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ATTENTION DEFICIT HYPERACTIVITY DISORDER (OR HYPERKINETIC DISORDER)

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Learning objectives

This chapter will help readers to:

- understand the characteristics of attention deficit hyperactivity disorder (ADHD) and its relationship with other common developmental and mental disorders;
- appreciate that ADHD is caused by a complex interaction between genes and social and environmental factors;
- understand treatment interventions, including educational, parenting, cognitive behavioural therapy and pharmacological; and
- appreciate that ADHD remains a highly pernicious chronic condition and that effective interventions can help prevent associated social and educational exclusion.



DISORDERS, DIFFICULTIES AND DIFFERENCES

Mental-health difficulties in childhood and early adolescence are best understood as emotions or behaviour outside the normal range for age, sex and cognitive ability, linked with an impairment of development and where the child suffers as a result. It is usually not the child who complains about the problem but rather one of the many adults involved in that child's life.

In contrast to most adult mental health disorders, ADHD is a neurodevelopmental disorder and represents a quantitative shift from normality within a developmental framework. It describes the most severe 1–3% of the childhood population in terms of hyperactivity, inattention and impulsiveness in more than one setting which is usually assessed within community paediatrics and Child and Adolescent Mental Health Services (CAMHS) teams for pharmacotherapy.

Applying a life-course perspective to ADHD, we know that present diagnostic criteria require symptoms of ADHD be present before the age of 7. However, evidence shows that ADHD can be diagnosed competently in pre-schoolers and the correlates of pre-school ADHD are similar to those found in school-age samples and include deficits in executive functioning and delay aversion regarded as essential features of core ADHD.

The key clinical features of ADHD can be summarized into a triad from early childhood of severe restlessness, inattention and impulsiveness. Brown (2000) produced a helpful model of executive function seen in ADHD focusing on six areas, alongside which he listed the expected impairments:

- 1 Prioritizing and organization.
- 2 Attention focus and control.
- 3 Alertness regulation and speed of processing.
- 4 Frustration and emotional management.
- 5 Memory recall and working memory.
- 6 Monitoring and regulation of actions.

MEDIA MYTHS AND CONTROVERSY

Media myths abound and the tabloid press is full of headlines such as 'ADHD an excuse for bad parenting'. Undoubtedly a controversial diagnosis, the issue of reliance on medication without addressing social, educational or family issues can lead to justified criticism. On the other hand, the consensus of evidence to date supports medication using stimulants (e.g. methylphenidate or ritalin) or non-stimulants (atomoxetine) as being the most effective intervention (Molina *et al.*, 2009). Without medication, many of the other sensible angles in treatment (such as specialist education) cannot be easily accessed by the pupil. However, with appropriately specialized teaching within small classes and high adult-to-pupil ratios, a child with ADHD may not require medication or at least need a lower dose.

EPIDEMIOLOGY OF ADHD

Multiple coexisting psychiatric conditions have been reported with childhood ADHD. Indeed, it is uncommon to have a child with merely ADHD alone. In a Swedish population sample with ADHD, the prevalence rate for another condition was 87%, while the prevalence rate for two or more comorbidities was 67%. The most common comorbid conditions reported have been antisocial disorders, especially conduct disorder (CD) in up to 25% and oppositional defiant disorder (ODD) in up to 50%. The presence of comorbid antisocial disorders could often be linked to mothers' psychiatric disorders or to negative parenting practices. A wide spectrum of developmental and learning disorders has been found to be associated with children with ADHD. These include specific learning difficulties, such as dyslexia, dysgraphia, dyscalculia and dyspraxia; Tourette's syndrome; and tic disorders. Until recently the presence of pervasive developmental disorder (i.e. autistic spectrum disorders) was thought to rule out a diagnosis of ADHD. However, research and practice have demonstrated that the two can be diagnosed as separate conditions in the same individual. It has been shown that other syndromes on the autistic spectrum, such as Asperger's syndrome, can co-occur with ADHD. ADHD is associated with a five-fold increase in mental disorders such as depression.

ASSESSMENT AND DETECTION OF ADHD



Case Study

Kieran was on the go all the time from his first steps at the age of 15 months. He was into everything and did not sleep properly through the night until he was nearly 5. His parents were exhausted and found that their extended family were not keen to look after him. By the start of primary school, Kieran had fractured his clavicle and elbow from jumping off trees and heights.

During infant school, Kieran struggled to sit still at circle time and was not popular with his peers. The school special educational needs co-ordinator (SENCO) discussed the class teacher's concerns with the parents. He was referred by the GP to the local community paediatrics team who recommended parent training around positive reinforcement and giving him some additional support to remain on task in school at School Action Plus of the code of practice. His parents felt blamed as bad parents by their friends but had two other older boys with no difficulties at all.

After a six months' trial of positive behavioural management and parenting classes, the parents were less punitive and found that there had been a short-term response to praise and clear targets. However, the progress did not last and he continued to 'be all over the place' and not able to sit and watch a film all the way through without getting up and making a nuisance of himself. He had no friends at school. His morale was low and he was struggling to read.

The community paediatrician discussed medication options with the parents who initially were sceptical as they were worried about side-effects and using medication in such a young child now aged 7. After careful reassurance, they decided that something was needed to improve Kieran because he was being excluded for disruptive behaviour and hitting his peers. He seemed to be gravitating towards all the 'problem children' at the school.

After a few months he was being invited to parties again for the very first time and his parents were in tears as they had been so worried about his social isolation.

The primary school took advice from the behaviour support specialist teacher service and instigated individualized approaches with as much one-to-one time with his teaching assistant as possible; increased computer-based learning helped his focus; and egg timers were employed to help with time management and awareness. Kieran was provided with a 'tangle' which is a plastic spiral that allowed him to fiddle with his hands under the table and not distract other children near him. He sat on a table close to the teacher so that he did not have the additional distraction of people in front of him. The tactical ignoring of attention-seeking behaviour and the use of visual cards to prompt him to remain on task were found to work. Target charts were used between home and school to reward him for clear goals and immediate rewards were given wherever possible. Kieran was placed with good role models to help him with learning appropriate behaviour. Nuisance items, such as rubber bands and rulers, were strategically removed, while activity reinforcement was employed using the less desirable task before the more desirable reward task. The parents were included as partners in Kieran's success. Close home-school liaison was maintained with email and diaries with the focus on the positives and reinforcing targets.

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Exercise was found to promote Kieran's focus. He enjoyed football and could concentrate better in a team now although he would need prompting when group instructions were given. His parent joined ADDIS UK and the local ADHD support network for parents.

Careful planning for the transition to secondary school was undertaken involving both the SENCO and the community paediatrician. His parents found a school which also provided nurturing for the Year 7 transition and had good links with the local community paediatrics and CAMHS team.

Kieran's medication needed to be changed to a preparation which covered the early evenings as well as during the school day and a suitable longer-acting preparation of methylphenidate was started. Kieran's sleep pattern needed help with melatonin to assist him at night.

AETIOLOGY AND UNDERLYING THEORETICAL MODELS

Biological Factors

The diagnosis of ADHD does not imply a particular underlying cause. The presence of psychosocial adversity or risk factors should not exclude the diagnosis of ADHD, which involves the relationship between multiple genes and environmental factors. ADHD is viewed as a disorder with many different subtypes resulting from the interplay of different risk issues.

Genetic Influences

ADHD symptoms show powerful genetic influences. Twin studies suggest that genes explain around 75% of the heritability of ADHD symptoms in the population (heritability estimate of 0.7 to 0.8). The genes affect the distribution of key ADHD symptoms across the wider population. No single gene has been identified in ADHD.

Environmental Influences

A range of biological factors can negatively affect brain development during the perinatal period and early childhood is associated with an increase in the risk of ADHD or attention deficit disorder (ADD). Such risk factors include maternal substance misuse during pregnancy, foetal hypoxia and very low birth weight; also brain injury, and exposure to toxins such as lead and a deficiency of zinc.

Epidemiological research indicates a link between additives in the diet and levels of hyperactivity; and a small proportion of children with ADHD demonstrate individual reactions to some foods or artificial additives, and could be helped by an exclusion diet with appropriate dietetic or medical advice (Richardson, 2004).

Psychosocial Factors

ADHD has been associated with severe early psychosocial adversity – for instance, in children who have survived depriving institutional care (Roy *et al.*, 2000). The mechanisms are not known but may include a failure to acquire cognitive and emotional control and the impact of early emotional neglect on brain development as well the probability of disrupted parenting due to familial ADHD and substance misuse by parents.

Parental–child relationships can be improved in children where ADHD symptoms have been successfully treated with stimulants. Parents themselves may also have unrecognized and untreated ADHD, which can also undermine relationships.

Dysfunctional relationships are more common in the families of young people with ADHD. Stressful family relationships may be related to the problems of living with a child with ADHD as well as a risk for the disorder itself. In ADHD, a harsh and punitive parenting style is a risk factor for developing oppositional and conduct problems.

Focus groups of children with ADHD have expressed very clear desires for better public understanding of the condition. They asked for empathy for their situations and less stigma attached to ADHD diagnoses. Experiences of stigma, such as bullying, name-calling, negative assumptions and differential treatment, were distressing to children, and negatively affected their self-evaluations, self-esteem and self-confidence. Close friendships were an important protective factor against the initiation and/or continuation of fights that arose as a result of the child with ADHD being bullied. These friendships were mentioned at least as often as medication as factors that helped children to restrain their impulse to fight and/or to continue fighting (NICE, 2008).

TREATMENT INTERVENTIONS

Psychological Therapies and Parenting Interventions

Parent-effectiveness training is a behaviour therapy intervention supporting parents of children with ADHD to use behaviour therapy techniques with their child. Parent training originated in the 1960s based on behavioural learning theory and play therapy. This intervention has developed further addressing beliefs, emotions and wider social issues as well as targeting poor self-confidence, depression, social isolation and marital difficulties (Scott, 2002). The focus is primarily with the child or young person's main caregiver, although some programmes add a child-directed component based on the principles of social skills training.

NICE (2006) recommended that all parent-training/education programmes, whether group or individual based, should include elements of the following:

- Social learning theory to underpin the curriculum.
- Strategies to improve relationships.
- A reasonable number of sessions – eight to twelve are suggested.

- Empowering the parents to identify aims and targets.
- Role play and homework to support the generalization of skills.
- Therapeutic alliance achieved through appropriately trained and experienced operatives.
- Consistent implementation promoted through manualization and adherence to the manuals involved.

Examples of programmes that demonstrated the essential characteristics listed above included the Webster–Stratton Incredible Years Programme and the Triple P – Positive Parenting Programme. Parents who might have the greatest needs could find it difficult to engage in groups and a more home-based and tailored approach may be required.

Behaviour Therapy

The chief technique involves the use of rewards or positive reinforcers that are thought likely to encourage the young person to make helpful changes in motor, impulse or attentional control. This may involve concrete rewards, such as extra time for recreational and leisure activities or the means to obtain items that the young person values. ‘Tokens’ (such as stars, chips, marbles and so on) may work for younger children in their own right, whereas for older children tokens will need to be exchanged for items of value to them. Social approval, such as praise or achievement certificates and self-praise, is a useful adjunct in such programmes.

Rewards are specific to an individual and what is of value to one child is not necessarily of value to another. There are also practical, financial, cultural and moral issues that make some rewards more suitable for some parents or teachers than others. Parents often argue against the use of ‘black mail’ or ‘bribery’ when discussing similar techniques.

A further set of techniques involves punishments or negative reinforcers. This approach may have some value when a particular impulsive behaviour is offensive to others and needs to cease immediately. Verbal reprimands, which have the merit of being simple and effective, may be delivered by parents, carers and teachers. Response cost techniques involve the loss of a potential reinforcer. These can take the form of deductions either from rewards already earned or from an agreed set of rewards given in advance but from which deductions can be made for inappropriate behaviour.

The third most common technique is ‘time out’ from social reinforcement, and is helpful where it is felt that inappropriate behaviour is being reinforced by the attention of others.

There is no evidence yet that psychological interventions for children with ADHD have measurable positive effects on teacher ratings of either ADHD symptoms or conduct-related behaviours. The beneficial effects of psychological interventions for ADHD therefore do not appear at present to transfer to the classroom environment. However, psychological interventions for children with ADHD, taking into consideration their developmental level, have moderate helpful effects according to parent ratings of ADHD symptoms and conduct problems, both for children not on medication and as an adjunct to continued routine medication for ADHD. Combining medication

with psychological interventions may be especially important in the management of older adolescents and adults with ADHD and comorbid antisocial behaviour, and these individuals benefit from interventions to develop prosocial skills, emotional control, problem-solving negotiation and conflict resolution.

EDUCATIONAL INTERVENTIONS

It is well established that children with ADHD fall behind their peers academically. It has been shown that this trend extends to children who are severely inattentive, hyperactive and impulsive in the classroom, even if they do not have a formal diagnosis of ADHD. The studies by Merrell and Tymms are based on a large sample of English school children aged between 5 and 7 years, and they found that inattention was particularly related to academic underachievement and that impairment was proportionate to the number of key symptoms (Merrell and Tymms, 2005). Moreover, children who had been identified by their teachers in the reception year of school as having severe ADHD symptoms were found to fall behind their peers academically until the end of primary schooling at the age of 11 years and beyond.

Situational variation with how ADHD presents is well established in schools. There are clear differences in behaviour across secondary schools using observation and self-report measures which have been replicated. Galloway *et al.* (1995) proposed that ‘differences between teachers are substantially greater than differences between schools’, and posited that the teacher was the dominant influence on behaviour in the classroom. Gray and Sime (1988) suggested that the majority of the variance in behaviour lay within schools themselves. In the Elton Report (HMSO, 1989) it is stated that ‘a teacher’s general competence has a strong influence on his or her pupils’ behaviour’.

A study set in one LEA found that more than half the teachers had some experience of teaching a child with a diagnosis of ADHD (Sayal *et al.*, 2006), and that a time-limited educational intervention for teachers had been found to raise awareness and improve recognition of children with possible ADHD (Sayal *et al.*, 2006).

Teacher-led educational interventions consist of managing academic activities or adapting the physical environment. A description of a wide range of educational strategies for use with children with ADHD is given by Cooper and Ideus (1996), who suggest techniques such as the following:

- Awareness of potential distractions and manage those within the classroom by close proximity with the teacher.
- The child can use a stipulated quiet area.
- Appropriately interesting activities.
- Instructions need to be simple and unambiguous.
- Promotion of structure and predictability.
- Avoiding boredom through needless repetition.
- Simplification by dividing into manageable chunks.

- Promoting praise for positive results.
- Paired working as opposed to larger groups.
- Time out when misbehaving.
- Positive reinforcement using tangible tokens.
- Removal of tokens in response to inappropriate behaviour.

The provision of in-service training, peer observation and coaching by professionals can be effective, but the process takes time, and Adey *et al.* (2004) suggested that 30 hours of in-service provision are necessary to create sustained changes to teachers' classroom practice.

Teacher-led interventions, such as giving clear and effective commands, have large beneficial effects on the behavioural problems of children with ADHD. Teachers who have received training about ADHD and its management should provide behavioural interventions in the classroom to help children and young people with ADHD.

DIETARY RECOMMENDATIONS

Health professionals need to emphasize the importance of a balanced diet, good nutrition and regular exercise for those of any age with ADHD. Some have found the elimination of artificial colouring and additives from the diet to be helpful. Dietary fatty acid supplementation (e.g. omega 3) is not recommended by NICE.

PHARMACOLOGICAL TREATMENT

The Multimodal Treatment Study of Children with ADHD ((MTA) Jensen *et al.*, 2007) was a large (n 579), randomized trial with children assigned to one of the following groups: medication management, intensive behavioural treatment, combination treatment or community care (which included medication for approximately two thirds of the sample).

KEY FINDINGS

At 14 months (MTA Co-operative Group, 1999) the outcome strongly favoured careful medication (irrespective of the presence or absence of behaviour therapy); at that point the randomization ended, families were free to choose treatment or not, and the intensive interventions (medication monitoring and behavioural work) were discontinued. Later reports have provided details of follow-up of the groups at 24 (Jensen *et al.*, 2007) and 36 months after randomization. By the three-year mark, the outcome was similar for all four groups.

Molina *et al.* (2009), in their eight-year MTA follow-up study, found that the type or intensity of 14 months of treatment for ADHD in childhood does not predict functioning

six to eight years later. Rather, the early ADHD symptom trajectory, regardless of treatment type, is prognostic. Innovative treatment approaches targeting specific areas of adolescent impairment are needed. Adverse events at the 24 and 36-month points after randomization included influences on growth in height and weight – an effect of 0.75 inches at the two-year mark, with no further loss at the three-year point and catch-up growth by the eight-year point, suggesting no growth suppression in that timescale.

SAFETY ISSUES

In 2006 the US Food and Drug Administration (FDA) conducted a review on reports of sudden death in patients treated with ADHD medications using data from the Adverse Event Reporting System (AERS) (<http://www.fda.gov/ohrms/dockets/ac/06/briefing/2006-42106-07-01-safetyreview.pdf>). The review concluded that the rate of sudden death with methylphenidate and atomoxetine was below background rates available. The Medicines and Healthcare products Regulatory Agency (MHRA) (UK) published a drug safety update in January 2010 and concluded:

The benefits of methylphenidate continue to outweigh the risks when used to treat ADHD in children aged 6 years or older and adolescents. The longer-term safety of methylphenidate remains under close review, and the results of ongoing studies to characterise the known or potential risks of ADHD medicines will be evaluated when available (<http://www.mhra.gov.uk/Publications/Safetyguidance/DrugSafetyUpdate/CON06829>)

People with ADHD have a higher risk than the general population for running into problems with substance misuse. The risk appears to be linked with the presence of conduct disorder and social adversity. In UK clinical experience, however, the misuse of prescribed drugs by people with ADHD is very uncommon. The use of illicit drugs, such as cannabis and cocaine, is probably not increased by receiving stimulants, at least in the short term. It may even be reduced according to a meta-analysis by Wilens *et al.* (2003), which suggested that treatment with stimulants for ADHD was associated with a substantial reduction (approximately twofold) in drug misuse.

Observational follow-up of the MTA trial has found that medication does not contribute significantly to the risk for substance misuse in adolescence and behaviour therapy is associated with reduction of risk (Molina *et al.*, 2009). The reasons for a reduced risk of substance misuse with treatment are likely to impact upon impulsivity and conduct disorder symptoms with enhanced academic performance and family functioning.

It is important to note that use of alcohol or cannabis is not a contraindication to stimulant prescribing but rather should raise the possibility of drug diversion and should impact upon the choice of preparation in favour of the longer-acting medicines with very low abuse potential. Concomitant cannabis and stimulant use should be closely monitored because of the theoretical risks of increased dopamine in the genesis of psychosis in some studies.

Methylphenidate at a higher dose is more likely than placebo to cause the following short-term adverse effects: insomnia, anorexia, irritability, moodiness, thirst, itching,

diarrhoea, palpitations, stuttering, reddened eyes, incoherent speech and decreased bodyweight. The long-term studies of methylphenidate indicate an increased risk of side-effects, including an increase in systolic blood pressure and heart rate increase. Methylphenidate is thought to increase intrasynaptic concentrations of the neurotransmitters dopamine and noradrenaline (norepinephrine) in the frontal cortex as well as subcortical brain regions associated with motivation and reward and thus it improves the saliency of academic tasks.

Atomoxetine is a non-stimulant drug relatively recently introduced into the UK, licensed for use in children of six years and over and young people for the treatment of ADHD, as well as having a continuation licence into adulthood. It is thought that it works by selectively inhibiting the presynaptic noradrenaline transporter, thus inhibiting noradrenaline reuptake. Atomoxetine has less potential for misuse and does not require the same strict prescribing and storage conditions as methylphenidate and dexamfetamine as it is not a controlled drug.

Methylphenidate and atomoxetine have a similar side-effects profile with respect to effects on appetite, growth, pulse and blood pressure, requiring similar monitoring. Rarer harm events associated with atomoxetine include initial increased risk of suicidal thoughts and (very rarely) hepatic damage.

Drug treatment is not indicated as the first-line treatment for all school-age children and young people with ADHD. It should, rather, be held back for those with severe symptoms, such as those with the more severe ICD 10-defined hyperkinetic disorder (1–2% of the child population) and impairment or for those who have refused non-drug interventions or have not responded sufficiently to parent-training/education programmes or group psychological treatment (<http://www.who.int/classifications/icd/en/bluebook.pdf>). However, NICE (2008) recommends that, following treatment with a parent-training/education programme, children and young people with ADHD and persisting significant impairment should be offered drug treatment. The use of medicines in the treatment for children and young people with ADHD should always form part of a comprehensive treatment plan that includes psychological, behavioural and educational advice and interventions.

It is mandatory that, before starting drug treatment, children and young people with ADHD should have a full pre-treatment assessment, which should include the following:

- A full mental-health and social assessment.
- A full history and physical examination, including:
 - assessment of history of exercise syncope, undue breathlessness and other cardiovascular symptoms;
 - heart rate and blood pressure (plotted on a centile chart);
 - height and weight (plotted on a growth chart); and
 - family history of cardiac disease and examination of the cardiovascular system.
- An electrocardiogram (ECG) if there is past medical or family history of serious cardiac disease, a history of sudden death in young family members or abnormal findings on cardiac examination.
- A risk assessment for substance misuse and drug diversion (where the drug is passed on to others for non-prescription use).

FUTURE DIRECTIONS FOR TRAINING AND MULTIAGENCY DEVELOPMENT

Multiagency working in relation to ADHD raises challenges. Different models of disability and how to respond to it are held by different agencies. Parents, young ADHD patients and carers also need to be able to be part of steering groups or have their views represented. A number of successful multi-professional teams for ADHD are emerging with protocols for multi-professional working, including the role of GPs in monitoring aspects of care, and the GP with a special interest model has proved helpful for ADHD transitional and adult clinics. There remain, however, difficulties regarding transitional arrangements between CAMHS and adult mental health services and a general lack of support for adults with ADHD because of the difficulties associated with getting a diagnosis and treatment.

SUMMARY



- Apart from the impact on the individual, ADHD has a pernicious impact on society in the following areas (Coghill, 2006):
 - There is a dramatic increase in healthcare attendance through bike accidents and a tripling of related vehicular accidents.
 - There are exclusions in nearly one half of cases and a one-third drop-out of education, with lower occupational aspirations.
 - There is a significant increase in parental divorce rates and a similar increase in sibling conflict.
 - Absenteeism and decreased productivity at work.
 - A doubling of the substance misuse rate and a risk of earlier involvement and complexity of treatment.
 - Quality-of-life research indicates that children with ADHD are in the bottom one twentieth on measures of quality of life.
- Research has shown (Brassett-Grundy and Butler, 2004) that men and women who had childhood ADHD were significantly more likely than those without ADHD to face negative outcomes in adulthood, affecting various degrees of social exclusion. ADHD is as much a female problem, as it is a male problem and the adult lives of those with childhood ADHD are typified by social deprivation and adversity.
- The recommendations for cutting down the public and personal cost of ADHD include:
 - better screening for ADHD, perhaps in primary care.
 - wider use of sensitively designed early interventions and individually tailored treatment plans.
 - ongoing treatment and support for those with ADHD through adolescence into adulthood; and
 - raised awareness of ADHD amongst parents, health professionals, social-care workers, educationalists and those in the criminal justice system.
- These measures will help to ease the negative impact that childhood ADHD has on the life-course, stopping young sufferers from becoming socially excluded and unproductive adults.

Further Reading

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