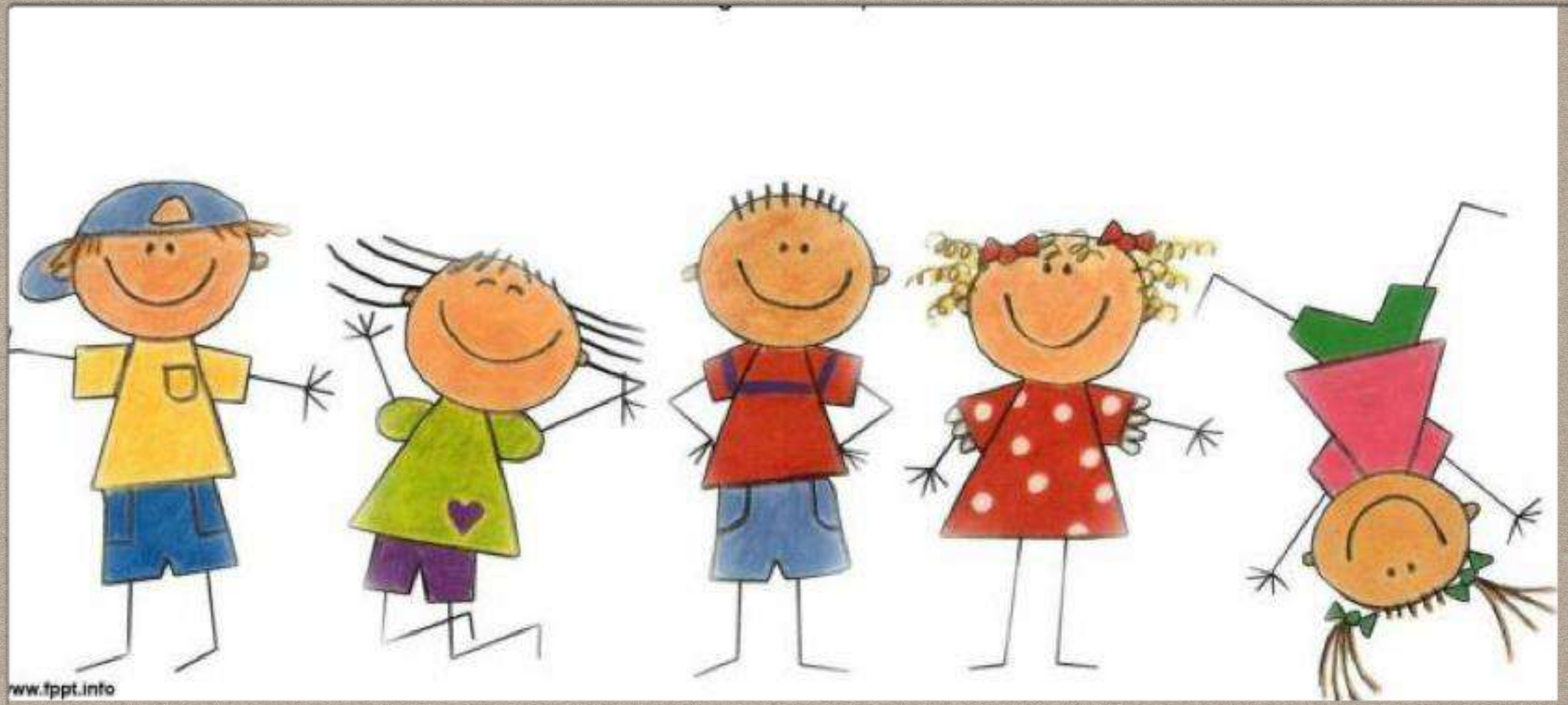
ATTENTION DEFICIT HYPERACTIVITY DISORDER



NTION DEFICIT HYPERACTIVITY DISORD

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OUTLINE

History

Introduction

Epidemiology

Etiology

Diagnostic classification

Clinical Presentation

Co Morbidity

Differentials

Assessment

Treatment

Course

Summary

HISTORY

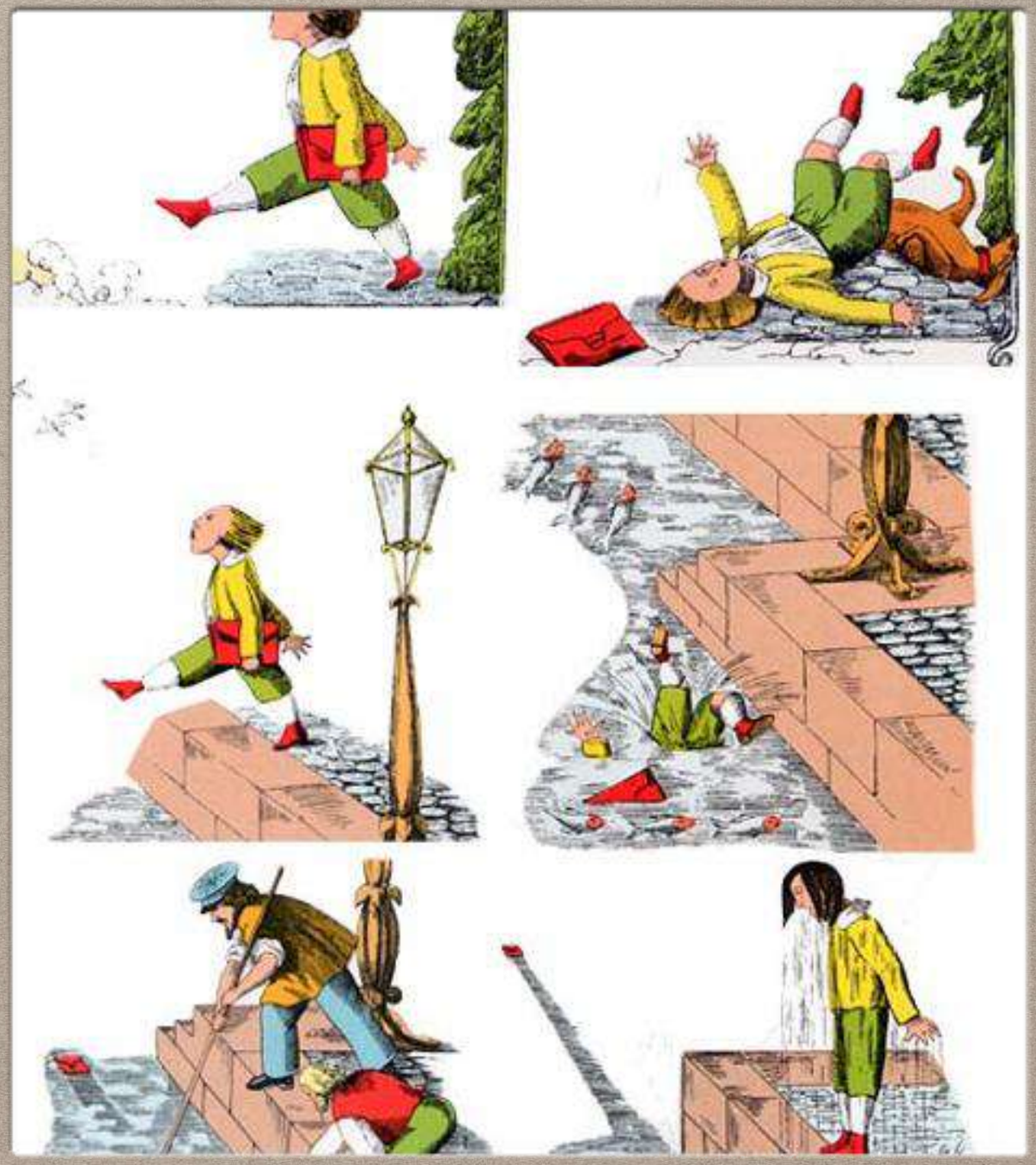
Heinrich Hoffman mid 19th centuary

Story book

Johnny look in the Air

Inattentive and easily distracted child

Hyperactive



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Attention deficit hyperactivity disorder timeline

1902
George Still

1918
Influenza epidemic

1960 MBD

1960 Hyperactive child syndrome

1980
DSM III
ADD

1987
ADHD

INTRODUCTION

Many children show a persistent style of behaving in an impulsive inattentive and restless fashion

Manifest in somewhat different ways at different ages

Importance for clinicians

Risk of later antisocial adjustment educational failure and aspects of personality dysfunction in later adolescence and adult life

Unpleasant for the caregivers

Most common reasons for clinical referral during the school years

CONTINUED

Inattentiveness refers to a style of behaviour involving dis organization and lack of persistence

Overactivity refers simply to an excess of movements it is often the most salient problem in early childhood but the least important in adult life

Its features are statistically closely allied to impulsiveness and they are often combined into one construct of "hyperactivity"

Impulsiveness means acting without reflecting

CONTINUED

Some degrees of inattentiveness high activity and impulsiveness are of course shown by ordinary children

Diagnostic identification severity and consistency of the behaviours and on their impact on social adjustment

Possible for inexperienced parents or teachers to regard ordinary childish high spirits as evidence of hyperactive behaviour

The tolerance of parents varies a good deal

Degree of financial loss suffered because of the child's problems are strong predictors professional attention

EPIDEMIOLOGY

Rates of ADHD 7 to 8 in prepubertal elementary school children

Epidemiological studies ADHD occurs in about 5 percent of youth including children and adolescents

25 percent of adults

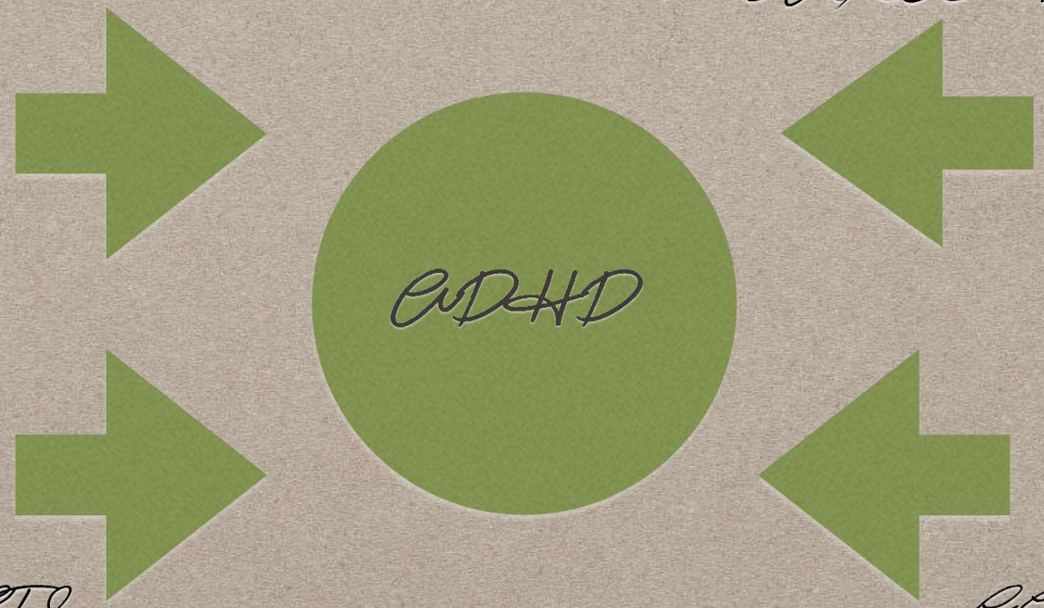
ADHD is more prevalent in boys than in girls with the ratio ranging from 2 1 to as high as 9 1

Symptoms of ADHD are often present by age 3 years

ETIOLOGY

ENVIROMENTAL

NEUROANATOMY
NEUROCHEMICAL



CNS INSULTS

GENETICS

- Polygenetic theory

Family adoption and twin studies suggest ADHD is familial and highly heritable Rietveld Hudziak Bartels et al 2003

Parents and siblings of cases display up to an eight fold increased risk for ADHD Faraone Biederman 2000

Biological relatives are more at risk than adoptive family members Sprich Biederman Crawford et al 2000

According to twin studies ADHD is amongst the most heritable conditions with estimates between 60 and 90 Thapar Harrington Ross et al 2000

CONTINUED

In meta analysis significant pooled effects have been reported for three polymorphisms of dopamine genes

the D4 and D5 receptors DRD4 and DRD5 and the dopamine transporter DAT1 eg Faraone et al 2005 Thapar O'Donovan Owen 2005a

The DRD4 and DAT1 are most likely to have functional significance

Based on animal knockout models tests of potentially functional polymorphisms of the serotonin trans porter and receptor genes SLC6A4 and HTR1B suggest an association with ADHD Faraone et al 2005

ENVIRONMENTAL FACTORS

The growing realization of the limitations of the study of genes in isolation from environments has led to renewed interest in environmental risk in ADHD

Prenatal Factors

Maternal lifestyle during pregnancy has been linked to ADHD Linnet Dalsgaard Obel et al 2003

The evidence is strongest for maternal smoking for which a dose response relationship with ADHD appears to exist Thapar Fowler Rice et al 2003

Exposure to cocaine has a range of harmful effects in utero of which an increased risk of ADHD might be one Linares Singer Kirchner et al 2006

Continued

Maternal stress during pregnancy and associated over secretion of cortisol have been implicated in ADHD Kapoor Dunn Kostaki et al 2006 O'Connor Heron Golding et al 2003 Rodriguez Bohlin 2005

Exposure to medication eg benzodiazepines anticonvulsants may represent a risk although these effects are difficult to disentangle from the effects of the maternal mental illness Steinhausen Losche Koch et al 1994

Perinatal factors

Bhutta Cleves Casey et al 2002 reported a two fold increase in ADHD in children born with a very low birth weight

ADHD children are more likely to have experienced pregnancy and birth complications Ben Amor Grizenko Schwartz et al 2005

These effects are difficult to disentangle from low birth weight and the increased risk that vulnerable children may be at for a difficult birth

POSTNATAL PHYSICAL FACTORS

Social and biological factors appear to have a role in the postnatal period

Exposure to lead and related neurotoxins may be associated with increased risk of inattentive and hyperactive behaviour

but these exposures are both linked to social disadvantage and cause other non specific neurodevelopmental difficulties Levitt 1999

Suggestions of the role of dietary deficiencies require further examination in large scale trials

POST NATAL SOCIAL ENVIRONMENT

Children who experienced extreme physical cognitive and social deprivation in infancy were at an increased risk of pervasive and persistent overactivity and inattention

Claims that parenting is implicated in the causes of ADHD are controversial

Whereas children suffering extreme neglect and abuse may be at increased risk for ADHD

Child evoke negative and hostile responses from parents Seipp Johnston 2005 while parental characteristics including adult ADHD symptoms can moderate these responses and exacerbate coercive cycles Murray Johnston 2006

Continued

Limited evidence from good longitudinal studies

However the fact that parent training can significantly reduce core ADHD symptoms in preschoolers highlights the potential power of the social environment to influence the course of ADHD Sonuga Barke Daley Thompson et al 2001

NEUROCHEMICAL FACTORS

Dopamine is a major focus of clinical investigation

Prefrontal cortex

Simulants known to be the most effective medications in the treatment of ADHD affect both dopamine and norepinephrine

leading to neurotransmitter hypotheses that may include dysfunction in both the adrenergic and dopaminergic systems

NEUROPHYSIOLOGICAL FACTORS

EEG studies in ADHD children and adolescents found evidence of increased theta activity frontal regions

Further studies of youth with ADHD have provided data showing elevated beta activity in their EEG studies

Clarke and colleagues found that those ADHD children with combined type of ADHD were the ones who showed significantly elevated beta activity on EEG

Current investigation of EEG in youth with ADHD have identified behavioural symptom clusters among children with similar EEG profiles

NEUROANATOMICAL

Neuroanatomical correlations for the superior and temporal cortices with focusing attention external parietal and corpus striatal regions with motor executive functions the hippocampus with encoding of memory traces the prefrontal cortex with shifting from one stimulus to another

Further hypotheses suggest that the brainstem which contains the reticular thalamic nuclei function is involved in sustained attention

CONTINUED

A review of MRI/PET and SPECT

show evidence of both decreased

volume and decreased activity in

prefrontal regions

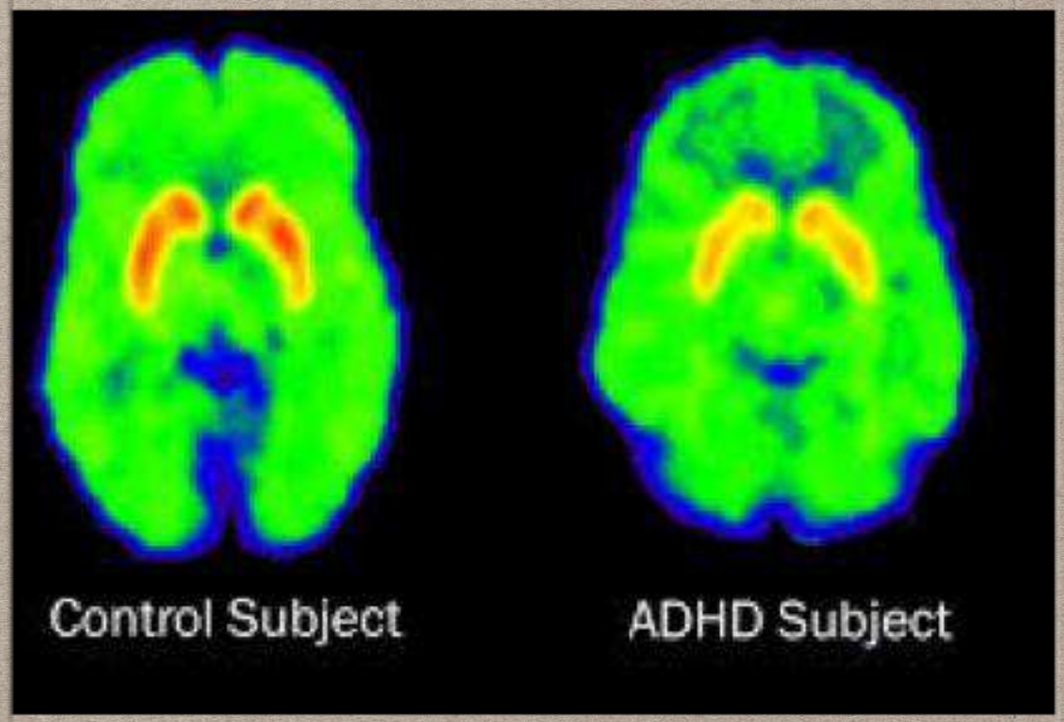
anterior cingulated

globus pallidus

caudate

thalamus and

cerebellum



DIAGNOSTIC CLASSIFICATION

- There are two main approaches

DSM IV TR recognizes "Attention Deficit Hyperactivity Disorder" ADHD

ICD 10 World Health Organization 1992 which uses the category of "Hyperkinetic Disorder"

They are based on essentially the same descriptions of behavior but weight the different items differently

CONTINUED

Both schemes require that the level of behaviours should be out of keeping with the person's developmental age and that they should be impairing to social adjustment

Clinicians may find it useful to use the concepts of both schemes recognizing their strengths and weaknesses

DSM IVTR	ICD 10
ADHD	Hyperkinetic disorder
requires all three components to be present	Divided into cases where this is so "Combined type" and those where only inattentiveness or only overactivity and impulsiveness are present
excluded if its signs are better explained by a coexistent disorder	excluded by the presence of other disorders such as autism and anxiety states

DSM IV TR	DSM 5
symptoms had to be present by age 7 years	"several inattentive or hyperactive impulsive symptoms" must be present by age 12 years
two subtypes Inattentive and Hyperactive Impulsive type	1 combined presentation 2 predominantly inattentive presentation and 3 predominantly hyperactive impulsive presentation
Exclusion	permitting a comorbid ADHD and ASD to be made
6 Symptoms	5 symptoms
	Examples of symptoms has been added

DSM 5

A A persistent pattern of inattention and or hyperactivity impulsivity that interferes with functioning or development as characterized by 1 and or 2

1 Inattention Six or more of the following symptoms have persisted for at least 6 months to a degree that is inconsistent with developmental level and that negatively impacts directly on social and academic occupational activities

2 Hyperactivity and impulsivity Six ormore following symptoms have persisted for at least 6 months to a degree that is inconsistent with developmental level and that negatively impacts directly on social and academic occupational activities

- Fails to give close attention to details
- Difficulty sustaining attention in tasks
- Does not seem to listen when spoken to directly
- Does not follow through on instructions
- Difficulty organizing tasks and activities
- Avoids tasks which require sustained mental effort
- Loses things necessary for tasks or activities
- Easily distracted by extraneous stimuli
- Forgetful in daily activities

- Fidgets with hands and feet
- Leaves seat in classroom
- Runs about or climbs excessively
- Has difficulty playing quietly
- Often on the go
- Often talks excessively
- blurts out answers before questions completed
- Has difficulty awaiting turn
- Interrupts and intrudes on others

SUBTYPE

A Combined Type

Clinical levels of both inattention and hyperactivity impulsivity

Most common subtype

B Predominantly Inattentive Subtype

Clinical levels of inattention only

Often not identified until middle school

Sluggish cognitive tempo

C Predominantly Hyperactive Impulsive Subtype

Clinical levels of hyperactivity impulsivity only

More common among very young children prior to school entry

ICD 10

F90 Hyperkinetic disorders

early development usually in the first 5 years of life

Diagnostic guidelines

The cardinal features are impaired attention and overactivity both are necessary for the diagnosis and should be evident in more than one situtation

continued

F900 Disturbance of activity and attention

F901 Hyperkinetic conduct disorder

F909 Hyperkinetic disorder unspecified

CLINICAL FEATURES

ADHD can have its onset in infancy

Infants with ADHD are active in the crib sleep little and cry a great deal

Impulsiveness and an inability to delay gratification are characteristic

Children with ADHD are often susceptible to accidents

The most cited characteristics of children with ADHD in order of frequency are hyperactivity attention deficit impulsivity memory and thinking deficits

Associated features often include perceptual motor impairment emotional lability and developmental coordination disorder

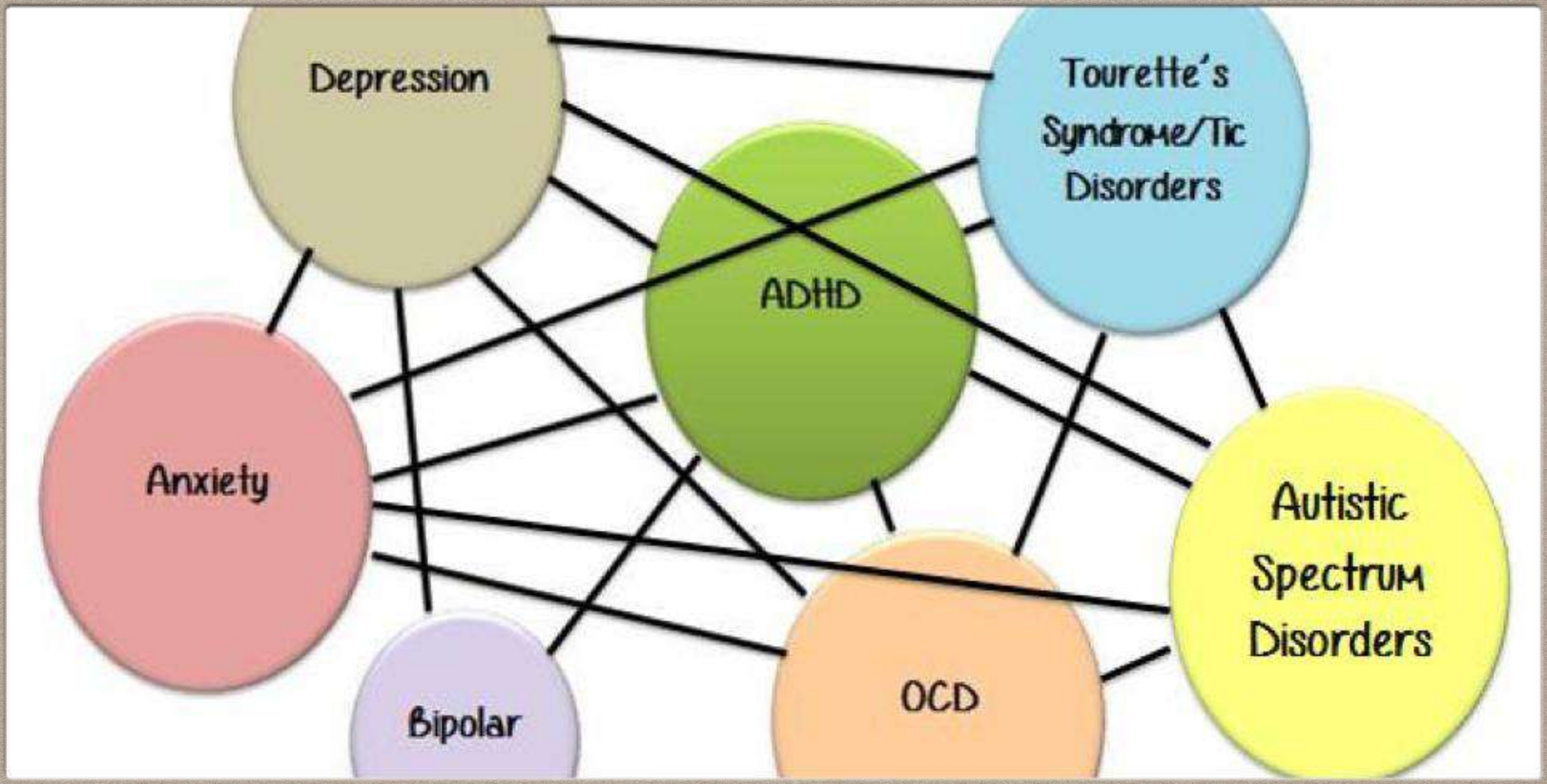
Continued

The mental status examination in a given child with ADHD who is aware of his or her impairment may reflect a demoralized or depressed mood

Children with ADHD often have problems with motor coordination

Difficulty copying age appropriate figures rapid alternating movements right left discrimination ambidexterity reflex asymmetries

	Preschool	Primary school	Adolescene	Adulthood
Inattentive	Short play sequence 3min	Brief actiuties 10min	Persistence less than peers 30 min	Details not completed lack of foresight
Overactive	"Whirlwind"	Restless when calm expected	Fidgety	Subjective Sense of Restlessness
Impulsive	Does not listen no sense of danger	Acting out of turn interruptin	Poor self control	Motor other accidents unwise designs



CO MORBIDITY

Axis One

Oppositional Defiant Disorder

Conduct disorder

Mood disorders depression or bipolar

Anxiety disorders

Tic disorder

Substance abuse

Autism

Axis Two

Speech and Language disorders

Specific Learning Disability SLD 10 25

Axis Three

Intellectual disablity Borderline to Profound

Axis Four

Seizure disorder Brain trauma CNS infections

Axis Five

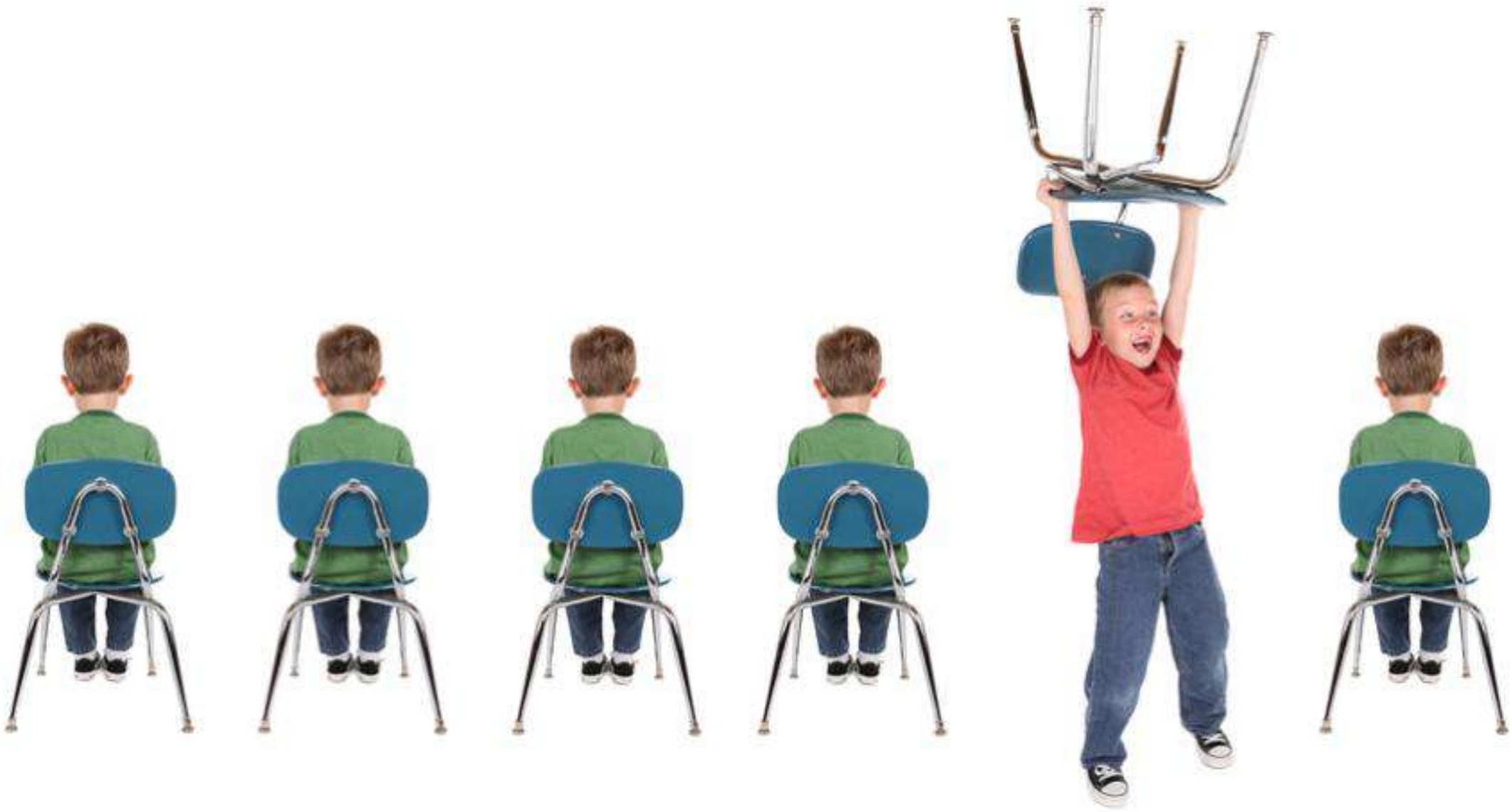
Chaotic disorganized environment

Parental psychiatric illness

Marital conflicts

Physical and Sexual abuse of the child

Family stress



DIFFERENTIELS

ODD

May be characterized by resistance to work or school tasks because of a refusal to submit to others' demands

Accompanied by negativity hostility and defiance

In ADHD however the aversion to school or mentally demanding tasks is due to difficulty in sustaining mental effort forgetting instructions and impulsivity

Hyperactivity represents either a risk factor for later oppositional and conduct disorders or is an early onset form of conduct problem

The clinical implications are important

it is worth detecting and treating hyperactivity even before conduct problems have appeared

When conduct problems do appear whether hyperactivity and inattention are in fact present in which case a mixed disorder is recognized

Intermittent explosive disorder

ADHD and intermittent explosive disorder share high levels of impulsive behavior

Intermittent explosive disorder show serious aggression toward others which is not characteristic of ADHD

Do not experience problems with sustaining attention as seen in ADHD

In addition intermit tent explosive disorder is rare in childhood

Intermittent explosive disorder may be diagnosed in the presence of ADHD

Other neurodevelopmental disorders

The increased motor activity that may occur in ADHD must be distinguished from the repetitive motor behavior that characterizes stereotypic movement disorder and some cases of autism spectrum disorder

Stereotypic movement disorder the motor behaviour is generally fixed and repetitive eg body rocking self biting

ADHD fidgetiness and restlessness are typically generalized and not characterized by repetitive stereotypic movements

Tourette's disorder frequent multiple tics can be mistaken for the generalized fidgetiness of ADHD Prolonged observation may be needed to differentiate fidgetiness from bouts of multiple tics

Specific learning disorder

appear inattentive because of frustration lack of interest or limited ability

Inattention not impairing out side of academic work

Intellectual developmental disorder

Symptoms of ADHD are common among children placed in academic settings that are inappropriate to their intellectual ability

In such cases the symptoms are not evident during non academic tasks

A diagnosis of ADHD in intellectual disability requires that inattention or hyperactivity be excessive for mental age

Autism spectrum disorder

The social dysfunction and peer rejection seen in individuals with ADHD must be distinguished from the social disengagement isolation and indifference to facial and tonal communication cues seen in individuals with autism spectrum disorder

Children with autism spectrum disorder may display tantrums because of an inability to tolerate a change from their expected course of events

In contrast children with ADHD may misbehave or have a tantrum during a major transition because of impulsivity or poor self control

Reactive attachment disorder

Children with reactive attachment disorder may show social disinhibition but not the full ADHD symptom cluster

Display other features such as a lack of enduring relationships that are not characteristic of ADHD

BPAD

Bipolar disorder has been associated with euphoria grandiosity and a cycling course with each episode lasting for at least several days

ADHD by contrast has been regarded as a persisting disability in which euphoria is not particularly a feature

The goal directed overactivity of mania is usually seen as in some contrast with the disorganized and off task activity of ADHD

An unstable and overreactive mood is very common in ADHD

Important to note that the assessment of ADHD needs to include the recognition of rapid and volatile mood changes when they are present

Many assessment measures such as the Conners' scales do indeed include such symptoms

ASSESSMENT

Parent interview most important

- The key elements include a thorough history covering

presenting symptoms differential diagnosis possible comorbid conditions as well as medical developmental school psychosocia

Child diagnostic interview history and mental status examination

CONTINUED

School related assessment

Reports of classroom and school behaviour

Learning

Attendance

Scores

Communication between the doctor family and school is essential to make a diagnosis

continued

Additional evaluation if indicated

- IQ academic assessment
- Speech and language assessment
- Social development
- Pre vocational skills

continued

Get the history from more than one family member

Get details from school teacher and or tuition teacher

Get assessments by other professional as needed

Look out for comorbid diagnoses

continued

No biological marker is diagnostic for ADHD

Cognitive testing that helps to confirm a child's inattention and impulsivity

includes a continuous performance task in which

a child is asked to press a button each time a particular sequence

of letters or numbers is flashed on a screen

Errors of omission Children with poor attention

Errors of commission Impulsivity

RATING SCALES

Preschool

The Early Childhood Attention Deficit Disorder Evaluation Scale ECADDES

Elementary School

Child Behavioral Checklist CBCL Parent Teacher or Youth forms

Conners Parent and Teacher Rating Scales CPRS and CTRS

Adolescent

Conners Wells Adolescent Self Report of Symptoms CWAS

Adolescent Symptom Inventory 4 ASI 4

Adults

Conners Adult Attention Deficit Rating Scale CAADRS

management

FDA Approval for ADHD Medications

Methylphenidate		
Concerta	Methylphenidate	6 and older
	(OROS long acting)	6 and older
Ritalin	Methylphenidate	6 and older
Ritalin SR	Methylphenidate (extended release)	6 and older
Ritalin LA	Methylphenidate (long-acting)	6 and older
Metadate ER	Methylphenidate (extended release)	6 and older
Metadate CD	Methylphenidate (extended release)	6 and older
Methylin	Methylphenidate (oral solution and Chewable tablet)	6 and older
Daytrana	Methylphenidate (patch)	6 and older
Dexmethylphenidate		
Focalin	Dexmethylphenidate	6 and older
Focalin XR	Dexmethylphenidate (extended release)	6 and older
Dextroamphetamine		
Dexedrine	Dextroamphetamine	3 and older
Amphetamine Salts		
Adderall	Amphetamine	3 and older
Adderall XR	Amphetamine (extended release)	6 and older
Lisdexamfetamine		
Vyvanse	Lisdexamfetamine	6 and older
Nonstimulants		
Strattera	Atomoxetine	6 and older
Alpha Agonists		
Kapvay	Clonidine (extended	6 -17

NICE guidance summary of treatment for attention deficit hyperactivity disorder

Drug treatment should only be initiated by a specialist and only after comprehensive assessment of mental and physical health and social influences

- For cases with moderate or lesser degrees of severity psychological interventions are recommended as initial therapy with medication subsequently if still required
- For severe cases ie those with pervasive impairment from their ADHD medication will usually be the first line treatment
- Methylphenidate dexamfetamine and atomoxetine are recommended within their licensed indications

Methylphenidate is usually first choice of medication but decision should include consideration of

- co morbid conditions tics Tourette's syndrome epilepsy
- tolerability and adverse effects
- convenience of dosing
- potential for diversion
- patient parent preference

- If using methylphenidate consider modified release preparations convenience of single day dosage improving adherence reducing stigma acceptability to schools or multiple doses of immediate release greater flexibility in controlling time course of action closer initial titration

- Where more than one agent is considered suitable the product with the lowest cost should be prescribed

- Monitoring should include measurement of height and weight with entry on growth charts and recording of blood pressure and heart rate

Methylphenidate

usually the first choice of drug when a drug is indicated

It is a central nervous stimulant with a large evidence base from trials

Adverse effects include insomnia anorexia raised blood pressure and growth deceleration which can usually be managed by symptomatic management and or dose reduction

Initially 5 10 mg daily titrated up to a maximum of

2 mg kg day in divided doses using weekly increments of 5 10 mg maximum 100 mg

Initially 18 mg in the morning titrated up to a maximum of

54 mg or after review up to 108 mg in adults

continued

Rebound affect

Motor tics

Growth Suppression

Drug holidays

Dexamfetamine

An alternative central nervous system CNS stimulant

effects and adverse reactions are broadly similar to methylphenidate

but there is much less evidence on efficacy and safety than exists for methylphenidate and it plays a part in illegal drug taking

Both methylphenidate and dexamfetamine are Controlled Drugs prescriptions should be written appropriately and for not more than 28 days

Atomoxetine is a suitable first line alternative

It may be particularly useful for children who do not respond to stimulants or whose medication cannot be administered during the day

It may also be suitable where stimulant diversion is a problem or when 'dopaminergic' adverse effects such as tics anxiety and stereotypies become problematic on stimulants

Parents should be warned of the possibilities of suicidal thinking and liver disease emerging and advised of the possible features that they might notice

clonidine and tricyclic antidepressants Third line drugs

Very few children should receive these drugs for ADHD alone There is some evidence supporting the efficacy of carbamazepine and bupropion

There is no evidence to support the use of second generation antipsychotics for ADHD symptoms

but risperidone may be helpful in reducing severe coexistent levels of aggression and agitation especially in those with moderate learning disability

Modafanil appears to be effective[10] but has not been compared with standard treatments and its safety is not established

PSYCHOSOCIAL INTERVENTION

Psychosocial interventions for children with ADHD include Psychoeducation

Academic organization skills remediation

Parent training

Behavior modification in the classroom and at home

Cognitive behavioral therapy CBT

Social skills training

Social skills groups behavioral training for parents and behavioral interventions at school and at home have been studied alone and in combination with medication management

Evaluation and treatment of coexisting learning disorders or additional psychiatric disorders is important

When children are helped to structure their environment their anxiety diminishes

It is beneficial for parents and teachers to work together

A common goal of therapy is to help parents recognize and promote the notion that child is still capable of being responsible

Parental training is an integral part of the psychotherapeutic interventions for ADHD

Most parental training is based on helping parents develop usable behavioral interventions with positive reinforcement that target both social and academic behaviors

Group therapy aimed at both refining social skills and increasing self esteem

COURSE AND PROGNOSIS

The course of ADHD is variable

Symptoms have been shown to persist into adolescence or adult life in approximately 50 percent of cases

In the remaining 50 percent they may remit at puberty or in early adulthood

In some cases the hyperactivity may disappear but the decreased attention span and impulse control problems persist

Overactivity is usually the first symptom to remit and distractibility is the last

Persistence is predicted by a family history of the disorder negative life events and comorbidity with conduct symptoms

When remission does occur it is usually between the ages of 12 and 20yrs

Most patients with the disorder however undergo partial remission and are vulnerable to CD antisocial behavior s

Learning problems often continue throughout life

In summary

Symptoms occur on a continuum of mild to severe and across various settings

genetic and environmental influences likely act together both additively and multiplicatively to create a spectrum of neurobiological risk

Significant comorbidity

Medications one mode of treatment

Multimodal treatment is the rule

Parents and teachers play an important role

Long term treatment essential


THANK YOU