

# ADHD- Paediatrician's perspective

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Look's familiar?



# Typical Referral

- Child A
- 6 years old
- Poor listening skills
- Easily distracted
- Disruptive in class
- Talkative, constantly on the go
- Poor sense of danger/ social cues
- Possible Tics

# TRUE OR FALSE?

- ADHD is an excuse for bad parenting.
- Children grow out of ADHD.
- It is impossible to manage a child with ADHD in a large class.
- ADHD only affects a small number of children.
- ADHD medication is the only management for ADHD.



# Historical



- 1845 -The story of Fidgety Phillip by Heinrich Hoffmann, German Doctor
- ***"Let me see if Philip can Be a little gentleman;  
Let me see if he is able To sit still for once at  
table." Thus spoke, in earnest tone, The father to  
his son; And the mother looked very grave To  
see Philip so misbehave. But Philip he did not  
mind His father who was so kind. He wriggled  
And giggled, And then, I declare, Swung  
backward and forward  
And tilted his chair, Just like any rocking horse;-  
"Philip! I am getting cross!"***

# Historical

- 1902- Lancet, Paediatrician George Still
- 1940s- Termed minimal brain injury
- 1962- minimal brain dysfunction (findings were more associated with dysfunctions of neural pathways than injury)
- 1970s- Hyperkinetic reaction of childhood
- Recently DSM/ICD classifications
- DSMV 2013, ICD11

# What is ADHD?

- Neurodevelopmental
- Neurobiological
- Neurobehavioural
- Developmental
- Mental

# Characterised by 3 core symptoms

- Inattention, Hyperactivity, Impulsivity
- Diagnostic criteria of DSM (Diagnostic and Statistic Manual- V of the American Psychiatric Association<sup>1</sup>.
- ICD 10- The International Classification of Disease of WHO – Hyperkinetic disorder<sup>2</sup>.



# Core features- HISTORY

- For a diagnosis:
- Core areas occur to a level that is unreasonable for their developmental age
- Pervasive
- Substantial Impairment
- Consider impact on quality of life
- Across the life span

# Diagnosis-DSMV (History)

- Symptom onset before 12 years old versus 7 years in DSMIV
- Minimum of 6 symptoms-  
Hyperactivity/Impulsivity
- Minimum of 6 symptoms- Inattention
- Subtypes- predominantly  
hyperactive/impulsive, predominantly  
inattentive, combined type

# Epidemiology

- Worldwide prevalence (Polanczyk G et al)
- 5.3% children, 2.5% adults<sup>3</sup>
- Boys – 2.45 times higher<sup>3</sup>
- Persistence- studies wide variation- generally 40-60%<sup>3</sup>
- Methylphenidate prescriptions in UK: 6000 in 1994, 345,000 in 2003, 420,000 in 2007 and 657,000 in 2014

# AETIOLOGY

- Exact cause unknown
- Mostly genetic – no single gene
- Inheritability high 0.7%<sup>4</sup>
- Implicated genes<sup>5</sup>-e.g. DAT1, DRD4 and 5, serotonin receptor1B
- Serotonin transporter(5HTT)

# AETIOLOGY

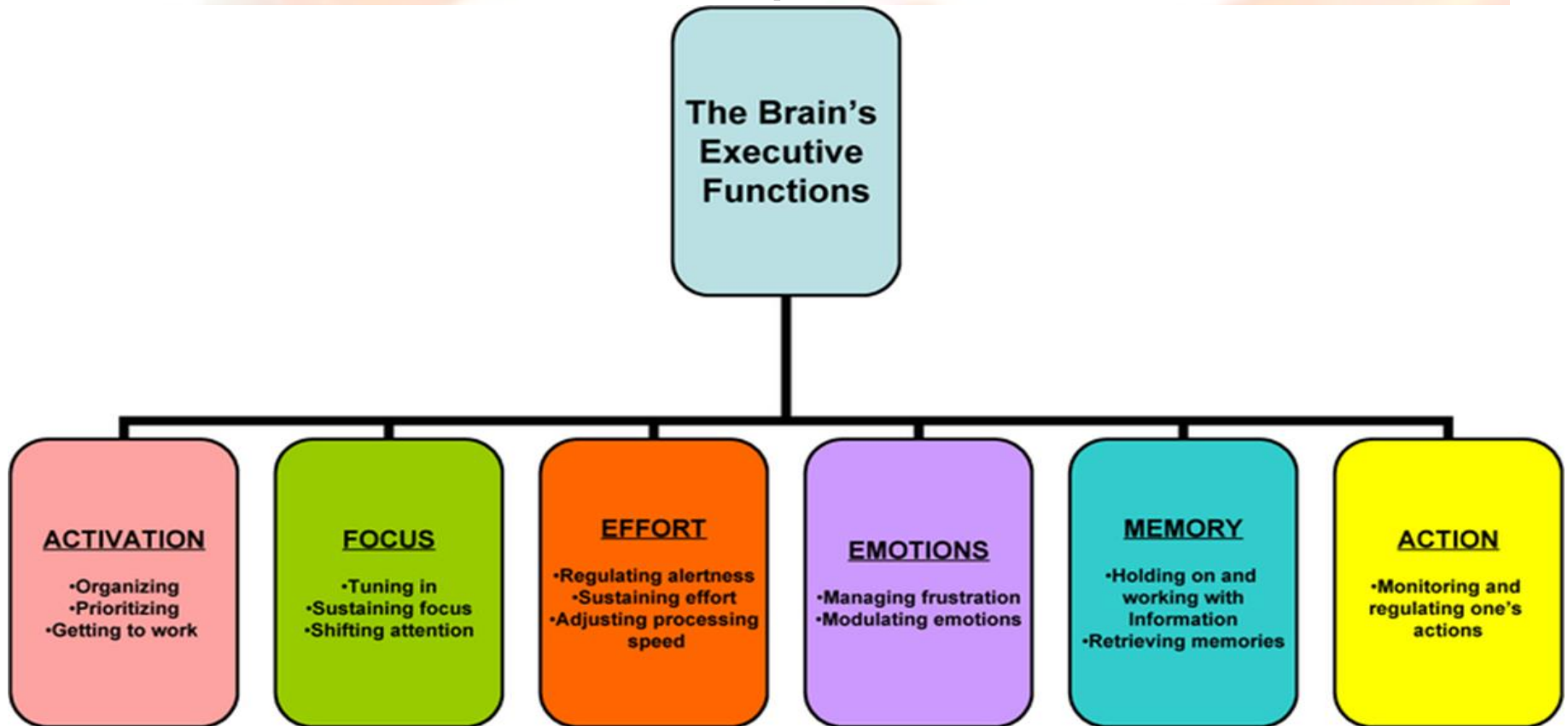
- History
- Low birth weight (preterm < 26 weeks)<sup>6</sup>
- Pre natal-smoking<sup>7</sup>- evidence emerging (genetic/environmental versus direct effect on foetal brain)
- Alcohol (FASD)
- Cocaine abuse in pregnancy (Milberger et al, 1996)
- Diet- limited evidence
- Artificial colourings<sup>8</sup>- hyperactivity

# NEUROBIOLOGY

- Small structural abnormalities in some brain areas
- Structural Imaging studies<sup>10</sup>-reduced grey matter volumes and cortical thickness-  
frontal, parieto-temporal, basal ganglia, cerebellum, basal ganglia

# Executive Function (EF)

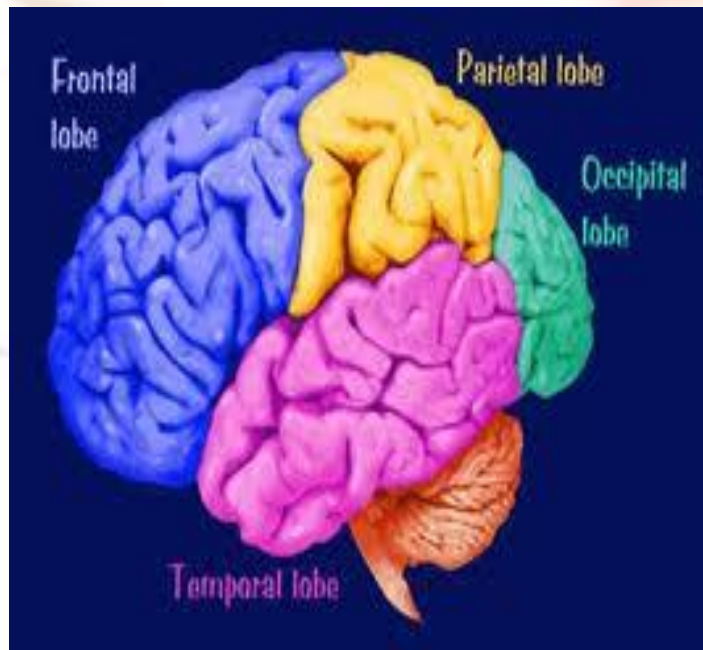
- Impaired<sup>9</sup> in ADHD
- Areas for EF develop later in life



# LOCATION OF THE EXECUTIVE FUNCTION

The frontal lobe, the command centre of the brain and this is where our executive function resides.

Poor transmission of messages =  
breakdown of  
executive functions=  
symptoms of ADHD





# NEUROBIOLOGY

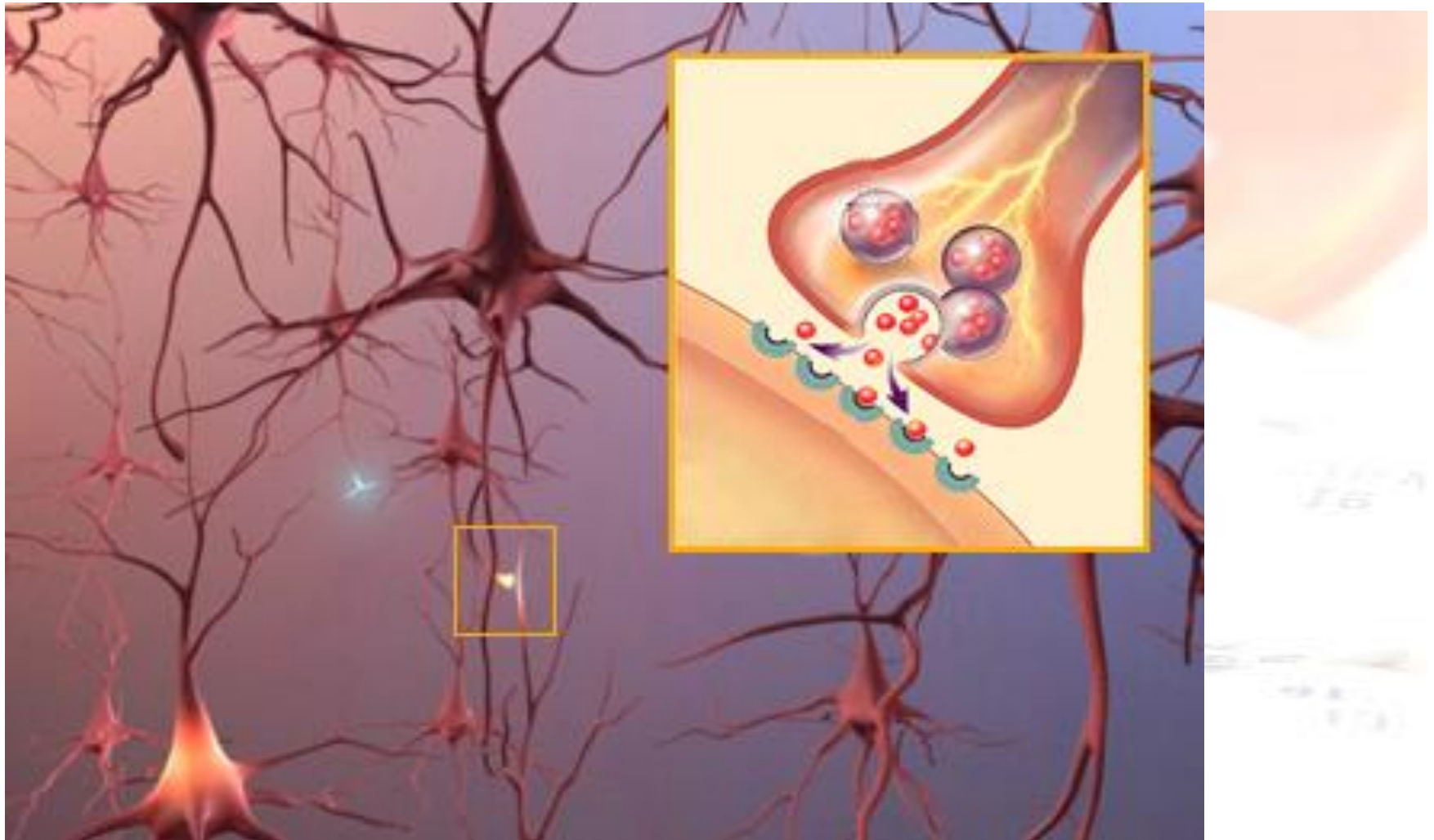
- Functional MRI
- Under stimulated neural pathways in ADHD-frontal, parieto- temporal, basal ganglia, cerebellum, basal ganglia
- Neurotransmitter dysregulation in ADHD
- Dopamine/ Noradrenaline<sup>11</sup>
- Insufficient amounts at the synapse (chemical imbalance)
- Messages slow down- poor EF

# Dopamine and Noradrenaline

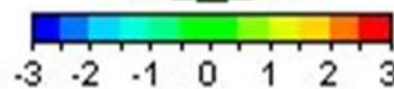
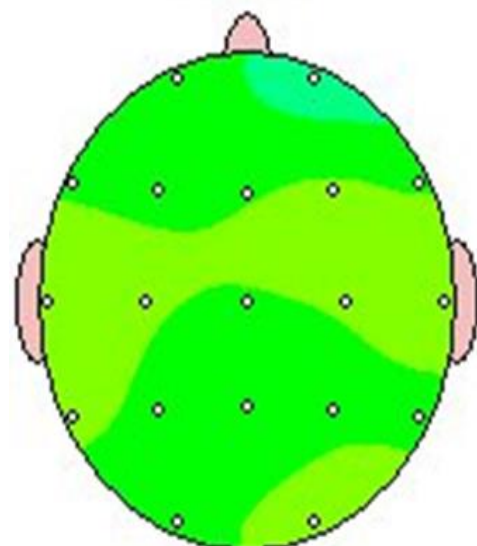
- These neurotransmitters are needed to facilitate an effective transfer of messages across the nerve cells- effective EF
- Analogy
- The neurotransmitters act like 'postmen' to deliver letters/ messages



# NEUROTRANSMITTERS AT THE SYNAPSE

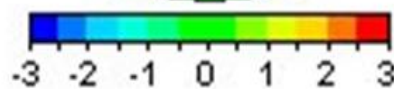
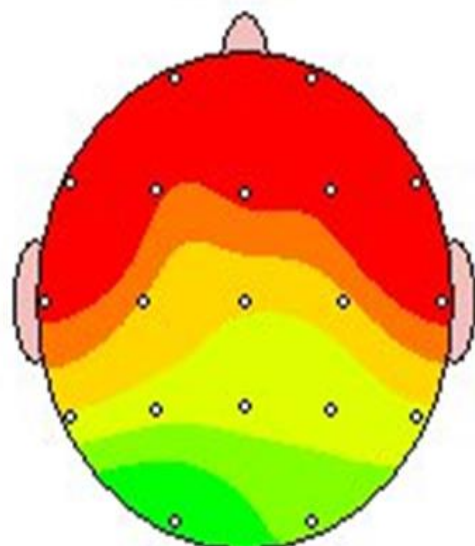


NORMAL



This is a normal BrainMap

ADHD



This is one of the typical BrainMap patterns seen in a child with ADHD. It shows an underactive (red colour) frontal lobe behind the forehead.

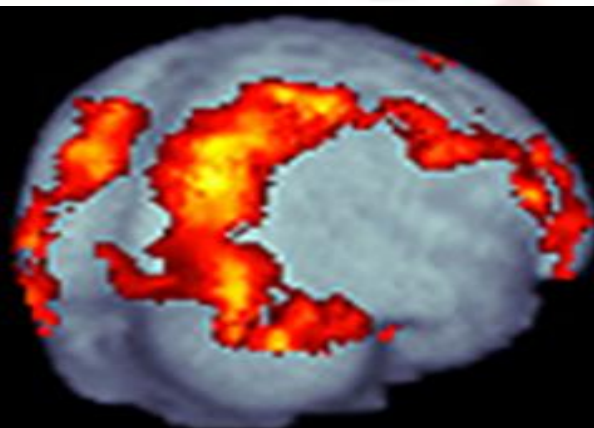


a)

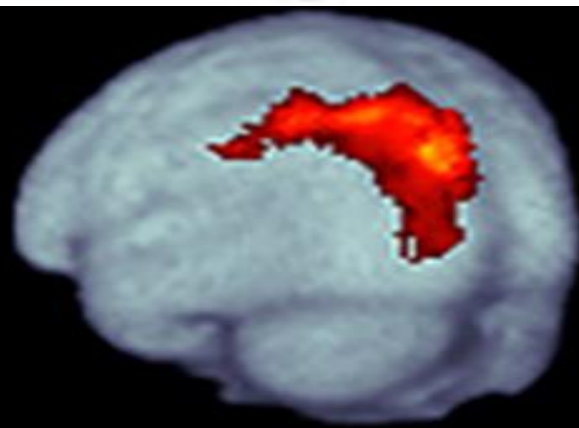
5

1

z-score



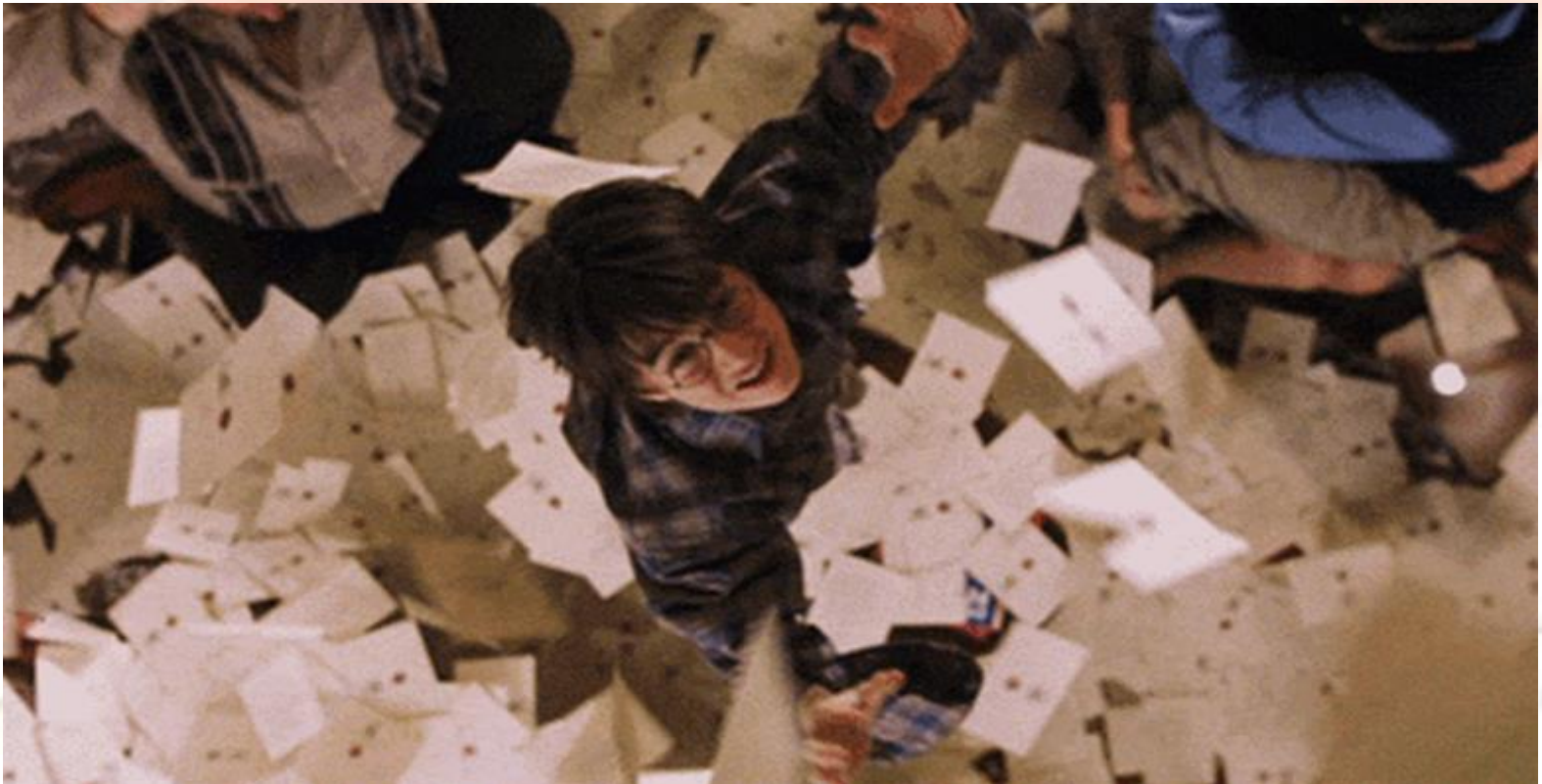
Control



ADHD

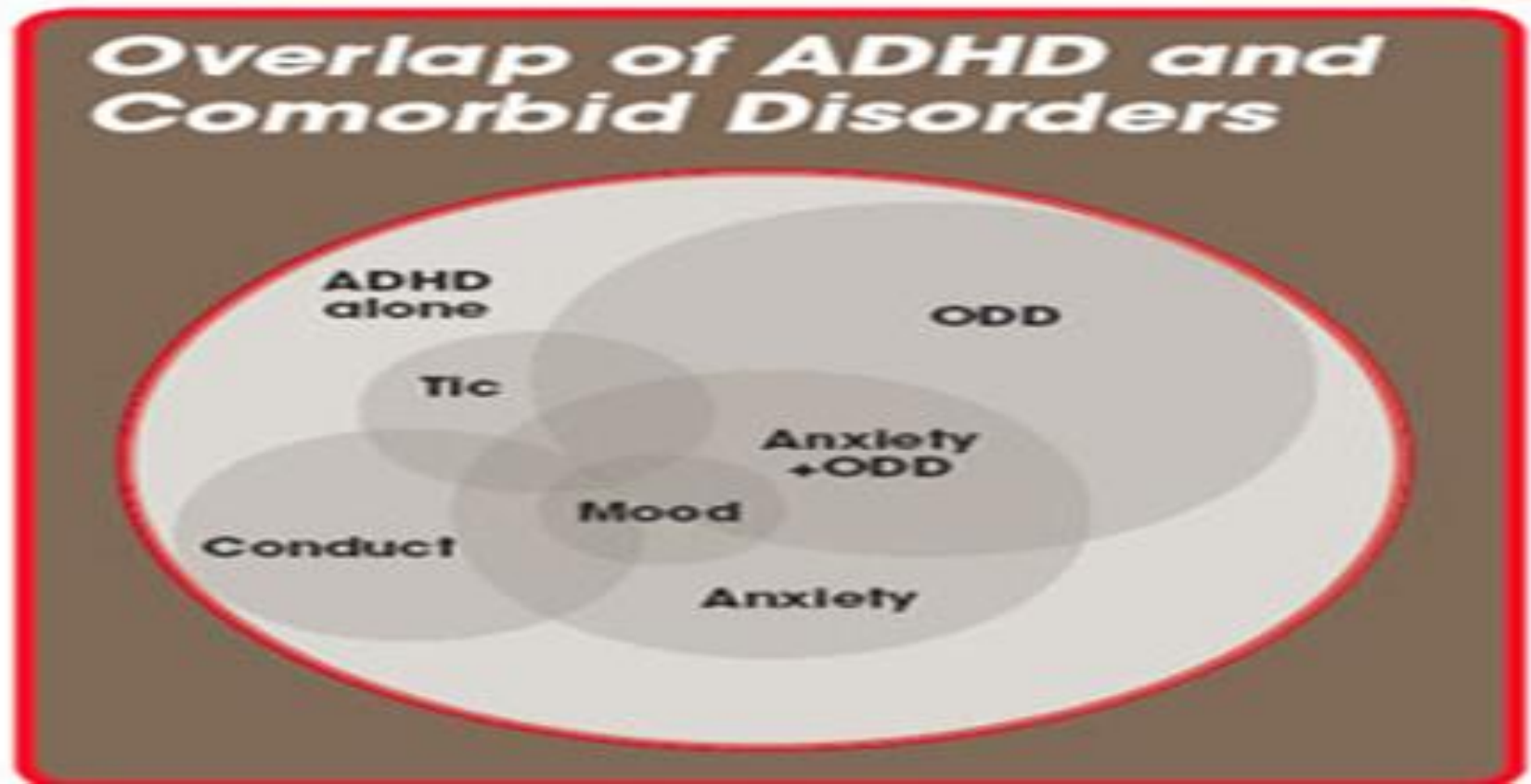
# Ineffective neurotransmission

- Messages not delivered **EFFECTIVELY-CHAOS AT THE POST-OFFICE!**



# ADHD Comorbidity<sup>12</sup>- multiple

Goldman S, Genel M, Bezman R, Slanetz P. Diagnosis and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents. *JAMA*. 1998;279:1100-1107.



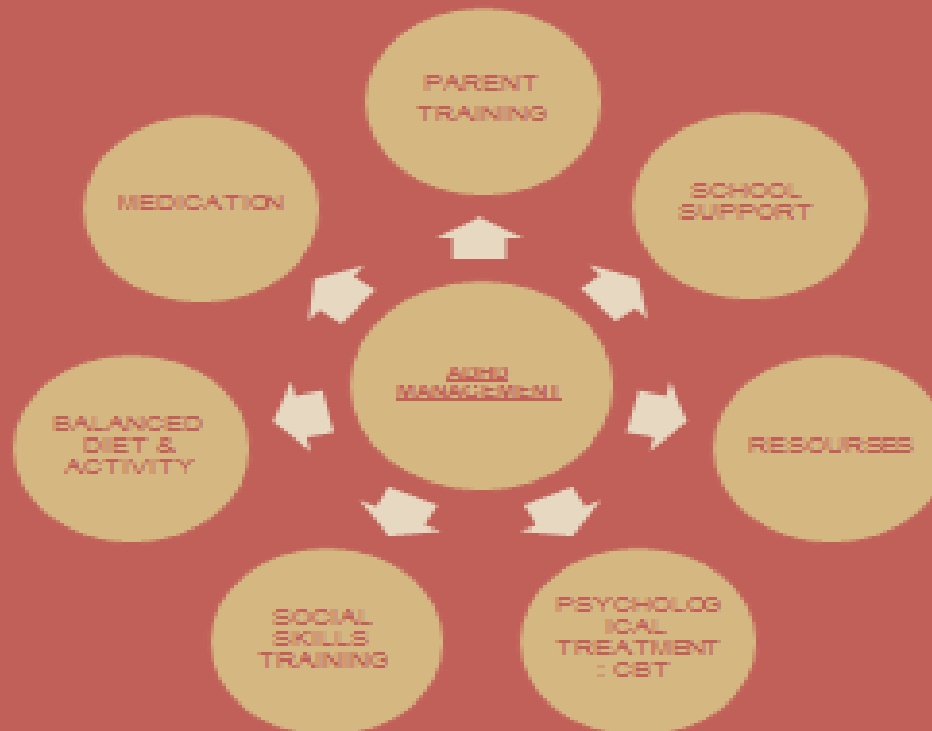
# Other

- Neurodevelopmental
- Autism spectrum disorder
- Specific learning difficulties
- Sleep onset difficulties
- Substance misuse (young people)
- Developmental coordination disorder

# Multimodal Management

[www.nice.org.uk/cg72](http://www.nice.org.uk/cg72)

## ADHD MANAGEMENT





# Pharmacological

- Stimulants e.g. Methylphenidate
- Blocks reuptake of dopamine at the synapse
- Non stimulants- Atomoxetine
- Increases extracellular levels of noradrenaline
- Efficacy, side effects, abuse potential, non compliance

# Non Pharmacological

- Psychoeducation
- Parent training interventions
- Classroom based interventions
- Psychological therapies- social skills training, anger management, problem solving
- Older children – CBT
- Diet, sleep, sensory

# PROGNOSIS <sup>13</sup>

## Impact of untreated/Under-treated ADHD beyond core symptoms.

1. Barclay RA et al 1996; Paediatrics:98:1089-95 2. Liebson et al, 2001: JAMA : 285 60-68



# SUMMARY

- ADHD is a complex heterogeneous neurobiological disorder
- Genetic and non genetic factors play a role in its aetiology
- World wide prevalence is 5%
- Persists into adulthood
- More common in boys than girls
- Associated with other complex conditions
- Management is multimodal

# RESOURCES

- [www.addmore.org.uk](http://www.addmore.org.uk)- NHS resource



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- 13 Barclay RA et al 1996; *Paediatrics*:98:1089-95 2. Liebson et al, 2001: *JAMA* : 285 60-66