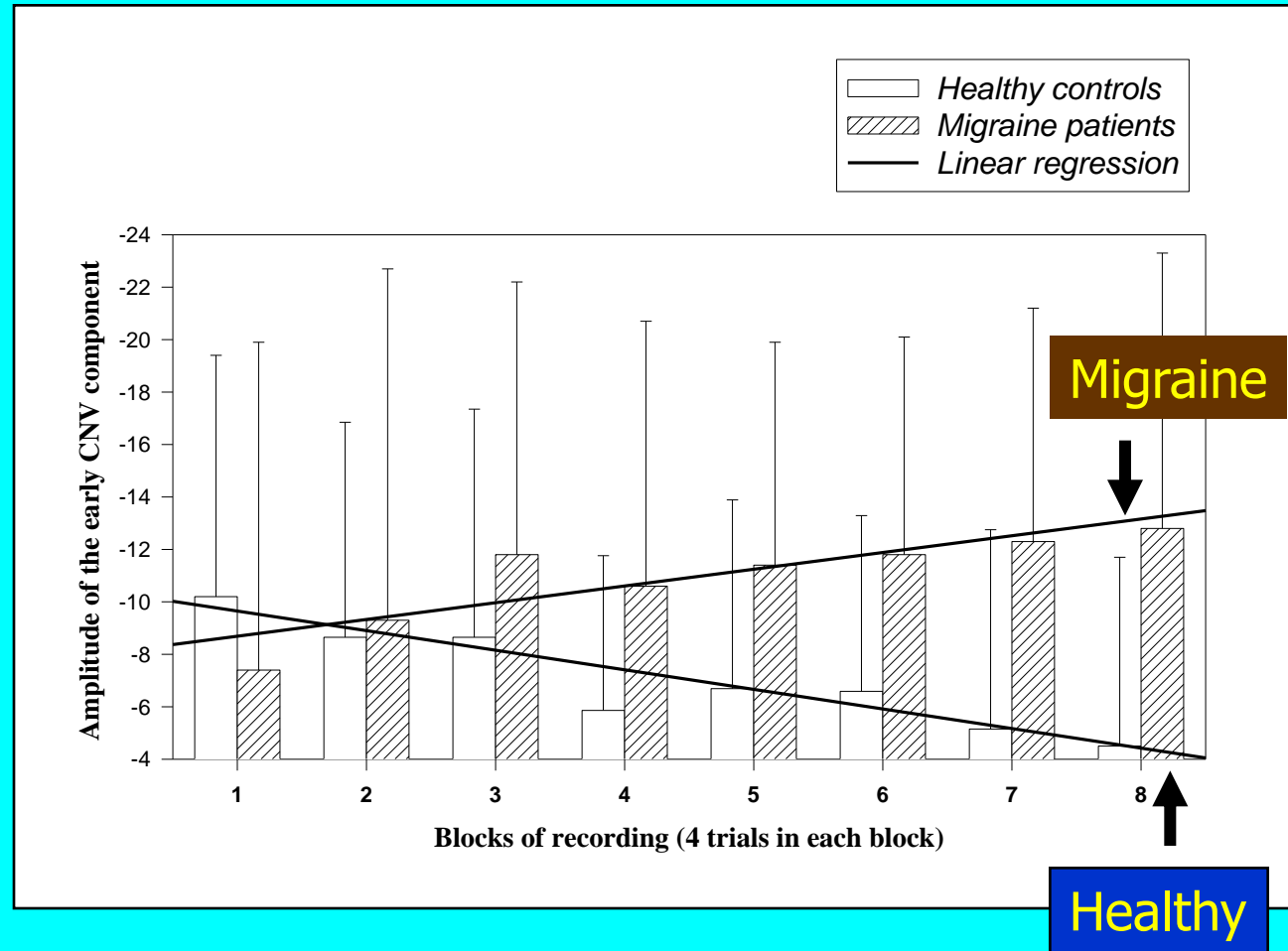
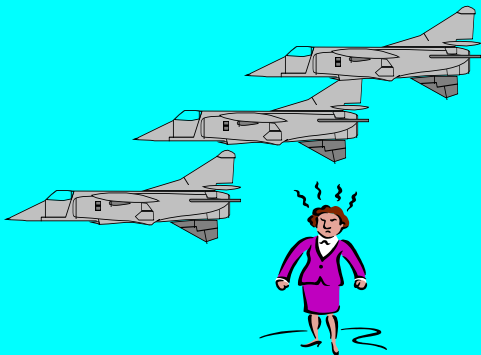
Slow cortical potentials for cortical information processing

CNV-Amplitudes in ADHD vs Healthy

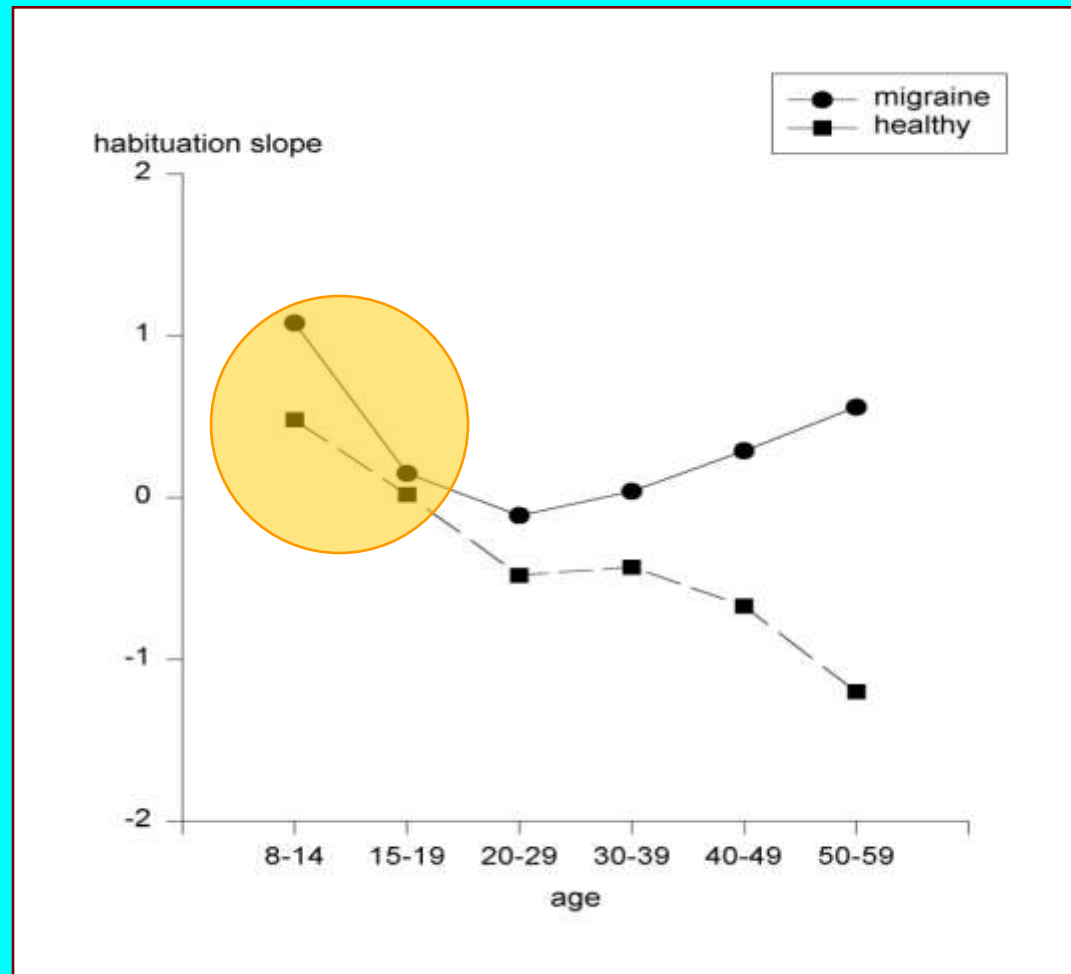
ADHD: N=22; Mean age=10.9; SD=1.6
Healthy: N=17; Mean age=11.0; SD=2.3



Habituation in children



However, generally,
children do not habituate prior to
puberty

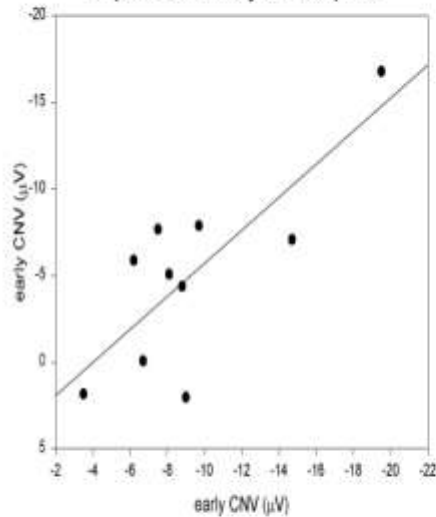


Heredity of CNV-Amplitudes, but not Habituation

Pearsons' product-moment correlations
between twins

MZ twins

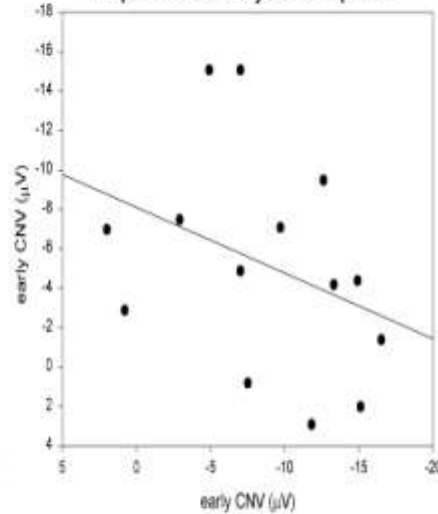
Amplitude of the early CNV component



$n = 10$
 $r = .782$
 $p = 0.007$

DZ twins

Amplitude of the early CNV component



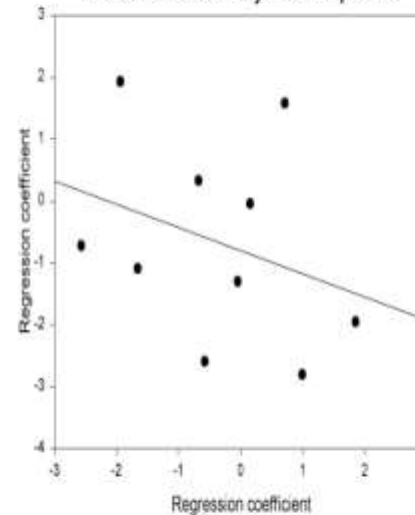
$n = 14$
 $r = -.351$
 $p = 0.22$

CNV-Amplitudes

Pearsons' product-moment correlations
between twins

MZ twins

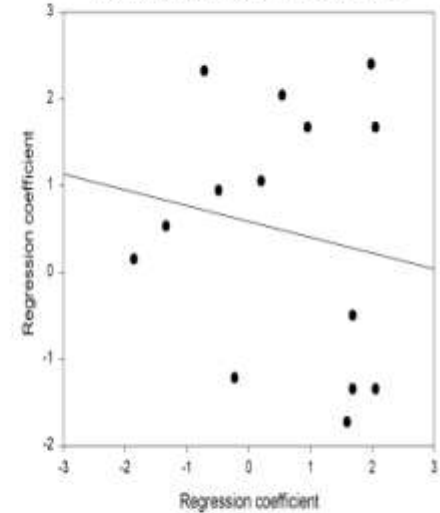
Habituation of the early CNV component



$n = 10$
 $r = .19$
 $p = 0.59$

DZ twins

Habituation of the early CNV component



$n = 14$
 $r = -.12$
 $p = 0.67$

CNV-Habituation

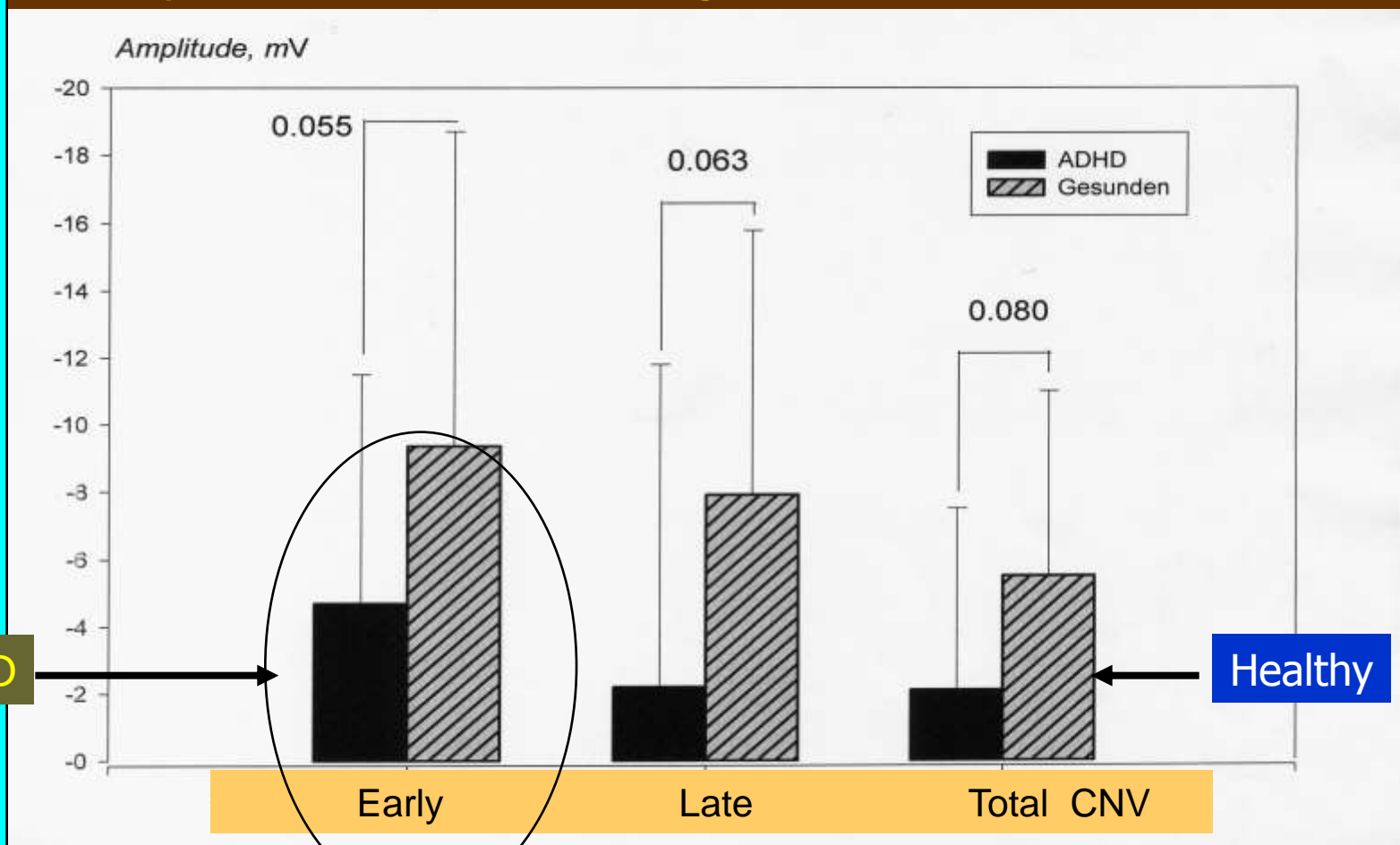
**Cortical Responsiveness is
inherited**

**However,
(Dis)Habitation is learned...**

Extremely fast Habituation in ADHD

ADHD: N=22; Mean age=10.9; SD=1.6

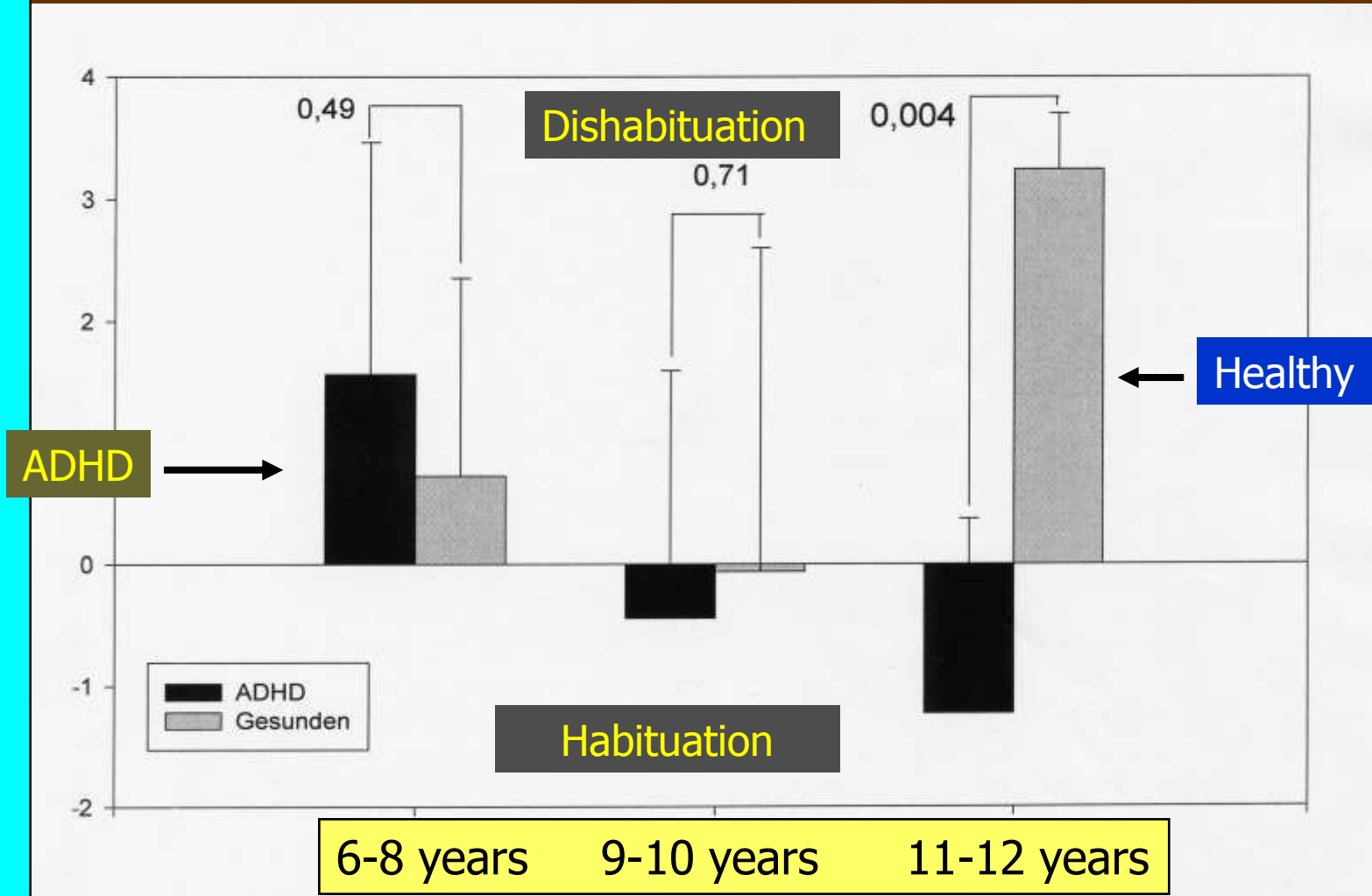
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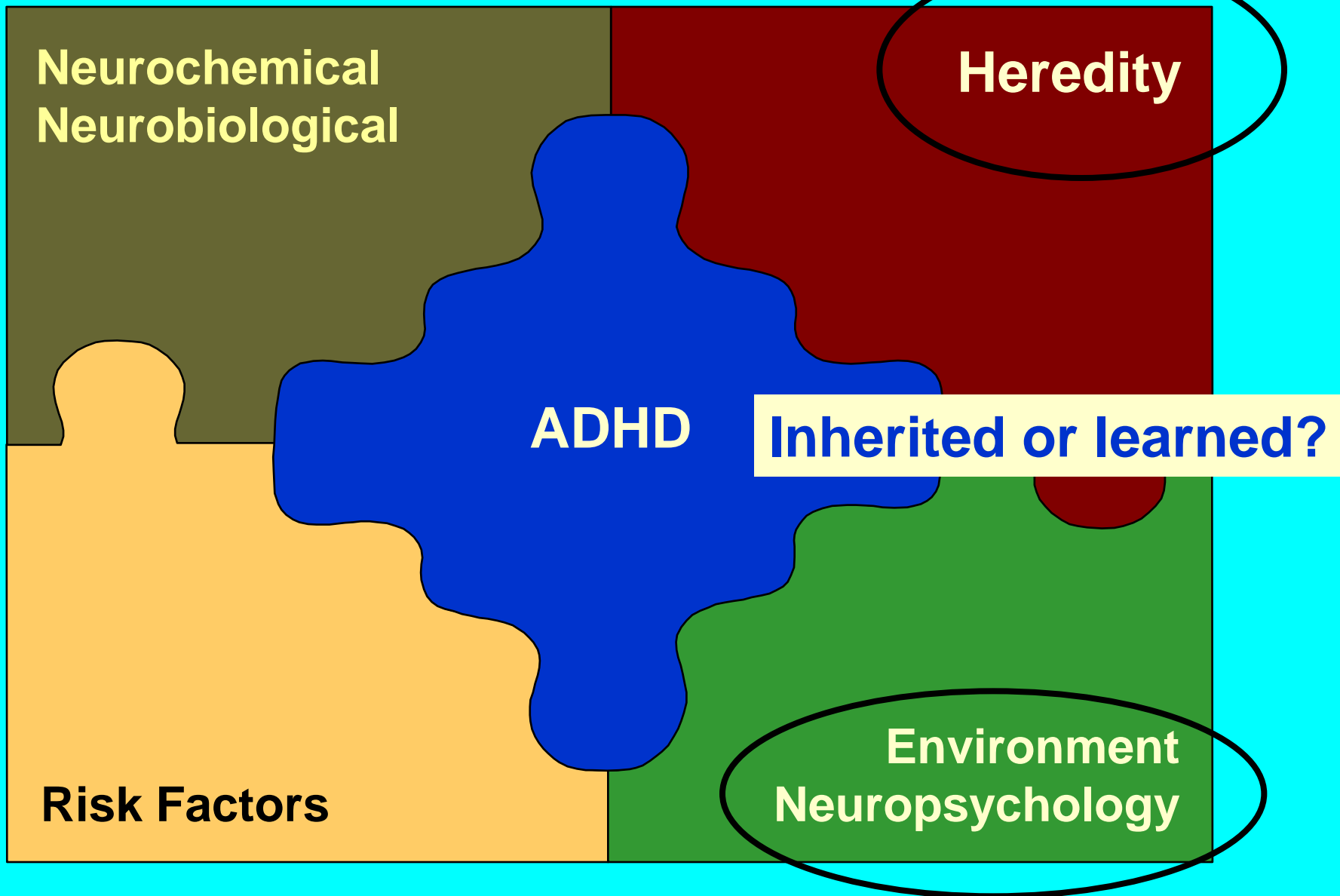
CNV-Habituation & Age in ADHD and HC

ADHD: N=22; Mean age=10.9; SD=1.6

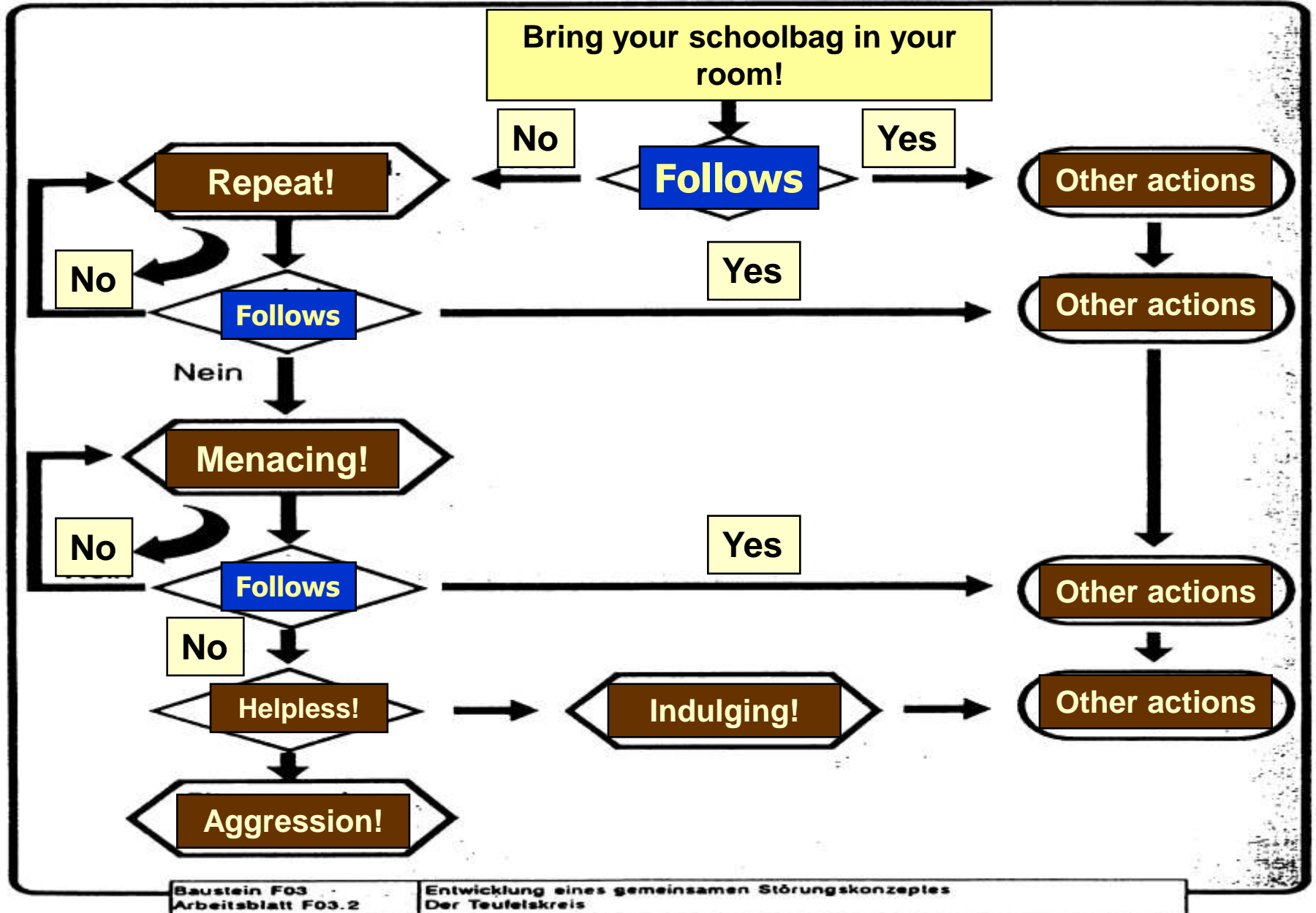
Healthy: N=17; Mean age=11.0; SD=2.3



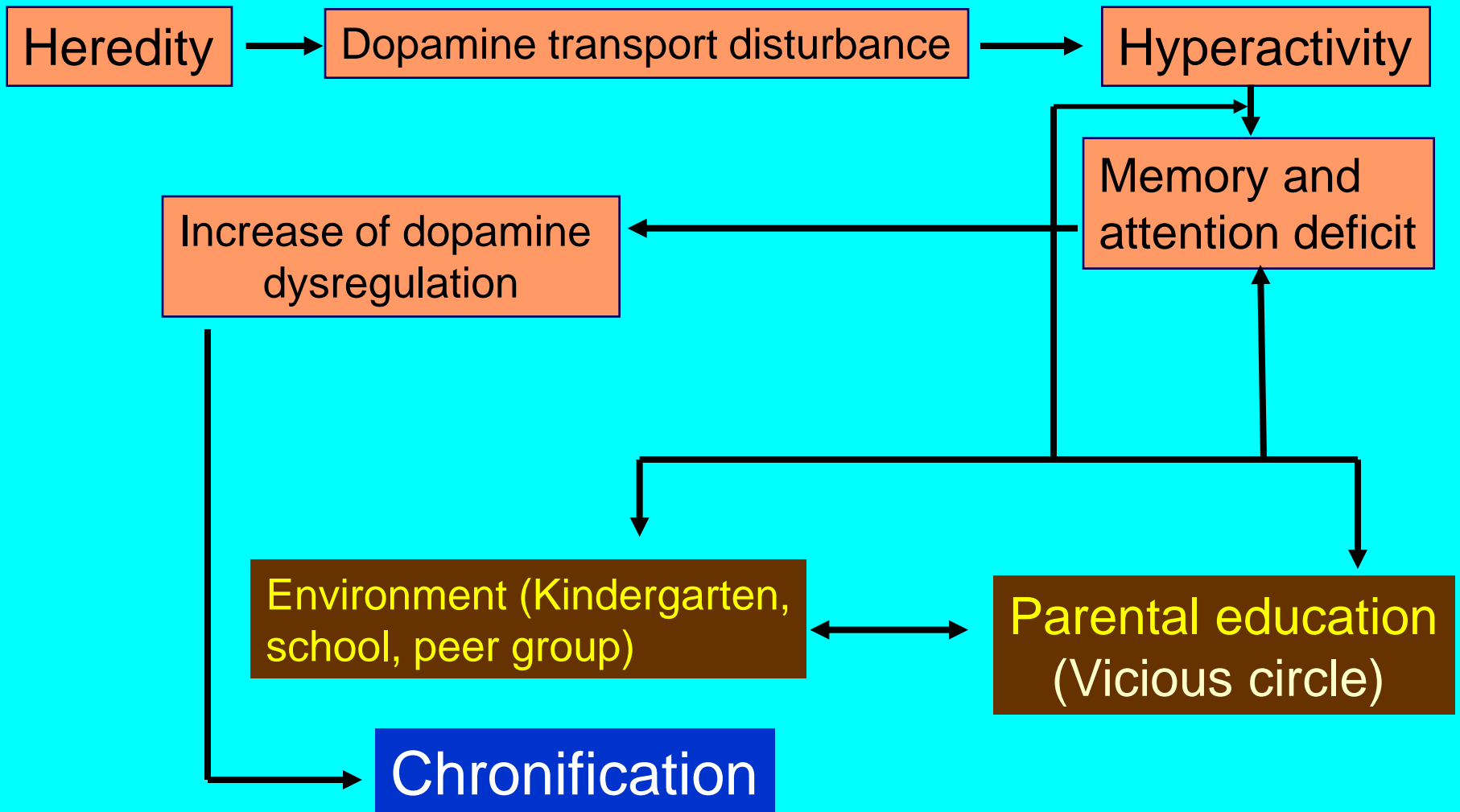
Etiopathogenesis



The vicious circle



A Behavioral Medicine Model of the Etiopathogenesis of ADHD



Overview

- ADHD – really a trendsetter of today?
- ADHD – a brain dysfunction?
- ADHD – etiopathogenesis?
 - The neurobiopsychological models
 - The behavioral medicine model
- **ADHD - treatment approaches?**

Multi Modal Treatment Concept

* Ambulance of Behavioral Prevention in Families
(ViFa) in Kiel *

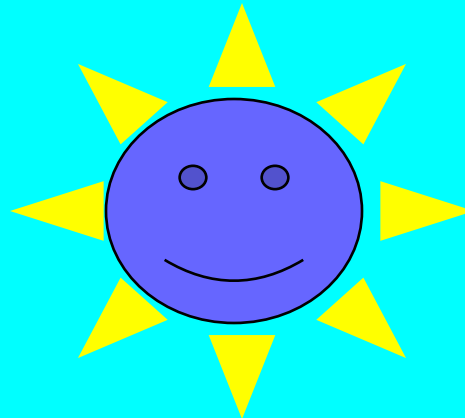
Counseling of the parents

Parent Training

Behavioral
Therapy of the kids

Teachers
Counseling/training

Pediatrician:
Pharmac. treatment



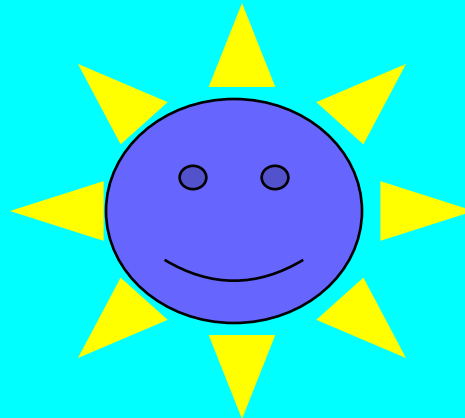
Multi Modal Therapy

ViFa

Counseling of the parents

Parent Training

Group Training
Bug in the Ear Training



Behavioral
Therapy of the kids

Social skills training
Attention training
Token system
Impulse control
Training
Neurofeedback

The ADHD Concept of the ViFa

Multidimensional Diagnosis
SORCK, Neuropsychology

Four Sessions

Parental Counseling &
Behavioral Parent Training (BPT)

Two Sessions
Ten Sessions

Alternate:

Week 1 → ICD (1 h)

Week 2 → BPT (2 h)

Week 2 → CGT (1,5 h)

Week 3 → ICD (1 h)

And so on...

Total 50 hours

Individual Child Training ICD
Children Group Training CGT

25 Sessions
15 Sessions

ADHD-Summer camp 2 weeks daily

In Our Department No Child-Training without Parent Training

- ❖ Assistance in diagnosis
- ❖ Co-Trainer at home
- ❖ Help to motivate the child
- ❖ Mandatory attendance by parents at evening sessions

The parental behavioral training

- ✓ **Education/Counseling**
- ✓ **Role playing and Videofeedback of parents/child interaction situations**
- ✓ **Learn to ignore and to reinforce, how to apply consequences**
- ✓ **Parental coaching
„the Bug in the Ear System“ → Homework**



The Kiel ADHD-Summer Camp Training

Daily Activities

08.00 am:	Arrival
08.15 – 08.50:	Breakfast
09.00 – 09.30:	Test 1 (arithmetic tests)
09.40 – 10.50:	Social Skills Training (Theater)
11.00 – 11.30:	Test 2
11.40 – 12.20:	Sport
12.30 – 1.00 pm:	Test 3
1.00 – 1.35:	Lunch
1.45 – 2.15:	Relaxation
2.20 - 3.00:	Social Skills Training (Theater)
3.00 – 3.30:	Test 4
3.40 – 4.10:	Leisure time
4.15 – 4.45:	Test 5
4.50 – 5.30:	Reflection of the day: Counting of the tokens, awards
5.30:	Farewell



Stringent operant conditioning (Response- Cost- Token System)

Olympiade

- ⇒ Different activities
- ⇒ Rules established
- ⇒ Introduction to the **Response- Cost- Token- System**
- ⇒ Usage in all daily situations
- ⇒ Awards at the end of the day and at the end of the Camp





7 locks and 7 keys for the treasure chest

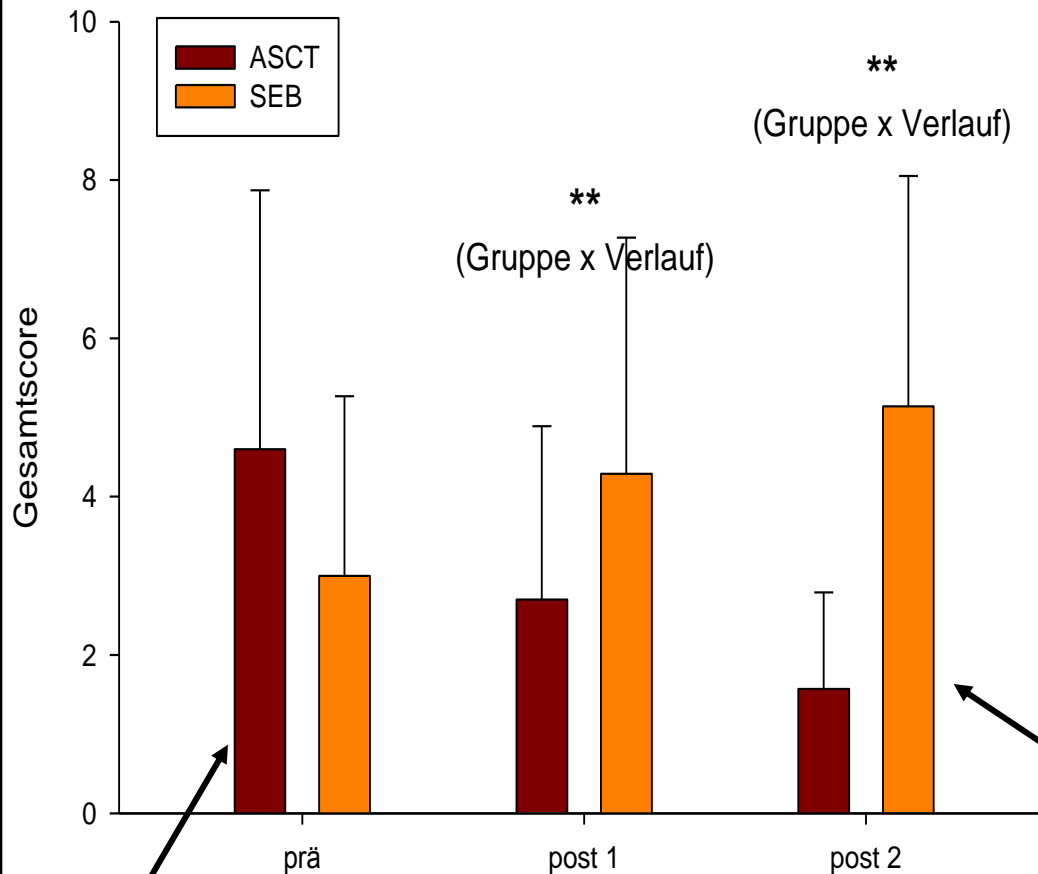
It can be opened by Tokens



Results of the German Study

Inattention - Long term Efficacy

Adapted Connors Rating Scale - Teacher



Significant Improvements evaluated by the teachers

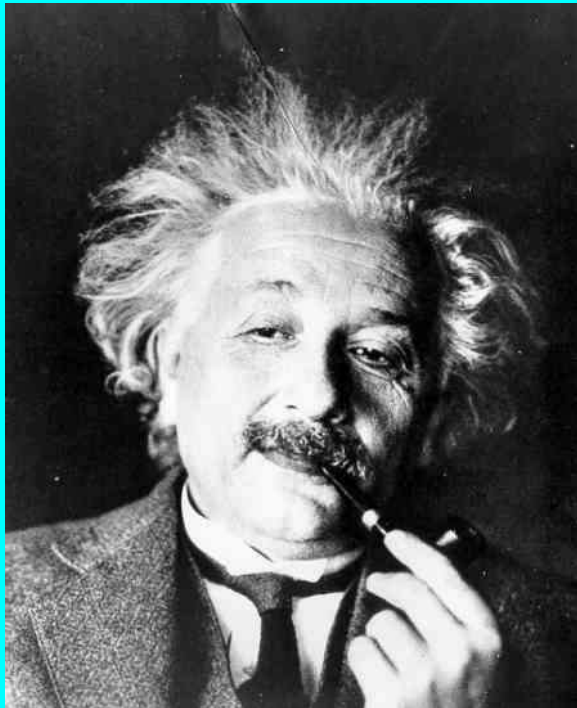
Counseling Group

ADHD Summer camp

Summarizing

- **Controversies → ADHD really is a disease and an educational problem**
- ADHD is a Dopamine transporting disturbance possibly modulated by learning processes
- ADHD needs a systematic extensive neuropsychological and clinical diagnosis
- ADHD has to be treated using multi modal strategies including parents
- **ADHD cannot be treated by Methylphenidate alone without the supply or order of Behavioral Therapy in Germany (Ministry of Health)**

The Behavioral Medicine Perspective



**There are no great
discoveries and scientific
progresses, as long as *one*
unhappy child lives on the
earth.**

Albert Einstein (1879-1955)