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ATTENTION • DEFICIT •
HYPERACTIVITY • DISORDER
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What is ADHD?

Attention Deficit Hyperactivity Disorder is a neurodevelopmental condition that results in difficulty concentrating and staying focused, inability to control impulses or inhibit inappropriate behaviours and poor emotional control. People with ADHD may be overly restless or fidgety. It is more commonly diagnosed in boys than girls.

It is more commonly associated with childhood, where it can affect children's learning and social skills and family functioning, however it can also persist across the life span and result in increased rates of criminality, drug abuse and other mental health problems.

Many of the impairments experienced in ADHD are underwritten by key deficits in cognitive processes encompassing reward, attention, working memory, inhibition and cognitive flexibility. Deficits in these areas in turn lead to problems in broader skills such as reasoning, language comprehension, spatial processing and planning.

There are treatments that can help modify the behavioural symptoms of people with ADHD that involve a combination of medication and psychological therapies.

The precise causes of ADHD have not yet been identified. The fact that ADHD can run in families suggests a strong genetic link. Some environmental factors have also been associated with ADHD, and it is likely to be a complex interaction between multiple genetic risk factors and the influence of certain environments at particular stages of development.

ADHD is one of the most common mental disorders among Australian children—around 7.4% of children and adolescents have a diagnosis of ADHD.

7.4% OR AROUND
307,000
AUSTRALIAN CHILDREN

Further development of neuroimaging and EEG techniques will help characterise the brain anomalies associated with ADHD more accurately.

One of the challenges of ADHD lies in the variation of the way the condition presents in different individuals. Research is ongoing to improve diagnostic abilities using advanced neuroimaging techniques, such as structural, functional and diffusion magnetic resonance imaging (MRI), combined with machine learning applications to study brain structure and function and elucidate the underlying abnormalities that cause ADHD.

These MRI techniques, along with electroencephalography (EEG), a neurotechnology application that enables researchers to measure and observe the electrical signals associated with brain activity, have identified that ADHD primarily affects the frontostriatal, frontoparietal and attention networks—regions of the brain responsible for gathering and organising information, making decisions, executing tasks, working memory and attention.

Researchers have also found the brains of people with ADHD are usually 3–5% smaller and a number of specific grey and white matter structures are also reduced in size. It is thought that the brain differences evident in ADHD are possibly the result of a delay in maturation that catches up later in development, and that remission of ADHD may demonstrate normalisation of some or many of the brain abnormalities. Continued research will help determine how changes in brain structure and activity during development predict developmental changes in ADHD symptom expression.

The heterogeneity of ADHD also makes developing treatments challenging. Along with behaviour modification, counselling and tailored parenting teaching strategies, the most common treatment for ADHD currently is stimulant medication—drugs that act on the region of the brain associated with self-control. These help focus attention and concentration. However, as ADHD manifests differently from person to person, this treatment is only effective in around 70% of cases. This means that around 30% of children with ADHD are being exposed to an ineffective drug treatment with several

potential side effects during an important period of brain development and plasticity, which is a significant concern.

Further development of neuroimaging and EEG techniques will help characterise the brain anomalies associated with ADHD more accurately, improving our ability to diagnose and introduce more effective treatments for the condition as early as possible.

The Australian Brain Initiative will nurture the basic brain research required to better understand how the brain functions and explore the research needed to effectively treat disorders like ADHD.

The Initiative will also progress collaboration between research and industry to advance neurotechnology devices that have the potential to transform not only the capabilities of neuroscience research but also the lives of those living with conditions and disorders of the brain.

Health care costs associated with ADHD for children aged 4–9 in Australia amount to \$24–29 million.

These estimates do not include the substantial costs borne by the education or justice systems and those associated with family burden, school dropout and reduced employment prospects and productivity.

**ADHD IN AUSTRALIAN CHILDREN
AGED 4-9 COSTS OVER
\$24-29 MILLION**