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Hyperactivity Disorder (ADHD) in Criminal Justice Offender Populations

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# ‘Often Fails to Give Close Attention to Detail’: Attention-Deficit Hyperactivity Disorder (ADHD) in Criminal Justice Offender Populations

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## ABSTRACT

*Attention-Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder that presents in approximately 5% of children and 2.5% of adults. It is characterised by a range of behaviours that represent the extreme and problematic ends of the spectrums of inattention and/or hyperactivity/impulsivity across life contexts. The disorder generally presents during childhood and is highly heritable. A variety of genetic/biological liabilities are associated with ADHD. The interaction between these liabilities and suboptimal environmental experiences further increases the likelihood of problematic ADHD symptoms occurring. Especially when untreated, those with ADHD face a disproportionately high risk of calamitous life outcomes. One such potential trajectory is juvenile and/or adult criminal offending. Those with ADHD have been found to be five times more prevalent in juvenile detention settings and ten times more prevalent in adult prisons than they are in the general population. Despite this, ADHD is rarely given serious consideration when it comes to youth and criminal justice policy development and review. We contend that this is a colossal oversight. This oversight is, at least in part, likely due to the ill-informed controversy about the nature of ADHD and its treatment. In this article, we attempt to demystify some of these controversies. We also explain why those with ADHD are overrepresented in youth and criminal justice offender populations. Finally, we put forward ideas aimed at optimally addressing this overrepresentation and its impact on society.*

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## I INTRODUCTION

According to the most recent version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR),<sup>1</sup> Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder that presents within an individual, before the age of 12 years, in the form of a range of inattentive and/or impulsive/hyperactive symptoms. These symptoms have a significantly adverse impact on an individual's functioning across various life contexts (ie, home, school, and work). Research into ADHD has revealed that when an individual's ADHD is not diagnosed and/or is insufficiently/inappropriately treated, the individual has a disproportionately high likelihood of experiencing a variety of seriously deleterious life experiences and trajectories.<sup>2</sup> To provide some understanding as to its occurrence, it is worth noting that systematic and meta-analytic review studies have estimated that the pooled prevalence of ADHD across general populations appears to be 5 percent for children/adolescents (18 years of age and under), and 2.5 percent for adults.<sup>3</sup>

Esteemed ADHD researcher and educator Professor Russel Barkley postulates that deficits in self-regulation (SR) and executive functioning (EF) are at the core of the ADHD syndrome.<sup>4</sup> Based on his review of prior studies, Barkley has observed that seven EFs are consistently reported. These EFs are: 'self-awareness, inhibition, nonverbal and verbal working memory, emotional self-regulation, self-motivation, and planning/problem solving.'<sup>5</sup> A working EF-SR system enables individuals to account for both short-term and long-term outcomes of their behaviours and to contemporaneously plan for those outcomes.<sup>6</sup> Based on this understanding, it is not hard to comprehend why those with ADHD more often experience severe and frequent hardships and adversities than the 'average' person.

Lamentably, the prevalence of those with ADHD among youth and adult criminal justice offender populations is alarmingly high. Seminal large-scale meta-analyses such as that conducted by Young et al in

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<sup>1</sup> American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 5th ed, 2013).

<sup>2</sup> Corey J Lane and Mark David Chong, 'A Hard Pill to Swallow: The Need to Identify and Treat ADHD to Reduce Sufferers' Potential Involvement in the Criminal Justice System' (2019) 25 *James Cook University Law Review* 119.

<sup>3</sup> Peige Song et al, 'The Prevalence of Adult Attention-Deficit Hyperactivity Disorder: A Global Systematic Review and Meta-Analysis' (2021) 11 *Journal of Global Health* 04009.

<sup>4</sup> Russell A Barkley, 'Implications of the Executive Function—Self-Regulation (EF-SR) Theory of ADHD for Estimates of Persistence and Prevalence' (2021) 29(5) *The ADHD Report* 8.

<sup>5</sup> *Ibid* 8.

<sup>6</sup> Russell A Barkley, 'Improving Clinical Diagnosis Using the Executive Functioning - Self-Regulation Theory of ADHD' (2022) 30(1) *The ADHD Report* 1.

2015,<sup>7</sup> and Baggio et al in 2018,<sup>8</sup> have found that the prevalence of those with ADHD in incarcerated youth and adult offender populations is around 25 percent. This means that ADHD presents at a rate of five times more in child detention settings and ten times more in incarcerated adult populations than it presents in the general population. Based on statistics such as these, an ADHD diagnosis is a considerable risk factor for a person's potential involvement as an offender in youth and/or criminal justice settings.<sup>9</sup> To be clear, we make no suggestion in this article that every person with ADHD will become a youth or adult offender. In fact, most people with ADHD never have any involvement with any justice system.<sup>10</sup> Nevertheless, the significant overrepresentation of those with ADHD among youth and adult criminal justice offender populations, should be of great concern to practitioners and policymakers alike. Sadly, this appears rarely to be the case. In fact, as Lane and Chong pointed out in a paper in 2019: 'ADHD has received close to no significant attention in the most recent major reviews and inquiries into youth and criminal justice in Australia'.<sup>11</sup>

This apparent apathy or indifference could, in part, be due to campaigns 'that seek to label the whole idea of ADHD as an illness a "myth" and to brand the use of stimulants in children as a form of "mind control"'.<sup>12</sup> These campaigns 'have created a climate of fear among physicians, parents and educators and have sown anxiety and confusion among the general public'.<sup>13</sup> Policymakers, particularly those operating within the political realm, tend to be quite sensitive to such strong public sentiments, and as Pickett has asked, 'does public opinion matter to public officials? Indisputably, the answer is yes'.<sup>14</sup>

In his 2019 article, Freckleton emphasised a need for those working in Australian medico-legal and criminal law fields to acquire an appreciation and informed understanding of ADHD 'so as to reduce the incidence of uninformed drawing of [adverse] inferences about ADHD'.<sup>15</sup> The aim of this article is therefore to be a catalyst for continued and increased appreciation and informed understanding of

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<sup>7</sup> Susan Young et al, 'A Meta-Analysis of the Prevalence of Attention Deficit Hyperactivity Disorder in Incarcerated Populations' (2015) 45(2) *Psychological Medicine* 247.

<sup>8</sup> Stéphanie Baggio et al, 'Prevalence of Attention Deficit Hyperactivity Disorder in Detention Settings: A Systematic Review and Meta-Analysis' (2018) 9 *Frontiers in Psychiatry* 331

<sup>9</sup> Lane and Chong (n 2).

<sup>10</sup> *Ibid.*

<sup>11</sup> *Ibid* 132.

<sup>12</sup> Larry S Goldman et al, 'Diagnosis and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents' (1998) 279(14) *JAMA: The Journal of the American Medical Association* 1100, 1101.

<sup>13</sup> *Ibid* 1101.

<sup>14</sup> Justin T Pickett, 'Public Opinion and Criminal Justice Policy: Theory and Research' (2019) 2 *Annual Review of Criminology* 405, 417.

<sup>15</sup> Ian Freckleton, 'Attention Deficit Hyperactivity Disorder (ADHD) and the Criminal Law' (2019) 26(6) *Psychiatry, Psychology and Law* 817, 819.

ADHD by legal practitioners, members of the judiciary, clinicians, police, criminal justice workers, policy makers and other relevant stakeholders. Through this article, we also hope to demystify and, where appropriate, debunk some of the more egregious misconceptions that exist about ADHD, and its relationship to deviant and criminal behaviour.

This article has two parts. The first part provides a comprehensive review of much that is known about ADHD. This includes its nature, diagnosis, prevalence, aetiology, individual/societal impact, treatment and comorbidities. The second part provides a comprehensive review of relevant studies that have examined: (i) the prevalence of those with ADHD in criminal justice offender populations; (ii) platforms for understanding ADHD overrepresentation; (iii) ADHD-associated risks and vulnerabilities as well as outcomes for those with ADHD caught 'in the system'; and (iv) the type of treatments that are delivered in criminal justice settings. Finally, ADHD-related criminal justice costs, and other motivations for reform will be discussed; and some ideas on minimising the problematic relationship between ADHD and criminal justice will be proposed.

A 'failure to give close attention to detail,' is literally a potential symptom of ADHD mentioned in its diagnostic criteria. We feel that this phrase is reflective of the current situation regarding ADHD in criminal and youth justice offender populations and hence have titled our article accordingly.

## II ADHD – WHAT'S THE 'GO'?

### A *Historical Characterisation and Diagnosis of ADHD*

#### 1 *Pathway toward understanding and recognition*

Understanding of ADHD has developed in a complex but consistent way over the last 223 years. In 1798, Sir Alexander Crichton first highlighted how some mentally ill patients appeared to be suffering from a pathological incapacity to attend 'with a necessary degree of constancy to any one object'.<sup>16</sup> Many scholars agree, however, that Sir George Frederic Still's Goulstonian Lectures of 1902 were actually the 'scientific starting point of the history of ADHD'.<sup>17</sup> Still noted the existence of an 'abnormal defect of moral control' among children who were not also suffering from intellectual impairment. According to his analysis, these children exhibited symptoms of 'abnormal levels of

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<sup>16</sup> Alexander Crichton, 'An Inquiry Into the Nature and Origin of Mental Derangement: On Attention and Its Diseases' (2008) 12(3) *Journal of Attention Disorders* 200, 203.

<sup>17</sup> Klaus W Lange et al, 'The History of Attention Deficit Hyperactivity Disorder' (2010) 2(4) *ADHD Attention Deficit and Hyperactivity Disorders* 241, 244.

impulsivity and inattentiveness'.<sup>18</sup> During the 1930s, Franz Kramer and Hans Pollnow introduced their hyperkinetic disease of infancy – a condition that saw in children ‘a marked motor restlessness’ or ‘remarkable motor activity, which appears to be very urgent’.<sup>19</sup>

Surprisingly, no ADHD-like disorder appeared in the inaugural edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM) produced and published by the American Psychiatric Association (APA) in 1952. Nevertheless, an ADHD-like ‘Hyperkinetic Impulse Disorder’ was subsequently recognised as a distinct disorder in the second edition of the DSM.<sup>20</sup> The DSM-III<sup>21</sup> would build upon this diagnostic conceptualisation through the introduction of an ‘Attention Deficit Disorder’ that had two subtypes which were distinguished by an absence or presence of hyperactivity in its sufferers. A later revision of the DSM-III provided an augmented conceptualisation of the disorder through incorporation of potential symptoms of both inattention and hyperactivity/impulsivity that was then referred to as an Attention-Deficit/Hyperactivity Disorder. With the DSM-IV<sup>22</sup> and the advent of its latest edition, the DSM-5<sup>23</sup> (and now DSM-5-TR), ADHD is currently considered to be a neurodevelopmental disorder. The next section discusses the current ADHD diagnostic criteria.

## 2 Current Diagnostic Criteria

The DSM-5-TR lays out diagnostic criteria, definitions, and descriptions of all mental health, developmental, and neurodevelopmental disorders.<sup>24</sup> As noted above, the DSM-5-TR, classifies ADHD as a neurodevelopmental disorder. The manual describes neurodevelopmental disorders as ‘characterized by developmental deficits that produce impairments of personal, social, academic, or occupational functioning’.<sup>25</sup> Furthermore, the DSM-5-TR proposes that ADHD is:

defined by impairing levels of inattention, disorganization, and/or hyperactivity-impulsivity. Inattention and disorganization entail inability to

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<sup>18</sup> Ibid 244-45.

<sup>19</sup> Ibid 247.

<sup>20</sup> Lane and Chong (n 2) 120.

<sup>21</sup> American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders: DSM-III-R* (American Psychiatric Association, 3<sup>rd</sup> ed, 1987).

<sup>22</sup> American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders: DSM-IV* (American Psychiatric Association, 4<sup>th</sup> ed, 1994); American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders: DSM-IV-TR* (American Psychiatric Association, 4<sup>th</sup> ed, text revision, 2000).

<sup>23</sup> American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders: DSM-5* (American Psychiatric Association, 5<sup>th</sup> ed, 2013).

<sup>24</sup> American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders: DSM-5-TR* (American Psychiatric Association Publishing, 5<sup>th</sup> ed, text revision, 2022).

<sup>25</sup> American Psychiatric Association, *DSM-5* (n 23) 31.

stay on task, seeming not to listen, and losing materials, at levels that are inconsistent with age or developmental level. Hyperactivity-impulsivity entails overactivity, fidgeting, inability to stay seated, intruding into other people's activities, and inability to wait - symptoms that are excessive for age or developmental level.<sup>26</sup>

The DSM-5-TR proposes three possible diagnostic presentations of ADHD. These are:

1. predominantly inattentive presentation
2. predominantly hyperactive/impulsive presentation
3. combined presentation.

The DSM-5-TR requires that inattentive and/or hyperactive/impulsive symptoms must be present for an individual before the age of 12 years to be diagnosed with ADHD. Those symptoms must have a significantly adverse impact on an individual's functioning across various life contexts (ie, home, school, and work). For a diagnosis to be made during childhood, six inattentive or hyperactive/impulsive symptoms must be present at the time of assessment, whereas an adult diagnosis requires the presence of only five such symptoms.

### ***3 Clinical Diagnosis***

As alluded to earlier, ADHD has been the subject of some degree of controversy. Questions have been asked as to whether ADHD is a 'real' disorder; it has been suggested that it is overdiagnosed, and the appropriateness of using stimulant medication on children has been queried.<sup>27</sup> Lane and Chong note that some of this controversy is likely the result of the term 'ADHD' becoming somewhat of a colloquialism, and the controversy is also possibly likely due to research that uses crude indicators of ADHD prevalence.<sup>28</sup> In any event, there appears to be general agreement that at least some concerns regarding ADHD and its diagnosis, can be addressed through diagnostic procedure that involves a robust, comprehensive, systematic, and multi-faceted assessment, carried out by an appropriately trained professional (such as a clinical psychologist, psychiatrist, or developmental paediatrician), who applies strict ADHD diagnostic criteria.<sup>29</sup> On this point,

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<sup>26</sup> Ibid 61.

<sup>27</sup> Lane and Chong (n 2) 124; Matthew Bisset et al, 'Recent Attitudes toward ADHD in the Broader Community: A Systematic Review' (2022) 26(4) *Journal of Attention Disorders* 537.

<sup>28</sup> Lane and Chong (n 2).

<sup>29</sup> Eg, National Institute for Health Care and Excellence (NICE), 'Attention Deficit Hyperactivity Disorder: Diagnosis and Management' (Treatment Guideline No [NG87], National Institute for Health Care and Excellence, 2018) (Web page <<https://www.nice.org.uk/guidance/ng87>>); Heval Özgen et al, 'International Consensus Statement for the Screening, Diagnosis, and Treatment of Adolescents with Concurrent Attention-Deficit/Hyperactivity Disorder and Substance Use Disorder' (2020) 26(4-5)

Castellanos noted that ‘the diagnostic criteria for ADHD, albeit still explicitly provisional, [have] obtained “very good” test-retest reliability (intraclass kappa = 0.61), the sine qua non of scientific inquiry, in the DSM-5 field trials’.<sup>30</sup>

To recapitulate, the importance and benefit of adherence to robust assessment methodology and strict application of diagnostic criteria in ADHD diagnostic investigations cannot be overemphasised. This is absolutely necessary so as to maintain the credibility of ADHD as a legitimate diagnostic syndrome.

## **B Prevalence and Sociodemographic Particularities**

Some statistics relating to the prevalence of ADHD were mentioned earlier but will be further elucidated upon in this section. Both international and Australian prevalence research will be discussed here.

### **1 Australian Prevalence Estimates**

Unfortunately, there is a significant paucity of ADHD prevalence research that has been conducted in Australia. Nevertheless, two important and recent studies have provided some indication of the prevalence of ADHD in the Australian general population. In the first of these studies, conducted by Deloitte Access Economics in 2018, it was reported that, approximately 281,000 Australian young people (19 years old and under) and 533,000 adults (20 years old and over) in Australia had ADHD.<sup>31</sup> In the second important study published in 2022, Sciberras et al reported that the ‘overall prevalence in 2019 across all ages was estimated to have been 3.2% (4.9% males, 1.5% females), representing 814,500 Australians (620,900 males, 193,600 females)’.<sup>32</sup> While not specifically reported in that study, but based on statistics reported by the researchers, the mean Australian ADHD general population prevalence estimate for children and young people (age categories up to 19 years) appears to be 4.5 percent, while for adults over 19 years of age, ADHD prevalence appears to be 2.5 percent.

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*European Addiction Research* 223; Stan Kutcher et al, 'International Consensus Statement on Attention-Deficit/Hyperactivity Disorder (ADHD) and Disruptive Behaviour Disorders (DBDs): Clinical Implications and Treatment Practice Suggestions' (2004) 14(1) *European Neuropsychopharmacology* 11; Susan Young et al, 'Guidance for Identification and Treatment of Individuals with Attention Deficit/Hyperactivity Disorder and Autism Spectrum Disorder Based Upon Expert Consensus' (2020) 18(1) *BMC Medicine* 1.

<sup>30</sup> Francisco Xavier Castellanos, 'A Biased Perspective on Brain Imaging of ADHD' (2021) 178(8) *American Journal of Psychiatry* 694, 695.

<sup>31</sup> Deloitte Access Economics, 'The Social and Economic Costs of ADHD in Australia: Report Prepared for the Australian ADHD Professionals Association 2018' (Web Page) <<https://www2.deloitte.com/au/en/pages/economics/articles/social-economic-costs-adhd-Australia.html>>.

<sup>32</sup> Emma Sciberras et al, 'Social and Economic Costs of Attention-Deficit/Hyperactivity Disorder Across the Lifespan' (2022) 26(1) *Journal of Attention Disorders* 72.



## 2 *International Prevalence Research*

A number of detailed meta-analytic studies from around the world have been conducted to arrive at ADHD prevalence estimates in the past 30 years. In their 2007 meta-analysis of 102 studies that comprised of 171,756 subjects from across the globe, Polanczyk et al uncovered an ADHD worldwide-pooled prevalence of 5.29 percent among participants aged 18 and below.<sup>33</sup> Also in 2007, Fayyad et al conducted a 'trans-national' ADHD prevalence analysis of individuals 18 to 44 years of age, across 10 countries (USA, Colombia, Mexico, Belgium, France, Germany, Italy, Spain, Netherlands and Lebanon) and came to a 'trans-national' prevalence estimate of 3.4 percent, with the less 'developed' countries having a lower estimated prevalence rate (1.7%) than the more 'developed' countries.<sup>34</sup> Simon et al, in their meta-analysis of six prior adult ADHD prevalence studies involving 5307 individuals, found a pooled prevalence estimate of 2.5 percent.<sup>35</sup> Willcutt, who conducted a meta-analytic review of 86 studies comprising 163,688 children and adolescents in 2012, reported that the pooled prevalence rates of ADHD in children and adolescents were consistently found to be between 5.9 and 7.1 percent across teacher ratings, parent ratings or clinical diagnostic procedure.<sup>36</sup> In 2015, Thomas, Sanders, Doust, Beller and Glasziou found an overall pooled prevalence estimate of 7.2 percent in their meta-analysis of 175 eligible studies involving individuals over the age of 18 years.<sup>37</sup> In their follow-up trans-national meta-analysis in 2017, Fayyad et al analysed the results of 20 ADHD prevalence studies involving 26,000 adults aged 18 to 44 and arrived at a trans-national prevalence estimate of 2.8 percent, again with the less 'developed' countries being found to have a lower estimated ADHD prevalence rate.<sup>38</sup> In 2014, Polanczyk et al conducted a review and meta regression analysis of 135 studies, through which they confirmed their prior ADHD prevalence estimates as valid across the preceding 30-year period.<sup>39</sup>

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<sup>33</sup> Guilherme Polanczyk et al, 'The Worldwide Prevalence of ADHD: A Systematic Review and Metaregression Analysis' (2007) 164(6) *American Journal of Psychiatry* 942. The stability of these estimates has been confirmed in an updated analysis by the same group of researchers. See Guilherme V Polanczyk et al, 'ADHD Prevalence Estimates Across Three Decades: An Updated Systematic Review and Meta-Regression Analysis' (2014) 43(2) *International Journal of Epidemiology* 434.

<sup>34</sup> John Fayyad et al, 'Cross-National Prevalence and Correlates of Adult Attention-Deficit Hyperactivity Disorder' (2007) 190(5) *British Journal of Psychiatry* 402.

<sup>35</sup> Viktória Simon et al, 'Prevalence and Correlates of Adult Attention-Deficit Hyperactivity Disorder: Meta-Analysis' (2009) 194(3) *British Journal of Psychiatry* 204.

<sup>36</sup> Erik G Willcutt, 'The Prevalence of DSM-IV Attention-Deficit/Hyperactivity Disorder: A Meta-Analytic Review' (2012) 9(3) *Neurotherapeutics* 490.

<sup>37</sup> Rae Thomas et al, 'Prevalence of Attention-Deficit/Hyperactivity Disorder: A Systematic Review and Meta-Analysis' (2015) 135(4) *Pediatrics* e994.

<sup>38</sup> Fayyad et al (n 34).

<sup>39</sup> Polanczyk et al (n 33).

In 2020, Dobrosavljevic, Solares, Cortese, Andershed, and Larsson's meta-analysis of 23 studies involving almost 21 million adults aged 50 years and older, found varying estimated prevalence rates of 2.18 percent for research that was based on validated scales, 0.23 percent that were based on research using formal clinical diagnosis processes, and 0.09 percent that were based on treatment rates.<sup>40</sup> Finally, a recent systematic review by Song et al in 2021 investigated the prevalence of symptomatic adult ADHD generally, as well as the prevalence of 'persistent' ADHD which had been diagnosed in childhood.<sup>41</sup> Based on their analysis, the researchers found that the overall prevalence of symptomatic adult ADHD was 6.76 percent, and the prevalence of 'persistent' adult ADHD was 2.58 percent. It was proposed that the disparity was due to the number of individuals now being diagnosed with ADHD in adulthood that were not previously diagnosed in their childhood.<sup>42</sup>

### 3 Demographic Prevalence Trends

A variety of important factors and trends relating to ADHD population prevalence are worth noting. The first is gender prevalence disparity. Research has indicated that males are approximately three times more likely than females to be diagnosed with ADHD.<sup>43</sup> It has been proposed, however, that the ADHD gender prevalence disparity is overstated because females with ADHD disproportionately present with the less 'visible', predominantly inattentive subtype, and it is also due to misapplied and problematic gender stereotyping.<sup>44</sup> It is worth mentioning that relevant research indicates that ADHD gender prevalence disparity appears to reduce across the lifespan.<sup>45</sup>

A second trend to take into consideration is ADHD age prevalence. Research into ADHD persistence into adulthood has indicated that some of those who are diagnosed with ADHD during childhood will experience a large reduction in acutely problematic symptoms across their lifespan, and in some cases, to the degree that their symptoms no

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<sup>40</sup> Maja Dobrosavljevic et al, 'Prevalence of Attention-Deficit/Hyperactivity Disorder in Older Adults: A Systematic Review and Meta-Analysis' (2020) 118 *Neuroscience and Biobehavioral Reviews* 282.

<sup>41</sup> Song et al (n 3).

<sup>42</sup> Dobrosavljevic et al (n 40) 282.

<sup>43</sup> Willcutt (n 36). Susan Young et al, 'Females with ADHD: An Expert Consensus Statement Taking a Lifespan Approach Providing Guidance for the Identification and Treatment of Attention-Deficit/Hyperactivity Disorder in Girls and Women' (2020) 20(1) *BMC Psychiatry* 1; Anne B Arnett et al, 'Sex Differences in ADHD Symptom Severity' (2015) 56(6) *Journal of Child Psychology and Psychiatry* 632.

<sup>44</sup> Willcutt (n 36). See also, Arnett et al (n 43); Susan Young et al, 'Overview of Offenders with ADHD' in Jane McCarthy, Regi Alexander and Eddie Chaplin (eds), *Forensic Aspects of Neurodevelopmental Disorders: A Clinician's Guide* (Cambridge University Press, 2023) 34-37.

<sup>45</sup> Young et al (n 29).

longer meet ADHD diagnostic criteria.<sup>46</sup> Despite varying estimates of the number of individuals to which this trend applies, there is consistency in the view that it represents a minority of cases.<sup>47</sup> A very recent 2022 study by Sibley et al,<sup>48</sup> found evidence of patterns of remission [as opposed to extinction] in adults with ADHD, and it was suggested that drifts in and out of remission may be a feature of adult ADHD, as compared with its extinction. Explanations relating to ADHD symptom reduction into and across adulthood have included: successfully learnt and applied adaptive coping skills, the occurrence/emergence of stage of life structures and routines that scaffold and reduce the functional impact of ADHD, and potentially less exposure to challenging environments that interact poorly with ADHD-related vulnerabilities.<sup>49</sup>

To the degree that it is valid and accurate, the reported age-related reduction in ADHD symptoms parallels strikingly with criminology's desistance theory.<sup>50</sup> Desistance theory is based on the observation of crime statistics that show that criminal behaviour peaks in adolescence/early adulthood but then reduces across the lifespan. Again, we are not asserting here that ADHD causes crime, however, there does appear to be an important linkage which must be taken seriously.

Studies into impact culture and minority group status are mixed. Prior meta-analytic studies estimated that ADHD was less prevalent in minority groups including black Americans.<sup>51</sup> Contrary to the finding of other large studies,<sup>52</sup> a 2022 meta-analysis incorporating 23 prior studies by Cénat et al, found no differences in population-based pooled prevalence estimates between white and black Americans who, together, only had slightly higher prevalence rates than those from Hispanic and Asian backgrounds.<sup>53</sup>

Finally, international prevalence research studies such as that by Fayyad et al in 2007 and 2017, indicate that more 'developed' countries

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<sup>46</sup> Stephen V Faraone et al, 'The World Federation of ADHD International Consensus Statement: 208 Evidence-Based Conclusions about the Disorder' (2021) 128 *Neuroscience & Biobehavioral Reviews* 789; Young et al (n 29). See also, Susan Young and Kelly M Cocallis, 'Attention Deficit Hyperactivity Disorder (ADHD) in the Prison System' (2019) 21(41) *Current Psychiatry Reports* 1

<sup>47</sup> Faraone et al (n 46).

<sup>48</sup> Margaret H Sibley et al, 'Variable Patterns of Remission from ADHD in the Multimodal Treatment Study of ADHD' (2022) 179(2) *American Journal of Psychiatry* 142.

<sup>49</sup> Lane and Chong (n 2).

<sup>50</sup> Beth Weaver, 'Understanding Desistance: A Critical Review of Theories of Desistance' (2019) 25(6) *Psychology, Crime & Law* 641.

<sup>51</sup> Young and Cocallis (n 46).

<sup>52</sup> Young et al (n 29).

<sup>53</sup> Jude Mary Cénat et al, 'Prevalence and Risk Factors Associated With Attention-Deficit/Hyperactivity Disorder Among US Black Individuals: A Systematic Review and Meta-Analysis' (2020) 78(1) *JAMA Psychiatry* 21.

have higher estimated ADHD prevalence rates.<sup>54</sup> Unfortunately, such results need to be treated with due consideration and caution given diagnostic resourcing disparities across these groups of countries.<sup>55</sup>

## C *The Burden(s) of ADHD*

### *1 Individual Burden(s)*

Those with ADHD have been found to have a significantly higher risk of experiencing a variety of psychosocial adversities and problematic life trajectories as compared with those who do not have ADHD.<sup>56</sup> Those with ADHD are more likely to experience mental health difficulties and behavioural disorders.<sup>57</sup> In addition, those with ADHD have been found to experience more accidents, injuries, health and ultimately mortality issues than those without it.<sup>58</sup> Research has shown that those with ADHD have a higher risk of experiencing educational and school attendance issues that adversely impact on opportunity and wellbeing.<sup>59</sup> Not surprisingly, employment difficulties and vocational under-achievement problems are more likely for those with ADHD.<sup>60</sup> Those with ADHD are also disproportionately more likely to experience relationship and family violence issues.<sup>61</sup> As will be expanded upon later in this article, those with ADHD are overrepresented in criminal justice populations. Unsurprisingly, social

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<sup>54</sup> Fayyad et al (n 34). See also, John Fayyad et al, 'The Descriptive Epidemiology of DSM-IV Adult ADHD in the World Health Organization World Mental Health Surveys' (2017) 9(1) *ADHD Attention Deficit and Hyperactivity Disorders* 47.

<sup>55</sup> Fayyad et al (n 34).

<sup>56</sup> Val Harpin et al, 'Long-Term Outcomes of ADHD: A Systematic Review of Self-Esteem and Social Function' (2016) 20(4) *Journal of Attention Disorders* 295; Lane and Chong (n 2).

<sup>57</sup> Holly E Erskine et al, 'Long-Term Outcomes of Attention-Deficit/Hyperactivity Disorder and Conduct Disorder: A Systematic Review and Meta-Analysis' (2016) 55(10) *Journal of the American Academy of Child & Adolescent Psychiatry* 841; Arthur Caye, Douglas Teixeira Leffa and Luis Augusto Rohde, 'The Influence of Comorbidities on the Trajectories of ADHD Throughout Development' (2021) 130 *Neuroscience & Biobehavioral Reviews* 31.

<sup>58</sup> William J Barbaresi et al, 'Mortality, ADHD, and Psychosocial Adversity in Adults with Childhood ADHD: A Prospective Study' (2013) 131(4) *Pediatrics* 637; Nathalie Brunkhorst-Kanaan et al, 'ADHD and Accidents Over the Life Span - A Systematic Review' (2021) 125 *Neuroscience & Biobehavioral Reviews* 582.

<sup>59</sup> Nardia Zendarski et al, 'Examining the Educational Gap for Children with ADHD and Subthreshold ADHD' (2022) 26(2) *Journal of Attention Disorders* 282; Corey J Lane, 'Improving Psychological Well-Being in Adolescent Students with Chronic School Absenteeism' (Griffith University, 2016).

<sup>60</sup> William E Pelham III et al, 'The Long-Term Financial Outcome of Children Diagnosed with ADHD' (2020) 88(2) *Journal of Consulting and Clinical Psychology* 160; Abigail Caserta, 'ADHD in the Workplace: Comparing Evaluations of Self Versus Evaluations by Others' (State University of New York at Buffalo, 2019).

<sup>61</sup> Nannet Buitelaar, Jocelyne A Posthumus and Jan K Buitelaar, 'ADHD in Childhood and/or Adulthood as a Risk Factor for Domestic Violence or Intimate Partner Violence: A Systematic Review' (2020) 24(9) *Journal of Attention Disorders* 1203; Nannet Buitelaar et al, 'The Impact of ADHD Treatment on Intimate Partner Violence in a Forensic Psychiatry Setting' (2019) 25(7) *Journal of Attention Disorders* 1021.

service reliance and socioeconomic disadvantage occur much more for those with ADHD.<sup>62</sup>

## 2 *Economic Burden(s)*

ADHD-related fiscal burden for wider societies is extensive and alarming.<sup>63</sup> In 2018, the Australian ADHD Professionals Association commissioned Deloitte Access Economics to investigate the cost of ADHD to Australian society.<sup>64</sup> Health costs were reported to be A\$814 million. Education-system related costs were estimated to be A\$106 million, while criminal justice and other legal costs were estimated to be A\$307 million.<sup>65</sup> Economic productivity costs were reported as nearly A\$10.2 billion. Burden of disease costs calculated on the basis of estimates of disability adjusted life years (DALYs: ie, costs associated with years of life lost due to disability and premature mortality) were suggested to be A\$7.6 billion. Additional fiscal costs including deadweight losses (eg, lost tax, welfare, and disability payments) were reported to be A\$1.4 billion. It was put forward that Australia would ultimately bear a total cost of almost A\$20.5 billion for 2019.

A recent investigation by Schein et al in 2022 investigated the economic cost of ADHD to American society in 2018.<sup>66</sup> Education costs were estimated to be US\$11.6 billion for children and US\$6.7 billion for adolescents. Direct healthcare costs were found to be US\$5 billion for children and US\$4 billion for adolescents. In summing up all cost figures, the investigation revealed the annual economic cost of child and adolescent ADHD to the United States was US\$19.4 billion.

In their 2022 systematic review, Chhibber et al examined 44 prior studies investigating annual ADHD-related societal economic costs including European countries as well as America and Australia.<sup>67</sup> Chhibber et al' analysis revealed 'a substantial economic impact associated with ADHD. Estimates based on total costs ranged from \$US 831.38 to \$US 20,538 for per person estimates and from \$US356 million to \$20.27 billion for national estimates.'<sup>68</sup>

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<sup>62</sup> Sciberras et al (n 32); Deloitte Access Economics (n 31).

<sup>63</sup> Lane and Chong (n 2); Young et al (n 29).

<sup>64</sup> Deloitte Access Economics (n 31).

<sup>65</sup> Global ADHD-related costs are examined later in this article.

<sup>66</sup> Jeff Schein et al, 'Economic Burden of Attention-Deficit/Hyperactivity Disorder Among Adults in the United States: A Societal Perspective' (2022) 28(2) *Journal of Managed Care & Specialty Pharmacy* 168.

<sup>67</sup> Anindit Chhibber et al, 'Global Economic Burden of Attention-Deficit/Hyperactivity Disorder: A Systematic Review' (2021) 39(4) *PharmacoEconomics* 399.

<sup>68</sup> Ibid 399.

## **D ADHD Aetiology**

While the diagnostic parameters of ADHD appear to be fairly settled now, what is less clear is the issue of its origins. As Schilling, Walsh, and Yun have pointed out, ‘the precise etiology of ADHD is not known’.<sup>69</sup> Nevertheless, there is a body of empirical research that has brought to light potential biological and environmental factors aligned with ADHD presentation.

### **1 Heritability**

A number of concordance and twin studies have provided consistent and clear evidence that ADHD is a highly heritable syndrome.<sup>70</sup> In their seminal and extensive review of prior heritability studies in 2019, Faraone and Larsson observed that:

The mean heritability across 37 twin studies of ADHD or measures of inattentiveness and hyperactivity is 74% . . . . A similar heritability estimate of around 80% was seen in a study of MZ [monozygotic] and DZ [dizygotic] twins, full siblings, and maternal and paternal half-siblings.<sup>71</sup>

To provide an appreciation as to the extent of genetic contribution to ADHD presentation, Barkley commented that it is ‘just short of the genetic contribution to height and far greater than the contribution to IQ or human personality traits.’<sup>72</sup>

### **2 Genetics**

When considering DSM-5-TR ADHD diagnostic criteria as a whole, it becomes apparent that a large quantity of possible combinations of symptoms may exist that may sufficiently meet one or more ADHD presentation’s diagnostic criteria. It is easy to see why therefore that ADHD is a highly heterogenous disorder that encapsulates clusters of symptoms which may represent quite different individual presentations. It is little wonder that Heidebreder proposed that, like Autism Spectrum Disorder, with which ADHD has a high degree of comorbidity, ‘ADHD symptomology is best conceptualised on a spectrum’.<sup>73</sup>

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<sup>69</sup> Catrina M Schilling, Anthony Walsh and Ilhong Yun, ‘ADHD and Criminality: A Primer on the Genetic, Neurobiological, Evolutionary, and Treatment Literature for Criminologists’ (2011) 39(1) *Journal of Criminal Justice* 3, 4.

<sup>70</sup> Ibid. Faraone et al (n 46). Angelica Ronald, Nora de Bode and Tinca J C Polderman, ‘Systematic Review: How the Attention-Deficit/Hyperactivity Disorder Polygenic Risk Score Adds to Our Understanding of ADHD and Associated Traits’ (2021) 60(10) *Journal of the American Academy of Child & Adolescent Psychiatry* 1234.

<sup>71</sup> Stephen V Faraone and Henrik Larsson, ‘Genetics of Attention Deficit Hyperactivity Disorder’ (2019) 24(4) *Molecular Psychiatry* 562, 564.

<sup>72</sup> Russell A Barkley, ‘Questions and Answers’ (2017) 25(5) *The ADHD Report* 8, 8.

<sup>73</sup> Rebeca Heidbreder, ‘ADHD Symptomatology is Best Conceptualized as a Spectrum: A Dimensional Versus Unitary Approach to Diagnosis’ (2015) 7(4) *ADHD Attention Deficit and Hyperactivity Disorders* 249, 249.

Given the potential for symptomatic heterogeneity in the disorder, it is not surprising that studies into the genetic origins of ADHD have been unable to identify a specific genotype relevant to its presentation.<sup>74</sup> Nevertheless, genome-wide association studies (GWAS) have provided some insight into polygenic risk factors that appear to be associated with ADHD.<sup>75</sup> GWAS research involves investigating the entire human genome to locate common DNA variants referred to as single nucleotide polymorphisms (SNPs), that have incrementally small etiological impacts on ADHD presentation.<sup>76</sup> Grimm elucidates further:

A polygenic risk score (PRS) uses the summary statistics of SNP results from large GWAS to predict clinically significant variables. The idea of the PRS is to provide genetic risk prediction, given the large set of SNPs for each individual, and use it as a predictive tool for a specific trait. An individual PRS can be calculated by summing all trait-associated SNPs weighted by their effect sizes.<sup>77</sup>

In their extensive review of prior ADHD-related GWAS studies, Faraone and Larsson observed that studies 'show that about a third of ADHD's heritability is due to a polygenic component comprising many common variants each having small effects'.<sup>78</sup> In their article reporting the results of one of the largest GWAS investigations conducted to date, Demontis et al reported their finding of 'variants surpassing genome-wide significance in 12 independent loci, revealing new and important information on the underlying biology of ADHD'.<sup>79</sup> They further proposed that the results of GWAS studies provide support for 'the notion that common variants comprise a significant fraction of the risk underlying ADHD that with increasing sample size, and thus increasing statistical power, genome-wide significant loci will emerge'.<sup>80</sup>

In 2019 Luo et al<sup>81</sup> further emphasised that continued research into this area is important and warranted because:

Such research would have heuristic value for identifying biologically homogeneous subgroups and could facilitate the development of novel and

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<sup>74</sup> Naghme Kian, Noosha Samieefar and Nima Rezaei, 'Prenatal Risk Factors and Genetic Causes of ADHD in Children' (2022) *World Journal of Pediatrics* 1.

<sup>75</sup> Faraone and Larsson (n 71).

<sup>76</sup> Kian, Samieefar and Rezaei (n 74).

<sup>77</sup> Oliver Grimm, Thorsten M Kranz and Andreas Reif, 'Genetics of ADHD: What Should the Clinician Know?' (2020) 22(4) *Current Psychiatry Reports* 1, 4.

<sup>78</sup> Faraone and Larsson (n 71).

<sup>79</sup> Ditte Demontis et al, 'Discovery of the first genome-wide significant risk loci for attention deficit/hyperactivity disorder' (2019) 51(1) *Nature genetics* 63-75.

<sup>80</sup> Ibid 43.

<sup>81</sup> Yuyang Luo et al, 'A review of heterogeneity in attention deficit/hyperactivity disorder (ADHD)' (2019) *Frontiers in human neuroscience* 1-12.

more tailored interventions that target underlying neural anomalies characteristic of more homogeneous subgroups.<sup>82</sup>

### 3 *The Impact of Brain Structure and Neural Operations*

Neuroimaging studies have provided important information into other factors hypothesised to impact on ADHD aetiology.<sup>83</sup> In his 2021 review of brain imaging studies investigating volume differences between those with and without ADHD, Castellanos observed that:

In mega-analyses encompassing the entire sample, [ADHD] patients had significantly smaller intracranial volume (Cohen's  $d = -0.10$ ) after adjusting for sex, age, and site. Other analyses, adjusting for sex, age, site, and intracranial volume, found smaller volumes in the ADHD group for amygdala ( $d = -0.19$ ), accumbens ( $d = -0.11$ ), caudate ( $d = -0.11$ ), hippocampus ( $d = -0.11$ ), and putamen ( $d = -0.11$ ).<sup>84</sup>

Of note is that some of these brain structures have a direct effect on executive functioning and control.<sup>85</sup> Furthermore, in her 2018 paper into fMRI-Based Neurotherapies for ADHD, Rubia emphasised: 'The past 2 decades of MRI imaging in ADHD have shown relatively defined and well replicated brain abnormalities in a range of frontal, basal ganglia, parietal, and cerebellar regions and networks between these regions'.<sup>86</sup>

Particularly important, neuroimaging research has found that those with ADHD experience significant abnormal hypoactivation in frontoparietal neurological systems.<sup>87</sup> To explain further, those with ADHD appear to have relative mesocortical and mesolimbic dopamine deficiencies which impact on their ability to successfully apply inhibitory (effortful) control with respect to attention, inhibition, cognition and behaviour as is required in the relevant circumstance.<sup>88</sup> Treatment for ADHD will be discussed later, however it should be noted at this point that the provision of stimulant medication to those

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<sup>82</sup> Ibid 1.

<sup>83</sup> Martine Hoogman et al, 'Consortium Neuroscience of Attention Deficit/Hyperactivity Disorder and Autism Spectrum Disorder: The ENIGMA Adventure' (2022) 43(1) *Human Brain Mapping* 37.

<sup>84</sup> Castellanos (n 31) 695.

<sup>85</sup> Tejas R Mehta et al, 'Neurobiology of ADHD: A Review' (2019) 6(4) *Current Developmental Disorders Reports* 235.

<sup>86</sup> Katya Rubia, 'fMRI-Based Neurotherapies for ADHD' (2018) 26(6) *The ADHD Report* 1, 1.

<sup>87</sup> Oliver Grimm et al, 'Transdiagnostic Neuroimaging of Reward System Phenotypes in ADHD and Comorbid Disorders' (2021) 128 *Neuroscience & Biobehavioral Reviews* 165.

<sup>88</sup> Edmund JS Sonuga-Barke, 'The Dual Pathway Model of AD/HD: An Elaboration of Neuro-Developmental Characteristics' (2003) 27(7) *Neuroscience & Biobehavioral Reviews* 593; Nora D Volkow et al, 'Motivation Deficit in ADHD is Associated with Dysfunction of the Dopamine Reward Pathway' (2011) 16(11) *Molecular Psychiatry* 1147; Nora D Volkow, James M Swanson and Jeffrey H Newcorn, 'Dopamine Reward Pathway in Adult ADHD - Reply' (2010) 303(3) *JAMA: The Journal of the American Medical Association* 232.



with ADHD is aimed at reducing the impact of dopaminergic and other circuitry abnormalities.<sup>89</sup>

In 2002, Sonuga-Barke proposed the ‘Dual Pathway Model’ as a means to more simply understand the abnormal brain circuitry operation experienced by those with ADHD and its adverse impact on their functioning.<sup>90</sup> Specifically, he observed that prior research findings could be divided into two categories:

In one, AD/HD is a disorder of dysregulation of thought and action associated with diminished inhibitory control. In the other, it is a motivational style (delay aversion) associated with fundamental alterations in reward mechanisms.<sup>91</sup>

A diagrammatic representation of the Dual Pathway Model is presented below:

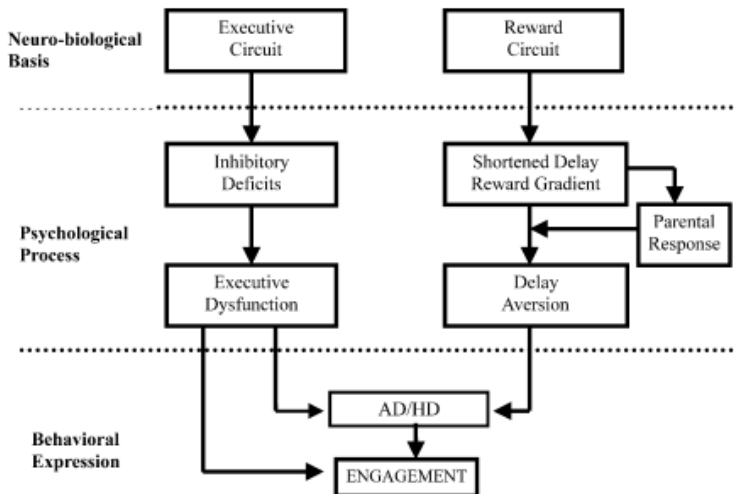


Fig. 1. The Dual Pathway Model of AD/HD.<sup>92</sup>

The Dual Pathway Model depicts two neuro-psycho-developmental processing pathways which lead to potential behavioural outcomes for those with ADHD.<sup>93</sup> A description of executive functioning was provided earlier in this article. The theoretical pathway depicted on the left-hand-side of the Model shows the potential for dysfunction caused

<sup>89</sup> Mehta et al (n 85).

<sup>90</sup> Edmund JS Sonuga-Barke, 'Psychological Heterogeneity in AD/HD - A Dual Pathway Model of Behaviour and Cognition' (2002) 130(1-2) *Behavioural Brain Research* 29.

<sup>91</sup> *Ibid* 30.

<sup>92</sup> This is the 'Elaborated' Dual Pathway Model as it appears in Sonuga-Barke (n 88).

<sup>93</sup> Grimm et al (n 87); Oliver Grimm et al, 'Transdiagnostic neuroimaging of reward system phenotypes in ADHD and comorbid disorders' (2021) 128 *Neuroscience & Biobehavioral Reviews* 165.

through defective executive circuitry.<sup>94</sup> It illustrates the idea that neurobiological inhibitory deficits have an adverse impact on an individual's ability to apply sufficient and appropriate effortful/executive control to task and/or setting and/or environmental demands.<sup>95</sup> What results in this circumstance is an inability to meet situational/environmental demands. Relevant behavioural outcomes follow and exemplify ADHD symptomology (eg, such things as disorganisation, losing track in conversations).<sup>96</sup>

The pathway depicted on the right-hand-side of the model shows the potential for dysfunction through defective reward/motivation circuitry.<sup>97</sup> It illustrates the notion that neurobiologically-related shortened delay-reward gradients impact on an individual's propensity to experience delay aversion.<sup>98</sup> In such circumstances, individuals develop a preference towards engaging in endeavours/actions which provide more immediate effort-related reward and have an aversion towards endeavours/actions that involve delayed rewards.<sup>99</sup> Relevant behavioural outcomes follow and exemplify ADHD symptomology (eg, fidgeting, excessive talking, impulsivity in general).<sup>100</sup> It is worth noting that the results of a variety of more recent important studies, continue to provide empirical support to the validity of the Dual Pathway Model.<sup>101</sup>

#### **4 Other Genetic Factors that Correlate with ADHD Presentation**

ADHD aetiological research has also found that the occurrence of a variety of other genetic abnormalities appear to coincide with ADHD presentation.<sup>102</sup> For instance, rare genetic mutations called 'de novo' mutations, that develop independent of an individual's parental genome, appear to accord with ADHD symptom presentation.<sup>103</sup> In

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<sup>94</sup> Sonuga-Barke (n 90).

<sup>95</sup> Ibid.

<sup>96</sup> Sonuga-Barke (n 88).

<sup>97</sup> Sonuga-Barke (n 90).

<sup>98</sup> Sonuga-Barke (n 88); Sonuga-Barke (n 90).

<sup>99</sup> Sonuga-Barke (n 90).

<sup>100</sup> Chun Shen et al, 'Neural Correlates of the Dual-Pathway Model for ADHD in Adolescents' (2020) 177(9) *American Journal of Psychiatry* 844; Jamie Lee Hamann, 'ADHD, MRI Research, and Complications in the Dual Pathway Model' (2022) *Digestion*; Grimm et al (n 87).

<sup>101</sup> Shen et al (n 100). Nicole B Groves et al, 'Executive Functioning and Emotion Regulation in Children with and without ADHD' (2021) *Research on Child and Adolescent Psychopathology* 1. See also, Michelle M Martel et al, 'Longitudinal Temperament Pathways to ADHD Between Childhood and Adolescence' (2022) *Research on Child and Adolescent Psychopathology* 1.

<sup>102</sup> Barkley (n 4) 8-9; Faraone et al (n 46).

<sup>103</sup> Joanna Martin et al, 'A Brief Report: De Novo Copy Number Variants in Children with Attention Deficit Hyperactivity Disorder' (2020) 10(1) *Translational Psychiatry* 1; Sonja

addition, the occurrence of chromosomal anomalies including chromosomal damage, deletion, or repetition also appear to be aligned with ADHD symptom presentation.<sup>104</sup> Furthermore, genetic disorders such as Down Syndrome, Williams Syndrome and Velocardial-Cranial-Facial Syndrome also appear to contribute to ADHD symptom occurrence.<sup>105</sup>

### ***5 Environmental Influences Linked to ADHD Presentation***

Taking into account studies that show ADHD is highly heritable, it appears that environmentally related factors account for at least about 25 percent of the variance in ADHD symptom appearance.<sup>106</sup> Accordingly, a number of extensive reviews have found a variety of perinatal and early childhood environmental influences that appear to correlate with ADHD occurrence.<sup>107</sup> Of these, maternal smoking during pregnancy appears to perhaps have the highest and most consistent association with ADHD presentation in children.<sup>108</sup> Maternal alcohol consumption also appears to be associated with increased likelihood of ADHD development.<sup>109</sup>

Studies have shown that maternal exposure to other toxins including pesticides as well as drugs like acetaminophen (ie, paracetamol) have been found to increase ADHD risk.<sup>110</sup> Additionally, gestational, and perinatal problems including the mother's age, maternal obesity, birth complications, and low child birthweight have also been found to be correlates of ADHD presentation in children.<sup>111</sup> A range of early environment risk psychosocial factors relating to ADHD diagnosis have also been identified as highly associated with ADHD presentation in childhood including neglect, malnourishment, early childhood trauma,

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LaBianca et al, 'Polygenic Profiles Define Aspects of Clinical Heterogeneity in ADHD' (2021) *MedRxiv* 2021.

<sup>104</sup> Kian, Samieefar and Rezaei (n 74).

<sup>105</sup> Barkley (n 4) 9; Faraone et al (n 46).

<sup>106</sup> Faraone et al (n 46). Kian, Samieefar and Rezaei (n 74).

<sup>107</sup> Kian, Samieefar and Rezaei (n 74). See also, Emma Sciberras et al, 'Prenatal Risk Factors and the Etiology of ADHD - Review of Existing Evidence' (2017) 19(1) *Current Psychiatry Reports* 1; Faraone et al (n 46) 794-96.

<sup>108</sup> Ji-Youn Han et al, 'The Effects of Prenatal Exposure to Alcohol and Environmental Tobacco Smoke on Risk for ADHD: A Large Population-Based Study' (2015) 225(1-2) *Psychiatry Research* 164. See also, Jae Han Kim Et Al, 'Environmental Risk Factors, Protective Factors, and Peripheral Biomarkers for ADHD: An Umbrella Review' (2020) 7(11) *The Lancet Psychiatry* 955.

<sup>109</sup> Kian, Samieefar and Rezaei (n 74).

<sup>110</sup> Han et al (n 108). Kian, Samieefar and Rezaei (n 74).

<sup>111</sup> Tania Das Banerjee, Frank Middleton and Stephen V Faraone, 'Environmental Risk Factors for Attention-Deficit Hyperactivity Disorder' (2007) 96(9) *Acta Paediatrica* 1269; Kian, Samieefar and Rezaei (n 74).

poor parental attachment,<sup>112</sup> family function problems,<sup>113</sup> and parental ADHD and/or other mental health diagnosis.<sup>114</sup>

## **6 *Biology/Environment Interaction***

As observed by Sonuga-Barke there is no one all-encompassing ‘grand theory of ADHD’.<sup>115</sup> Its existence appears influenced and perpetuated by interaction between a variety of genetic liabilities and environmental factors. Kian et al point out, the interaction of these factors ‘is commonly referred to as ADHD pathogenesis.’<sup>116</sup> It is also important to note here that estimates of the degree of contribution of factors to ADHD presentation, including heritability are, in part, influenced by genetic and environmental interaction confounding. This arises due to the inability to disentangle the influence of the shared impact of continued interaction between genetic and environmental factors.<sup>117</sup> To explain further, when genetic liabilities are exposed to certain environmental circumstances, associated problematic outcomes will occur that influence the increased likelihood of further problematic outcomes, which are then further exacerbated by genetic liabilities and so on.

The notion that gene-environment interaction influences ADHD symptoms is somewhat illustrated in a study by Daan van Rooj and her colleagues in 2015.<sup>118</sup> The study examined the ‘neural connectivity during response inhibition in adolescents with attention-deficit/hyperactivity disorder and their unaffected siblings’.<sup>119</sup> They found that even though some non-ADHD siblings had the same brain circuitry liabilities as their ADHD diagnosed siblings, these non-ADHD siblings did not exhibit clinical level ADHD symptoms. This illustrates the need for gene-environment interaction to bring about ‘threshold’ ADHD symptoms.

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<sup>112</sup> Marc-Andreas Edel et al, 'Attachment, Recalled Parental Rearing, and ADHD Symptoms Predict Emotion Processing and Alexithymia in Adults with ADHD' (2015) 14(1) *Annals of General Psychiatry* 43.

<sup>113</sup> Sarah E Johnson et al, 'Poverty, Parental Mental Health and Child/Adolescent Mental Disorders: Findings from a National Australian Survey' (2019) 12(3) *Child Indicators Research* 963.

<sup>114</sup> Banerjee, Middleton and Faraone (n 111).

<sup>115</sup> Sonuga-Barke (n 90) 29.

<sup>116</sup> Kian, Samieefar and Rezaei (n 74) 309.

<sup>117</sup> Barkley (n 4).

<sup>118</sup> Daan van Rooij et al, 'Altered Neural Connectivity During Response Inhibition in Adolescents with Attention-Deficit/Hyperactivity Disorder and Their Unaffected Siblings' (2015) 7 *Neuroimage: Clinical* 325.

<sup>119</sup> Ibid 325.

## E Comorbidity

ADHD has been shown to have a high degree of comorbidity with a variety of psychological disorders and other problematic psychosocial syndromes.<sup>120</sup> Individuals with ADHD have been shown to be at significantly increased risk of experiencing comorbid mood disorders including anxiety and depressive disorders, bipolar as well as post-traumatic stress disorders.<sup>121</sup> Those with ADHD are more likely to experience an increased level of suicidal ideation, self-harm, as well as suicide attempts and also completions.<sup>122</sup> ADHD has been found to be highly comorbid with other neurodevelopmental disorders, especially Autism Spectrum Disorder.<sup>123</sup> Learning (eg dyscalculia, dyslexia), speech, sleep and other disorders share high levels of comorbidity with ADHD.<sup>124</sup> Research indicates that those with ADHD are also more likely to experience personality disorders including borderline, narcissistic and Antisocial Personality Disorder (ASPD).<sup>125</sup> Foetal Alcohol Spectrum Disorder as well as what are sometimes referred to as other 'behavioural' or 'externalising' disorders including Oppositional Defiant Disorder (ODD) and Conduct Disorder (CD) are highly comorbid with ADHD.<sup>126</sup> Finally, those with ADHD are at least

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<sup>120</sup> Caye, Leffa and Rohde (n 57).

<sup>121</sup> Nitin Patel, Mita Patel and Harsha Patel, 'ADHD and Comorbid Conditions' in Jill Norvilitis (ed), *Current Directions in ADHD and Its Treatment* (BoD-Books on Demand, 2012) 25-46; Lane and Chong (n 2). Susan Young et al, 'Neurodevelopmental Disorders in Prison Inmates: Comorbidity and Combined Associations with Psychiatric Symptoms and Behavioural Disturbance' (2018) 261 *Psychiatry Research* 109.

<sup>122</sup> John Headley Ward and Sarah Curran, 'Self-Harm as the First Presentation of Attention Deficit Hyperactivity Disorder in Adolescents' (2021) 26(4) *Child and Adolescent Mental Health* 303. See also, Natasha Brown et al, 'The Mediating Roles of Mental Health and Substance Use on Suicidal Behavior Among Undergraduate Students with ADHD' (2022) 26(11) *Journal of Attention Disorders* 1437.

<sup>123</sup> Lucy Riglin et al, 'Investigating Attention-Deficit Hyperactivity Disorder and Autism Spectrum Disorder Traits in the General Population: What Happens in Adult Life?' (2021) 62(4) *Journal of Child Psychology and Psychiatry, and Allied Disciplines* 449; Young et al (n 7).

<sup>124</sup> Wael A Al-Dakroury, 'Speech and Language Disorders in ADHD' (2018) 4(134) *Abnormal Behavioural Psychology* 2472; Martin Nejedlý, 'The Circadian System and Sleep in Individuals with ADHD' (Thesis, Charles University, 2021).

<sup>125</sup> Mona Sameeh Khodeir, Safaa Refaat El-Sady and Huda Abd El-Razek Mohammed, 'The Prevalence of Psychiatric Comorbid Disorders Among Children with Specific Learning Disorders: A Systematic Review' (2020) 36(1) *The Egyptian Journal of Otolaryngology* 1.

<sup>126</sup> Stephen Faraone, Yanli Zhang James, Qi Chen, Henrik Larsson 'Predicting Comorbid Disorders in ADHD Using Machine Learning' (2019) 85(10) *Biological Psychiatry* S6; Shannon Lange et al, 'Prevalence of Externalizing Disorders and Autism Spectrum Disorders Among Children with Fetal Alcohol Spectrum Disorder: Systematic Review and Meta-Analysis' (2017) 96(2) *Biochemistry and Cell Biology* 241; Tinca C Polderman et al, 'The Co-Occurrence of Autistic and ADHD Dimensions in Adults: An Etiological Study in 17 770 Twins' (2014) 4(9) *Translational Psychiatry* 435; Sebastian Lundstrom et al, 'Childhood Neurodevelopmental Disorders and Violent Criminality: A Sibling Control Study' (2014) 44(11) *Journal of Autism and Developmental Disorders* 435; Nitin Patel, Mita Patel and Harsha Patel, 'ADHD and Comorbid Conditions' in Jill M Norvilitis (ed), *Current Directions in ADHD and its Treatment* (eBook Chapter, 15 February 2012) 25-46

four times more likely to experience a Substance Use Disorder (SUD) than those without ADHD.

### F *ADHD Treatment*

The recently developed *Australian Evidence-Based Clinical Practice Guideline for Attention-Deficit Hyperactivity Disorder (ADHD)* lists a variety of efficacious interventions for treating ADHD symptoms in addition to best-practice treatment approaches.<sup>127</sup> Treatment for an individual with ADHD may consist of pharmacological interventions, non-pharmacological interventions, or a combination of both.<sup>128</sup> Pharmacological treatments consist of both stimulant and non-stimulant medications.<sup>129</sup> The efficacy of stimulant medications in effectively treating ADHD symptoms is well-established.<sup>130</sup> A seminal large-scale network meta-analysis conducted by Cortese et al in 2018 reported that the use of methylphenidate for children/adolescents and amphetamine for adults with ADHD have the highest degree of effectiveness in reducing problematic ADHD symptoms.<sup>131</sup>

A variety of non-stimulant psychotropic medications have also proven effective in treating ADHD symptoms.<sup>132</sup> A body of meta-analytic evidence attests to the efficacy of non-stimulant treatments for ADHD, including atomoxetine,<sup>133</sup> and guanfacine.<sup>134</sup> A variety of large-scale analyses however have established that stimulant

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<<https://www.intechopen.com/books/current-directions-in-adhd-and-its-treatment/adhd-and-comorbidity>>; Matthew A Jarrett and Thomas H Ollendick, 'A Conceptual Review of the Comorbidity of Attention-Deficit/Hyperactivity Disorder and Anxiety: Implications for Future Research and Practice' (2008) 28(7) *Clinical Psychology Review* 1266; Esther Sobanski, 'Psychiatric Comorbidity in Adults with Attention-Deficit/Hyperactivity Disorder (ADHD)' (2006) 256(1) *European Archives of Psychiatry and Clinical Neuroscience* i26; Timothy E Wilens et al, 'Psychiatric Comorbidity and Functioning in Clinically Referred Preschool Children and School-Aged Youths with ADHD' (2002) 41(3) *Journal of the American Academy of Child & Adolescent Psychiatry* 262.

<sup>127</sup> Australian ADHD Guideline Development Group, *Australian Evidence-Based Clinical Practice Guideline for Attention Deficit Hyperactivity Disorder* (Australian ADHD Professionals Association, 1st ed, 2022).

<sup>128</sup> Lane and Chong (n 2); Faraone et al (n 46); Samuele Cortese, 'Pharmacologic Treatment of Attention Deficit-Hyperactivity Disorder' (2020) 383(11) *New England Journal of Medicine* 1050.

<sup>129</sup> Samuele Cortese et al, 'Comparative Efficacy and Tolerability of Medications for Attention-Deficit Hyperactivity Disorder in Children, Adolescents, and Adults: A Systematic Review and Network Meta-Analysis' (2018) 5(9) *The Lancet Psychiatry* 727; Faraone et al (n 46).

<sup>130</sup> Faraone et al (n 46); Cortese (n 128).

<sup>131</sup> Cortese et al (n 128).

<sup>132</sup> Iman Idrees et al, 'The Effects of Stimulant and Non-Stimulant Medications on the Autonomic Nervous System (ANS) Functioning in People with ADHD: A Systematic Review and Meta-Analysis' (2023) 144 *Neuroscience & Biobehavioral Reviews* 104968.

<sup>133</sup> Vinutha Ravishankar et al, 'The Efficacy of Atomoxetine in Treating Adult Attention Deficit Hyperactivity Disorder (ADHD): A Meta-Analysis of Controlled Trials' (2016) 24 *Asian Journal of Psychiatry* 53.

<sup>134</sup> Toyosaku Ota et al, 'Evaluating Guanfacine Hydrochloride in the Treatment of Attention Deficit Hyperactivity Disorder (ADHD) in Adult Patients: Design, Development and Place in Therapy' (2021) 15 *Drug Design, Development and Therapy* 1965.

medications are the most effective pharmacological intervention for treating ADHD symptoms.<sup>135</sup> For this reason they are generally regarded as the first-line medication treatment for ADHD, especially when symptoms are severe.<sup>136</sup>

It is important to note that, like most medications, ADHD pharmaceutical interventions are associated with an increased risk of unwanted side effects.<sup>137</sup> Such potential side effects include sleep disturbance,<sup>138</sup> irritability/mood variability (especially when the medication wears off),<sup>139</sup> subdued appetite,<sup>140</sup> slight growth (height) delay,<sup>141</sup> and cardiovascular complexities.<sup>142</sup> That said, there appears to be no significant association between ADHD medications and extremely 'adverse cardiac events' (ie, stroke, heart attack, sudden death). In instances where ADHD medication side-effects may occur, it is often the case that they can be managed through dosage adjustment or otherwise by swapping out one medication for another.<sup>143</sup> Moreover, Cortese points out that, for any medication, including those used to treat ADHD, 'clinical decision-making is often based on tricky trade-offs that should be considered at the individual patient level, rather than

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<sup>135</sup> Kung-Han Yang et al, 'Exploring the Effects of Pharmacological, Psychosocial, and Alternative/Complementary Interventions in Children and Adolescents with Attention-Deficit/Hyperactivity Disorder: Meta-Regression Approach' (2021) 24(10) *International Journal of Neuropsychopharmacology* 776. Ferrán Catalá-López et al, 'The Pharmacological and Non-Pharmacological Treatment of Attention Deficit Hyperactivity Disorder in Children and Adolescents: A Systematic Review with Network Meta-Analyses of Randomised Trials' (2017) 12(7) *PLOS One* e0180355.

<sup>136</sup> Erlend Faltinsen et al, 'Updated 2018 NICE Guideline on Pharmacological Treatments for People with ADHD: A Critical Look' (2019) 24(3) *BMJ Evidence-Based Medicine* 99; Samuele Cortese, Jeffrey H Newcorn and David Coghill, 'A Practical, Evidence-Informed Approach to Managing Stimulant-Refractory Attention Deficit Hyperactivity Disorder (ADHD)' (2021) 35(10) *CNS Drugs* 1035; National Institute for Health Care and Excellence (NICE) (n 29).

<sup>137</sup> Ankita Nanda et al, 'Adverse Effects of Stimulant Interventions for Attention Deficit Hyperactivity Disorder (ADHD): A Comprehensive Systematic Review' (2023) 15(9) *Cureus* e45995.

<sup>138</sup> Penny Corkum et al, 'The Effects of Extended-Release Stimulant Medication on Sleep in Children with ADHD' (2020) 29(1) *Journal of the Canadian Academy of Child and Adolescent Psychiatry* 33.

<sup>139</sup> Zachary D Stuckelman et al, 'Risk of Irritability with Psychostimulant Treatment in Children with ADHD: A Meta-Analysis' (2017) 78(6) *The Journal of Clinical Psychiatry* e648; Stephanie G Craig et al, 'Long-Term Effects of Stimulant Treatment for ADHD: What Can We Tell Our Patients?' (2015) 2 *Current Developmental Disorders Reports* 1.

<sup>140</sup> Jéssica Lima Gianformaggio, 'The Impact of Methylphenidate Treatment on the Appetite of Children Diagnosed with Attention Deficit/Hyperactivity Disorder - A Systematic Review' (2023) (Web Page) <<https://hdl.handle.net/10216/152836>>.

<sup>141</sup> Sara Carucci et al, 'Long Term Methylphenidate Exposure and Growth in Children and Adolescents with ADHD: A Systematic Review and Meta-Analysis' (2021) 120 *Neuroscience & Biobehavioral Reviews* 509.

<sup>142</sup> Le Zhang et al, 'Attention-Deficit/Hyperactivity Disorder Medications and Long-Term Risk of Cardiovascular Diseases' (2024) 81(2) *JAMA Psychiatry* 178.

<sup>143</sup> Cortese, Newcorn and Coghill (n 136)

straightforward one-size-fits-all recommendations.<sup>144</sup> Nonetheless, the need for further quality research examining the efficacy and safety of ADHD medications remains.<sup>145</sup>

A variety of efficacious non-pharmacological treatments for ADHD have likewise been developed. Broad declarations regarding the efficacy of non-pharmacological interventions are hard to make given that they are quite heterogenous in scope and nature.<sup>146</sup> Nevertheless, Cognitive Behavioural Therapy (CBT),<sup>147</sup> behavioural parent training,<sup>148</sup> and, more recently, exercise interventions<sup>149</sup> have been found to have a comparatively high degree of efficacy in reducing problematic ADHD symptoms.

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<sup>144</sup> Samuele Cortese and Cristiano Fava, 'Long-Term Cardiovascular Effects of Medications for Attention-Deficit/Hyperactivity Disorder—Balancing Benefits and Risks of Treatment' (2024) 81(2) *JAMA Psychiatry* 123.

<sup>145</sup> Cortese et al (n 129).

<sup>146</sup> Lane and Chong (n 2).

<sup>147</sup> Zoe Young, Nima Moghaddam and Anna Tickle, 'The Efficacy of Cognitive Behavioral Therapy for Adults With ADHD: A Systematic Review and Meta-Analysis of Randomized Controlled Trials' (2020) 24(6) *Journal of Attention Disorders* 875; Dong Li et al, 'Effects of Different Physical Activity Interventions on Children with Attention-Deficit/Hyperactivity Disorder: A Network Meta-Analysis of Randomized Controlled Trials' (2023) 17 *Frontiers in Neuroscience* 1139263. See also, Eili N Riise et al, 'Cognitive Behavior Therapy for Externalizing Disorders in Children and Adolescents in Routine Clinical Care: A Systematic Review and Meta-Analysis' (2021) 83 *Clinical Psychology Review* 101954; Yanxi Li and Lina Zhang, 'Efficacy of Cognitive Behavioral Therapy Combined with Pharmacotherapy Versus Pharmacotherapy Alone in Adult ADHD: A Systematic Review and Meta-Analysis' (2024) 28(3) *Journal of Attention Disorders* 279.

<sup>148</sup> Tycho J Dekkers et al, 'Meta-analysis: Which Components of Parent Training Work for Children With Attention-Deficit/Hyperactivity Disorder?' (2022) 61(4) *Journal of the American Academy of Child & Adolescent Psychiatry* 478; Yang et al (n 135); Valerie Tourjman et al, 'Psychosocial Interventions for Attention Deficit/Hyperactivity Disorder: A Systematic Review and Meta-Analysis by the CADDRA Guidelines Work GROUP' (2022) 12(8) *Brain Sciences* 1023; Dominique PA Doffer et al, 'Sustained Improvements by Behavioural Parent Training For Children With Attention-Deficit/Hyperactivity Disorder: A Meta-Analytic Review of Longer-Term Child and Parental Outcomes' (2023) 3(3) *JCPP Advances* e12196; Jerome Marquet-Doléac, Maëlle Biotteau and Yves Chaix, 'Behavioral Parent Training for School-Aged Children With ADHD: A Systematic Review of Randomized Control Trials' (2024) 28(3) *Journal of Attention Disorders* 377.

<sup>149</sup> Wenxin Sun, Mingxuan Yu and Xiaojing Zhou, 'Effects of Physical Exercise on Attention Deficit and Other Major Symptoms in Children with ADHD: A Meta-Analysis' (2022) 311 *Psychiatry Research* 114509; Li et al (n 147); Huan Huang et al, 'Chronic Exercise for Core Symptoms and Executive Functions in ADHD: A Meta-analysis' (2023) 151(1) *Pediatrics* e2022057745; Sima Dastamooz et al, 'The Efficacy of Physical Exercise Interventions on Mental Health, Cognitive Function, and ADHD Symptoms in Children and Adolescents with ADHD: An Umbrella Review' (2023) 62 *EclinicalMedicine* 102137; Feilong Zhu et al, 'Comparative Effectiveness of Various Physical Exercise Interventions on Executive Functions and Related Symptoms In Children And Adolescents With Attention Deficit Hyperactivity Disorder: A Systematic Review and Network Meta-Analysis' (2023) 11 *Frontiers in Public Health* 1133727; Yiling Song et al, 'Meta-Analysis of the Effects of Physical Activity on Executive Function in Children and Adolescents with Attention Deficit Hyperactivity Disorder' (2023) 18(8) *PLOS One* e0289732; Li et al (n 147).



Comorbid conditions must also be taken into account when treating ADHD.<sup>150</sup> The need to treat comorbid conditions such as depression and/or anxiety is a key factor in achieving best overall treatment effects for those with ADHD.<sup>151</sup> Both pharmacological and non-pharmacological treatments should be used to this end.<sup>152</sup> Additional pharmacological medications used to treat comorbid conditions in those with ADHD may include antidepressant medications (especially selective serotonin and/or norepinephrine reuptake inhibitors), anxiolytics, mood stabilising medications and antipsychotics.<sup>153</sup> In addition, non-pharmacological interventions, especially CBT, have also proven useful in treating comorbid conditions.<sup>154</sup>

The *Australian Evidence-Based Clinical Practice Guideline for ADHD* broadly advocates for the use of a multimodal approach in treating ADHD.<sup>155</sup> A multimodal approach involves an individual with ADHD, their family, as well as clinician and support professionals in developing and implementing a treatment plan that meets their needs, reduces problematic symptoms, and enhances their overall functioning.<sup>156</sup> The guideline acknowledges that multimodal approaches may involve the use of either pharmacological or non-pharmacological treatments.<sup>157</sup> Nevertheless, it emphasizes, that combined treatments should be seriously considered given the growing body of empirical evidence that shows pharmacological and non-pharmacological interventions used conjointly appear to best reduce problematic symptoms and improve functional outcomes for ADHD patients.<sup>158</sup> In the guideline it is further reasoned that:

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<sup>150</sup> Mark L Wolraich et al, 'Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents' (2019) 144(4) *Pediatrics* e20192528.

<sup>151</sup> Roberto León-Barriera et al, 'Treating ADHD and Comorbid Anxiety in Children: A Guide for Clinical Practice' (2023) 62(1) *Clinical Pediatrics* 39.

<sup>152</sup> For example see Virginio Salvi et al, 'ADHD and Bipolar Disorder in Adulthood: Clinical and Treatment Implications' (2021) 57(5) *Medicina* 466; Luke MacDonald and Joseph Sadek, 'Management Strategies for Borderline Personality Disorder and Bipolar Disorder Comorbidities in Adults with ADHD: A Narrative Review' (2023) 13(11) *Brain Sciences* 1517; Alan D Workman et al, 'Rates of Antidepressant, Anxiolytic, and ADHD Medication Use Among Patients Undergoing ESS' (2023) 132(12) *Annals of Otolaryngology & Laryngology* 1679.

<sup>153</sup> León-Barriera et al (n 151)

<sup>154</sup> *Ibid.*

<sup>155</sup> Australian ADHD Guideline Development Group (n 127)

<sup>156</sup> *Ibid.* 96.

<sup>157</sup> *Ibid.* 95.

<sup>158</sup> Eg, see Catalá-López et al (n 135); Michael O Ogundele and Hani F Ayyash, 'ADHD in Children and Adolescents: Review of Current Practice of Non-Pharmacological and Behavioural Management' (2023) 10(1) *AIMS Public Health* 35; Li and Zhang (n 147).

Recommendation for the use of combined pharmacological and non-pharmacological treatments are based on the balance of availability, costs, preferences, values assigned to consequences and resulting judgements.<sup>159</sup>

In summary, a variety of efficacious treatment approaches for ADHD do reliably exist. Despite this however, many people with ADHD receive no treatment.<sup>160</sup> Furthermore, important research indicates that untreated ADHD can result in increasing severity of symptoms.<sup>161</sup> The next section discusses the systemic barriers that those with ADHD face in receiving appropriate assessment, treatment and care services.

### G *Struggling Through ‘The System’*

Lamentably, those with ADHD not only have to deal with the challenging symptoms of their condition, but they are too often forced to deal with significant barriers to accessing crucial assessment, treatment and support services.<sup>162</sup> In a recent key study, Bissett et al conducted a systematic review of 1624 international articles that examined facets of ADHD-consumer-identified care needs.<sup>163</sup> They argued that:

Improving outcomes and facilitating thriving of consumers with suspected or diagnosed ADHD and their families/caregivers (henceforth termed ADHD consumers) requires greater awareness of the unmet needs of ADHD consumers.<sup>164</sup>

The study revealed consistent unmet need areas for those with ADHD including access to clinical and carer services, insufficient monetary support, as well as inadequate educational support and accommodations.<sup>165</sup> To address these unmet needs the authors proffered a number of recommendations including integrating recovery principles into care provision, promoting ADHD health literacy, expanding consumer involvement in research, service enhancement,

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<sup>159</sup> Australian ADHD Guideline Development Group (n 127) 95.

<sup>160</sup> Ylva Ginsberg et al, 'Underdiagnosis of Attention-Deficit/Hyperactivity Disorder in Adult Patients: A Review of the Literature' (2014) 16(3) *The Primary Care Companion for CNS Disorders* 23591. See also, Deloitte Access Economics (n 31). Duy Do et al, 'Prevalence and Predictors of Multimodal Treatment Among US Adults Newly Diagnosed With ADHD' (2023) *American Journal of Preventive Medicine*.

<sup>161</sup> Monica Shaw et al, 'A Systematic Review and Analysis of Long-Term Outcomes in Attention Deficit Hyperactivity Disorder: Effects of Treatment and Non-Treatment' (2012) 10(1) *BMC Medicine* 1; Heidi Boland et al, 'A Literature Review and Meta-Analysis on the Effects of ADHD Medications on Functional Outcomes' (2020) 123 *Journal of Psychiatric Research* 21.

<sup>162</sup> Australian ADHD Guideline Development Group (n 127).

<sup>163</sup> Matthew Bissett et al, 'Practitioner Review: It's Time to Bridge the Gap - Understanding the Unmet Needs of Consumers With Attention-Deficit/Hyperactivity Disorder - A Systematic Review and Recommendations' (2023) 64(6) *Journal of Child Psychology and Psychiatry* 848.

<sup>164</sup> Ibid 848.

<sup>165</sup> Ibid.

additional/greater ADHD-related training and education, and enhancing accessibility to the quality multimodal treatments.<sup>166</sup>

Of particular relevance to this paper, a significant development related to removal of systemic barriers to care for Australians with or suspected of having ADHD recently occurred. In early 2023, the Australian Senate commissioned their Community Affairs Reference Committee to investigate the obstacles that those with ADHD may face in obtaining reliable, prompt, and best practice assessment and in accessing necessary and appropriate support services so as to alleviate their neuro-developmental condition and/or the deleterious impact that it has on their daily living. Pursuant to that inquiry the Committee examined and analysed 700 submissions as well as the testimonies of 79 witnesses who attended at least one of the three scheduled days of public hearings across Australia. The Committee handed down its findings report in late 2023.<sup>167</sup> The report identified key impediments to accessing assessment and support services included an insufficiency of assessment and treatment services, exorbitant service costs, a paucity of supports in school, correctional and supported-living situations, and negative consumer experiences caused through excessive bureaucracy, uneven prescribing rules, stigma, and poor-quality care.<sup>168</sup>

The Committee's report offered fifteen policy recommendations aimed at removing or reducing these barriers. Briefly, these recommendations to Government included: (1) funding a National Framework for ADHD; (2) consulting with those with lived experience as well as healthcare training organisations to identify needs and augment healthcare access and support; (3) review of the Medicare Benefits Schedule to improve access to diagnostic and support services; (4) review of the Pharmaceutical Benefits Scheme to ensure safe and best-quality medications are being used; (5) expediting nation-wide conformity in ADHD prescribing rules; (6) developing a dedicated government ADHD information portal; (8) improving access to the National Disability Insurance Scheme and information around it; (9) providing funding for disability and ADHD advocacy organisations; (10) improving ADHD-related training and establishing competency standards in various settings including educational and institutional settings and workplaces; (11) improving ADHD-informed health services in institutional settings; (12) developing pathways that assess and improve the skills of healthcare professionals who provide support to those with ADHD; (13) implementing the *Australian Evidence-Based Clinical Guidelines for ADHD*; (14) investing in not for profit disability, support and advocacy organisations to aid in the provision of

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<sup>166</sup> Ibid 849-854.

<sup>167</sup> Senate Community Affairs References Committee, *Assessment and Support Services for People with ADHD* (Commonwealth of Australia, 2023).

<sup>168</sup> Ibid xi-xii.

community-based services; (15) supporting research aimed at understanding ADHD and reducing stigma towards it.<sup>169</sup>

Ultimately the Committee expressed a firm view that ‘more can be done to remove barriers for people with ADHD so that they can receive the assessments, healthcare and support they need.’<sup>170</sup> The Australian Government will be required to respond to the findings and recommendations of the Committee’s report. Unfortunately, the Government’s response will post-date the publication of the present article and so cannot be reported upon here. That said, it is essential that the Committee’s recommendations are seriously considered and implemented where reasonably possible to reduce the risk for those with ADHD becoming involved in our youth and criminal justice systems.<sup>171</sup> The disproportionate involvement of those with ADHD in youth and criminal justice offender populations is the topic to which we now turn.

### III ADHD & CRIMINAL JUSTICE, IT IS A CRIME NOT TO KNOW...

To provide a solid platform for understanding ADHD-related criminal justice issues, we have, to this point, focussed on outlining what ADHD is and what is known about it. We now turn to explaining the nature and significance of ADHD as it relates to criminal offending specifically and make the argument that this issue needs to be more significantly considered by youth and criminal justice policy makers.

#### A *Overrepresentation of Those with ADHD in Youth and Criminal Justice Populations*

##### 1 *Internationally*

It is arguable that the problematic association between ADHD and delinquency/crime arose, in large part, due to the international empirical studies that revealed a significant over-representation of ADHD sufferers among known child and adult offenders. In a key meta-analysis and systematic review conducted by Young et al in 2015, it was discovered that the overall prevalence of ADHD among adult prisoners and youth detainees (using only diagnostic clinical interview data) was 25.5 percent.<sup>172</sup> These findings are consistent with another meta-analysis conducted by Baggio et al in 2018 which found a general prevalence rate of 26.2 percent among adolescent/adult prison cohorts,

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<sup>169</sup> Ibid xv-xvii.

<sup>170</sup> Ibid xii.

<sup>171</sup> Lane and Chong (n 2)

<sup>172</sup> Young et al (n 7).

and a prevalence rate of 26.7 percent among those studies that only used clinical interviews to arrive at a diagnosis.<sup>173</sup>

When Young et al distinguished their data based on age (youth = 18 years of age and younger; adult = over 18 years of age), they found that those with ADHD represented 30.1 percent of the youth detention populations and 26.2 percent of adult prison populations.<sup>174</sup> According to Young et al, this represented 'on average, a fivefold increased prevalence of ADHD in youth prison populations (30.1%) and a 10-fold increase in adult prison populations (26.2%) compared with published general population prevalence (3–7% and 1–5%, respectively).'<sup>175</sup> In a more recent 2020 meta-analysis of 27 articles involving 24,824 male and 3,925 female adolescents who were in custody and aged between 10 and 19 years, Beaudry, Yu, Långström, and Fazel found that the ADHD random-effects pooled prevalence estimates were somewhat lower at 17.3 percent for males and 17.5 percent for females, nevertheless still indicating an alarmingly high ADHD prevalence in incarcerated populations.<sup>176</sup>

## 2 *Domestically (Australia)*

A significant paucity of Australian research exists which focusses on any aspect of ADHD, let alone that which might provide help in understanding the relationship between ADHD and criminal or youth justice issues.<sup>177</sup> While data relevant to those with ADHD in the criminal and/or youth justice populations may exist, it is certainly not widely or publicly available or reported upon very regularly. In this section, we provide a review of the small amount of publicly available research that focusses on, or at least mentions, ADHD prevalence in youth and/or adult criminal offender populations.

In 2014, Silva et al compared a large stimulant medicated sample of 9939 boys and 2892 girls with ADHD against a sample of frequency matched controls on a variety of youth and criminal justice-related indices.<sup>178</sup> The researchers found that those with ADHD had significantly more frequent and wide-ranging youth and criminal justice interactions than those without ADHD. Additional and more specific findings of this study will be discussed later in this article. Nevertheless,

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<sup>173</sup> Baggio et al (n 8) 5.

<sup>174</sup> Young et al (n 7).

<sup>175</sup> Ibid 255.

<sup>176</sup> Gabrielle Beaudry et al, 'Mental Disorders Among Adolescents in Juvenile Detention and Correctional Facilities: An Updated Systematic Review and Metaregression Analysis' (2021) 60(1) *Journal of the American Academy of Child and Adolescent Psychiatry* 46.

<sup>177</sup> Lane and Chong (n 2).

<sup>178</sup> Desiree Silva et al, 'Contact with the Juvenile Justice System in Children Treated with Stimulant Medication for Attention Deficit Hyperactivity Disorder: A Population Study' (2014) 1(4) *The Lancet Psychiatry* 278.

all findings have at least two limitations. First, Aboriginal and/or Torres Strait Islander peoples were not included in the study, which means that results cannot be generalised to first nations people(s). Second, there was no control or information regarding any individual within the ADHD sample receiving any non-pharmacological treatment(s). This means we have no idea of any potential additive or other impact that a non-pharmacological treatment used concurrently with the pharmacological treatment may have had on the results reported in the study.

A less comprehensive study was conducted by Moor et al in 2016.<sup>179</sup> The study investigated the potential for ADHD in the 200 inmates (150 males, 50 females) incarcerated in four prisons across the State of New South Wales. The researchers found that 17 percent of inmates in the four subject prison populations met full diagnostic criteria for ADHD, while a further 35 percent met a potentially 'subclinical' ADHD threshold.

The report produced as a result of the 2009 NSW Inmate Health Survey, also provided some insight in relation to the prevalence of ADHD in Australian adult criminal justice offender populations.<sup>180</sup> The report specified that 10.1 percent of inmates (11.8% of males and 6% of females) reported they had previously been diagnosed with ADHD. Compared to international statistics the figures reported in this study were low. However, it should be stressed that prevalence for this survey was obtained through self-disclosure of prior diagnosis, not any formal diagnostic process conducted in the prison setting. Furthermore, it may in fact be that ADHD was more prevalent in the subject prison population examined but hidden by comorbidity with other conditions. Nevertheless, the reported figures suggest that those with ADHD presented in this prison population 3-4 times more than in the general population.<sup>181</sup> As noted above, unfortunately, no statistics were provided in relation to ADHD prevalence for Aboriginal and/or Torres Strait Islander persons in the subject population.

Another important investigation of inmate mental health that included an analysis of ADHD within that population, was carried out by Davison et al in 2015.<sup>182</sup> Davison et al investigated the mental health and substance use problems of a population of prison inmates from Western Australia. They found that 16.9 percent of the sample of over 500 prisoners were identified as having ADHD. It was also reported

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<sup>179</sup> Elizabeth Moore et al, 'Adult ADHD Among NSW Prisoners: Prevalence and Psychiatric Comorbidity' (2016) 20(11) *Journal of Attention Disorders* 958.

<sup>180</sup> Natalie Mamone et al, 2009 *Young People in Custody Health Survey (YPICHS) - Full Report* (NSW Government, 2016).

<sup>181</sup> Based on prevalence statistics presented by Polanczyk et al (n 33).

<sup>182</sup> Sophie Davison et al, 'Mental Health and Substance Use Problems in Western Australian Prisoners' (Drug and Alcohol Office, Government of Western Australia, 2015).

that 7.9 percent of the Aboriginal and/or Torres Strait Islander people-identifying inmates had ADHD as compared with 20.5 percent of the non-Aboriginal and/or Torres Strait inmate population.

A NSW Government report completed with respect to the 2009 Young People in Custody Health Survey likewise provides useful information regarding ADHD within Australian youth justice offender populations.<sup>183</sup> A formal diagnostic investigation tool was used to determine if any of the youth detainees met the diagnostic criteria for any psychological or neurodevelopmental disorder. An alarming 69.7 percent of the young people surveyed were found to have some manner of attentional or behavioural disorder, with CD (at 59%) being the most frequently occurring disorder. Comorbidity issues between ADHD, ODD and CD are discussed later in this article.

The prevalence of ADHD in the juvenile detainee population was found to be 29.7 percent (26.8% males and 48.7% females). Based on general population prevalence estimates, this means that juveniles with ADHD were five to six times more prevalent in prison than they were prevalent in the general population at that time. Analyses relating to Indigenous youth detainees with ADHD revealed that 32.1 percent of the 140 Aboriginal and Torres Strait Islander youth detainees were found to have ADHD. This is higher than the prevalence percentage of 27.5 percent reported for non-Aboriginal and/or Torres Strait Islander-identifying youth detainees. Based on these results, and taking into account the general population prevalence statistics, Aboriginal and Torres Strait Islander youths with ADHD appeared in juvenile detention at a rate of around 6 times the rate at which ADHD youths appear in the general population.<sup>184</sup>

The 2015 Young People in Custody Health Survey report helped to provide more information regarding the prevalence of ADHD in youth detainee populations.<sup>185</sup> A very high and concerning 59.4 percent of the 192 young people surveyed during this subsequent investigation were found to have an attentional or behavioural disorder. CD (at 46.7%) was found to be the most frequently occurring disorder. Again, a discussion regarding comorbidity issues between ADHD, ODD and CD occurs later in this article. Lamentably, 22.4 percent (22.3% of males and 27.3% of females) of the youth detainee population were found to have ADHD.

Analysis of Indigenous status revealed that 24 percent of the 100 Aboriginal and/or or Torres Strait Islander youth detainees were found to have ADHD. This is compared to a not tremendously different 20.7 percent for non-Aboriginal and/or Torres Strait Islander youth

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<sup>183</sup> Mamone et al (n 180).

<sup>184</sup> Based on prevalence statistics presented by Polanczyk et al (n 33).

<sup>185</sup> Justice Health & Forensic Mental Health Network and Juvenile Justice NSW, *2015 Young People in Custody Health Survey: Full Report* (NSW Government, 2017).

detainees. This means that Aboriginal and/or Torres Strait Islander and Non-Aboriginal and/or Torres Strait Islander detainee youths with ADHD appeared in detention at a somewhat proportionate level, but together appeared at a rate four to five times that of young people with ADHD present in the general population.<sup>186</sup> The ADHD prevalence statistics presented in the 2015 Young People in Custody Health Survey report suggested there was less ADHD prevalence in youth detention in 2015 than in 2009. Whether the results of either survey reflect the true prevalence of ADHD in offender populations at the time of their completion or not is hard to say without a variety of comparative studies within the range of those timeframes. One or a variety of external factors such as changed police arrest practices, diversionary or sentencing practices, or diagnostic practices may have impacted on the reduced figures.

A more recent Australian study in this area was conducted by Korobanova, Spencer and Dean in 2021.<sup>187</sup> These researchers investigated the prevalence of mental health problems within a random sample of inmates from New South Wales. Korobanova, Spencer and Dean found that 11.4 percent of the sample (11.7% males and 7.6% females) self-identified as having been diagnosed with ADHD. They also reported that, based on a self-report screener, 27.4 percent (29.9% males and 35.1% females) were found to 'potentially' have ADHD. Highlighting the discrepancies between mental health data obtained by different sources (ie, reports of psychiatric history and self-report screeners), Korobanova and colleagues emphasised the flaws of having a singular approach to gauging mental health disorders but also the need to balance any augmented assessment approach with realistic considerations of available resources. They proposed a need for the development of assessment procedures and tools optimised for the prison setting specifically as a means to achieve such balance.

A recent New Zealand study is also worth mentioning. A New Zealand National Birth Cohort study by Anns et al examined interactions with, and pathways through, the criminal justice system for 149076 young adults with and without ADHD.<sup>188</sup> More than half of the young adults with ADHD were found to have interacted with the criminal justice system by the age of 25. The odds of being prosecuted by the police, charged with a crime, or convicted of a crime were nearly twice as high for those with ADHD, even when controlling for

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<sup>186</sup> Based on prevalence statistics presented by Polanczyk et al (n 33).

<sup>187</sup> Daria Korobanova, Sarah-Jane Spencer and Kimberlie Dean, 'Prevalence of Mental Health Problems in Men and Women in an Australian Prison Sample: Comparing Psychiatric History Taking and Symptom Screening Approaches' (2022) 21(1) *International Journal of Forensic Mental Health* 89.

<sup>188</sup> Francesca Anns et al, 'Risk of Criminal Justice System Interactions in Young Adults with Attention-Deficit/Hyperactivity Disorder: Findings from a National Birth Cohort' (2023) 27(12) *Journal of Attention Disorders* 1332.



important sociodemographic factors. In addition, those with ADHD were up to four times as likely to be convicted, regardless of offence type. Based on their findings, the authors advocated for necessary policy and procedural change to ensure 'early identification and responsivity' for those with ADHD who end up involved in the criminal justice system.<sup>189</sup>

As foreshadowed earlier, the study results presented in this section are quite limited in their scope and generalisability. Nevertheless, what they do appear to show is that, in concordance with international research, those with ADHD in Australia are alarmingly overrepresented in youth and criminal justice populations. In addition, the fact that Aboriginal and/or Torres Strait Islander juveniles with ADHD appear at a higher rate in detention than non-Aboriginal and/or Torres Strait Islander juveniles with ADHD, is a matter of great concern and something which should have been thoroughly considered since these results have come to light.

### **B Theoretical Platforms to Augment Understanding**

Only a few previous studies or reviews appear to have used theoretical/conceptual frameworks to augment an understanding as to why those with ADHD are overrepresented in youth and criminal justice offender populations.<sup>190</sup> Theoretical/conceptual frameworks that have been employed for this purpose include General Theory of Crime,<sup>191</sup> Criminogenic Cognitions Principles,<sup>192</sup> and Strain Theory.<sup>193</sup> We would, however, suggest two additional conceptual/theoretical frameworks, that is, the Dual Component Theory of Inhibition Regulation (DCTIR),<sup>194</sup> as well as the Disabling Criminological Perspective.<sup>195</sup> Both these frameworks appear to have

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<sup>189</sup> Ibid.

<sup>190</sup> Susan Young and Kelly Cocallis, 'Attention-Deficit/Hyperactivity Disorder (ADHD) and Offending' in Carlo Garofalo and Jelle J Sijtsema (eds), *Clinical Forensic Psychology: Introductory Perspectives on Offending* (Springer International Publishing, 2022) 303-319; Young et al (n 7); Amanda George, 'The Connections Between Attention-Deficit/Hyperactivity Disorder and Levels of Criminal Behavior Among Adults' (2022) 10(2) *Open Journal of Social Sciences* 1; Matthew C Johnson and Glen A Kercher, 'ADHD, Strain, and Criminal Behavior: A Test of General Strain Theory' (2007) 28(2) *Deviant Behavior* 131.

<sup>191</sup> Michael R Gottfredson and Travis Hirschi, *A General Theory of Crime* (Stanford University Press, 1990).

<sup>192</sup> Paul E Engelhardt, Gavin Nobes and Sophie Pischedda, 'The Relationship Between Adult Symptoms of Attention-Deficit/Hyperactivity Disorder and Criminogenic Cognitions' (2019) 9(6) *Brain Sciences* 128.

<sup>193</sup> Johnson and Kercher (n 190).

<sup>194</sup> Joshua J Reynolds and Sean M McCrea, 'The Dual Component Theory of Inhibition Regulation: A New Model of Self-Control' (2016) 41 *New Ideas in Psychology* 8.

<sup>195</sup> Leanne Dowse, Eileen Baldry and Phillip Snoyman, 'Disabling Criminology: Conceptualising the Intersections of Critical Disability Studies and Critical Criminology for People with Mental Health and Cognitive Disabilities in the Criminal Justice System' (2009) 15(1) *Australian Journal of Human Rights* 29.

significant promise in explaining elements of the problematic relationship between ADHD and criminal justice.

### ***1 The Dual Component Theory of Inhibition Regulation***

The DCTIR was developed by Reynolds and McCrea in 2016 as a means to simplify and create an applicable understanding of the concept of inhibitory regulation.<sup>196</sup> According to its creators, ‘the assumption of the DCTIR is that there are numerous domain-specific functionally specialised mechanisms that make up the mind ... and the DCTIR argues that self-control is accomplished by using one of these modules’.<sup>197</sup> Reynolds and McCrea go on to define ‘self-control’ as ‘the process by which computational mechanisms produce and adjust inhibition effort’.<sup>198</sup>

In this regard, Reynolds and McCrea propose one’s inhibition ‘module’ has both a ‘monitor’ component and a ‘threshold’ element.<sup>199</sup> The ‘monitor’ component (which contains two subroutines, ie detection and measurement) is responsible for determining if inhibition is required and if so, to what degree. The detection subroutine’s role is to identify when an inhibition might be required. The measurement subroutine’s role, however, is to gauge how gratifying a certain situational outcome might or might not be. The threshold component of the inhibitory module relates to an individual’s inclination and capacity to act with inhibitory effort. According to the theory, such ‘thresholds’ will vary widely across individuals in terms of some having higher thresholds, and others having lower thresholds.

Reynolds and McCrea further explain that ‘the likelihood that an individual will stop inhibiting and engage in the impulsive behaviour is a function of the amount and duration of temptation, and their tolerance of inhibition’.<sup>200</sup> Inspired, in part, by Gottfredson and Hirschi’s General Theory of Crime,<sup>201</sup> in their more recent paper, Reynolds and McCrea provide a rationale as to why the DCTIR might be useful in explaining criminal behaviour. They propose that:

There are at least three ways in which the inhibition module can affect criminal behaviour: no detection subroutine for the criminal behaviour

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<sup>196</sup> Reynolds and McCrea (n 194).

<sup>197</sup> Joshua J Reynolds and Sean M McCrea, ‘Criminal Behavior and Self-Control: Using the Dual Component Theory of Inhibition Regulation to Advance Self-Control and Crime Research’ (2018) 37(4) *Current Psychology* 832, 833.

<sup>198</sup> Reynolds and McCrea (n 194) 20.

<sup>199</sup> Reynolds and McCrea (n 197) 834.

<sup>200</sup> *Ibid* 835.

<sup>201</sup> Gottfredson and Hirschi (n 191).

exists, the modules involved with the criminal behaviour register high costs or temptation, or individuals have a low tolerance for inhibition.<sup>202</sup>

To further explain the first potential impact: individuals may be involved in criminal behaviour simply because they have no internal signal that alerts them to the possibility that the behaviour is problematic at a 'criminal level', and that the potential for inhibition might therefore be required. As for the second impact: potential engagement in criminal behaviour will necessarily involve a quick calculation as to the level of likely gratification versus the likely level of aversive consequence that may arise because of engagement in the criminal behaviour. To further explain the third impact: individuals will vary in the degree to which they can 'sit' in a state of inhibition. Those with a lesser 'threshold' will necessarily have a higher risk of involvement in impulse-driven criminal behaviour than someone who has a higher threshold. Thus, Reynolds and McRae propose that 'the model can account for a number of findings including patterns of recidivism, age differences, and the role of socioeconomic factors in crime'.<sup>203</sup>

The DCTIR, therefore, provides a good model for understanding the criminal acts committed by those with ADHD. Problems with inhibitory control are at the core of the ADHD syndrome.<sup>204</sup> Executive dysfunction, an inability to effortfully control impulsivity and a propensity for delay aversion are significant disadvantages associated with the experience of ADHD, and such phenomena are widely and independently regarded as risk factors for engagement in criminal behaviour.<sup>205</sup>

In DCTIR terms then, we might broadly say that those with ADHD have an 'inhibition module' that is impaired both in its components and subroutines. By way of further explanation, a person with ADHD's theorised 'monitor' subroutine may be conceived to be of a comparatively poor standard. Given such attention, working memory, self-awareness, and other executive functional deficits, there will likely be less propensity for such persons experiencing ADHD to register the possibility that behaviour they might be involved in is criminally problematic and that inhibition may be required. Whether the

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<sup>202</sup> Reynolds and McCrea (n 197) 834.

<sup>203</sup> Ibid 832.

<sup>204</sup> Mehta et al (n 85); Sonuga-Barke (n 88).

<sup>205</sup> Robert Eme, 'Trait Impulsivity/Attention-Deficit/Hyperactivity Disorder A Genetic Liability for Criminality' (2016) 3(1) *SOJ Psychology* 1. See also, Sebastian Lundström et al, 'Childhood Neurodevelopmental Disorders and Violent Criminality: A Sibling Control Study' (2014) 44(11) *Journal of Autism and Developmental Disorders* 2707; Olivia E Atherton et al, 'The Role of Effortful Control in the Development of ADHD, ODD, and CD Symptoms' (2020) 118(6) *Journal of Personality and Social Psychology* 1226; Jorim J Tielbeek et al, 'Genome-Wide Association Studies of a Broad Spectrum of Antisocial Behavior' (2017) 74(12) *JAMA Psychiatry* 1242.

appropriate ‘monitoring’ occurs or not, a person with ADHD additionally experiences a disproportionately high likelihood of impairment in their measurement routine. Deficits in executive and reward circuitry will likely tip an ADHD person in the direction of action that appears to be more immediately gratifying rather than exhibiting restraint aligned with longer-term benefit. Furthermore, an individual with ADHD will likely have a ‘threshold’ component that is adversely impacted upon by deficits in neurocircuitry. A lack of success in the application of effortful control to activate inhibition is a major component of ADHD. An individual with ADHD then, having an impairment in their ability to ‘sit’ with inhibition, and a propensity toward delay aversion will have a comparatively low ‘threshold’ which is likely, in turn, to increase the risk of involvement in (more immediately gratifying) criminal behaviour.

## **2 *Disabling Criminological Perspective***

A second potentially useful framework is that of Disabling Criminology proposed by Dowse, Baldry and Snowman in 2009.<sup>206</sup> In merging ideas from critical disability studies and critical criminology, Dowse, Baldry and Snowman attempted to provide a ‘hybrid’ approach to understanding the unique societal, institutional, and systemic factors that impact upon those deemed ‘disabled,’ ultimately to the degree that they become intertwined with the criminal justice system at a disproportionately high level.<sup>207</sup> They propose that the disabling critical criminology approach ‘provides a way of integrating the multiple impairments evident among a large number of people in prison and brings dimensions of disadvantage and exclusion together with the experience of disability in the context of offending’.<sup>208</sup>

Dowse and colleagues assert that a need for disabling critical criminology to be an analytical lens is broadly identified through the following key insights: certain types of impairments can result in or heighten vulnerability to social exclusion; the presence of impairment and social exclusion can result in increased vulnerability to being caught in the criminal justice system; and entry into the criminal justice system is itself likely to be further disabling to someone who is already experiencing impairment.<sup>209</sup>

In 2021, Holland, Reid and Smirnov noted the applicability of a disabling critical criminological approach to understanding the plight

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<sup>206</sup> Dowse, Baldry and Snoyman (n 195).

<sup>207</sup> Eileen Baldry et al, ‘Cruel and Unusual Punishment’: An Inter-Jurisdictional Study of the Criminalisation of Young People with Complex Support Needs’ (2018) 21(5) *Journal of Youth Studies* 636.

<sup>208</sup> Dowse, Baldry and Snoyman (n 195) 42.

<sup>209</sup> *Ibid* 42.

of those with neurodevelopmental disorders more broadly,<sup>210</sup> but this article will apply it to ADHD specifically. Application of a disabling criminological perspective to the plight of those with ADHD who end up disproportionately overrepresented in the youth and criminal justice systems adds to the quality of understanding this issue. The three insights outlined by Dowse and colleagues appear particularly applicable to the topic at hand.

First, ADHD is a neurodevelopmental disorder that certainly places an individual in a situation of social disadvantage.<sup>211</sup> It is implicitly obvious that a person who displays five or more of the following types of behaviours: inattention, disorganisation, forgetfulness, distractibility, failure to follow through on tasks, loses things, and avoids complex tasks - may experience social difficulty and vulnerability to social exclusion. The social difficulty and vulnerability experienced may be exacerbated when added to five or more of the following types of behaviours: fidgets and squirms, leaves their seat inappropriately, behaves inappropriately, has difficulty being quiet, talks excessively, blurts out answers, is always 'on the go,' has difficulty waiting their turn and interrupts or intrudes on others.

Second, as discussed above, those with impairment in executive functions, inhibition problems and delay aversion face an increased risk of becoming involved in deviant and/or criminal behaviour, and are disproportionately more prone to social exclusion. The dual experience of executive impairment and social exclusion place individuals with ADHD in a comparatively riskier position with respect to their potential involvement as an offender in the criminal justice system. The empirically established fact regarding the overrepresentation of those with ADHD in criminal justice offender populations is clear evidence of this.

Finally, we have outlined many extra impairment-related deficits a person with ADHD faces when they become involved in the criminal justice system. Studies discussed earlier in this article show differential treatment by police, disadvantage in pre-arrest, arrest, court, sentencing, and custodial procedures and settings. ADHD-based impairments will adversely impact upon an individual with ADHD's potential to 'smoothly sail' through a criminal justice process. Increased complexity and confusion will likely follow and self-perpetuate. Ultimately, trouble

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<sup>210</sup> Lorelle Holland, Natasha Reid and Andrew Smirnov, 'Neurodevelopmental Disorders in Youth Justice: A Systematic Review of Screening, Assessment and Interventions' (2021) *Journal of Experimental Criminology* 1.

<sup>211</sup> Alan Rokeach and Judith Wiener, 'Friendship Quality in Adolescents with ADHD' (2020) 24(8) *Journal of Attention Disorders* 1156; Christina M Harkins, Benjamin L Handen and Micah O Mazurek, 'The Impact of the Comorbidity of ASD and ADHD on Social Impairment' (2022) 52(6) *Journal of Autism and Developmental Disorders* 2512; Caitlin Bishop et al, 'An Examination of the Association Between Anxiety and Social Functioning in Youth with ADHD: A Systematic Review' (2019) 273 *Psychiatry Research* 402.

in detention settings, and the comparatively high degree of recidivism in ADHD offenders, provide evidence of the fact that involvement in the criminal justice system is further disabling.

In summary, both the DCTIR and Disabling Criminology perspectives provide good platforms for consideration of the overrepresentation of those with ADHD in the juvenile and criminal justice systems. The future use of these platforms in aiding understanding and predicting criminal justice involvement for those with ADHD is encouraged.

### ***C Nature of Justice System Involvement by those with ADHD***

#### ***1 Age of Onset***

In their research studies, Rösler et al<sup>212</sup> as well as de Sanctis, Newcorn and Halperin,<sup>213</sup> found that criminal onset (as evidenced by convictions and arrests, respectively) occurred earlier for those participants with ADHD as compared with those who did not experience ADHD. Silva and her colleagues found that, as compared to matched controls, boys had their first community correction (ie, non-custodial) sanction recorded at a younger age.<sup>214</sup> In their 2009 logistic regression analysis of the US National Longitudinal Study of Adolescent Health data, Fletcher and Wolfe reported that the participants who were symptomatic of ADHD when they were between the ages of 5 and 12 years old, were much more likely to self-report criminal behaviour when they were young adults (eg, stealing, selling drugs, robbery and/or burglary) than those who did not similarly suffer from this disorder.<sup>215</sup>

#### ***2 Sociocultural Features***

Regarding the sociocultural features of those with ADHD in criminal justice populations, Young et al assert: 'significant prevalence disparities exist with regard to those with ADHD who are from different sociocultural groups in the reported prevalence rates of differing cultural groups in the (criminal justice system) population'.<sup>216</sup>

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<sup>212</sup> Michael Rösler et al, 'Prevalence of Attention Deficit/Hyperactivity Disorder (ADHD) and Comorbid Disorders in Young Male Prison Inmates' (2004) 254(6) *European Archives of Psychiatry and Clinical Neuroscience* 365.

<sup>213</sup> Virginia A De Sanctis et al, 'Childhood Maltreatment and Conduct Disorder: Independent Predictors of Adolescent Substance Use Disorders in Youth with Attention Deficit/Hyperactivity Disorder' (2008) 37(4) *Journal of Clinical Child and Adolescent Psychology* 785.

<sup>214</sup> Silva et al (n 178).

<sup>215</sup> Jason Fletcher and Barbara Wolfe, 'Long-Term Consequences of Childhood ADHD on Criminal Activities' (2009) 12(3) *The Journal of Mental Health Policy and Economics* 119.

<sup>216</sup> Young et al (n 44).

Differing judicial practices across national and international jurisdictions have also been suggested to have a potential impact on this finding.<sup>217</sup> Other potential contributors to this finding have been suggested to include biases or prejudicial practices, differing ideas on what might represent ‘non-normative’ and unacceptable behaviour across sociocultural groups, socioeconomic status, and/or sufficiency of access to health and other services.<sup>218</sup>

### 3 Gender Impact(s)

There is a paucity of studies which investigate ADHD gender ratio differences in juvenile and adult criminal justice offender populations.<sup>219</sup> This is likely to be, at least in part, because females are less involved in criminal offending than males.<sup>220</sup> Accordingly, such studies (when they are carried out) may be adversely impacted by smaller sample size, which will then cause power and generalisability problems that flow on as a result.<sup>221</sup> In their 2019 review of prior research, Young and Cocallis propose that, unlike that which is reported in general population prevalence studies, available and relevant meta-analyses reveal that ADHD tends to be just as prevalent in female offenders as it is in males.<sup>222</sup> This is in contrast with the local findings of Silva et al who reported that ADHD female youths were seven times more likely to have a juvenile detention record than matched controls, whereas ADHD male youths were only two and a half times more likely than matched controls to have a detention record.<sup>223</sup>

### 4 Types of Offences Committed

A 2016 study by Mohr Jensen and others found that those with ADHD are overrepresented in every criminal offence category.<sup>224</sup> Other studies have found that arrests and/or commencement of proceedings against those with ADHD most commonly relate to crimes such as property offences, drug offences, weapons possession, and offences against the

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<sup>217</sup> Lane and Chong (n 2); Young et al (n 44).

<sup>218</sup> Lane and Chong (n 2); Young et al (n 44).

<sup>219</sup> Young and Cocallis (n 46) 1-2.

<sup>220</sup> Alex R Piquero, Nicole Leeper Piquero and Chelsey Narvey, 'Developmental and Life-Course Perspectives on Female Offending' in Shelley L Brown and Loraine Gelsthorpe (eds), *The Wiley Handbook on What Works with Girls and Women in Conflict with the Law: A Critical Review of Theory, Practice, and Policy* (Wiley Blackwell, 2022) 24-33.

<sup>221</sup> Young et al (n 55).

<sup>222</sup> Young and Cocallis (n 46). See also Baggio et al (n 8); Young et al (n 7).

<sup>223</sup> Silva et al (n 178).

<sup>224</sup> Christina Mohr-Jensen and Hans-Christoph Steinhausen, 'A Meta-Analysis and Systematic Review of the Risks Associated with Childhood Attention-Deficit Hyperactivity Disorder on Long-Term Outcome of Arrests, Convictions, and Incarcerations' (2016) 48 *Clinical Psychology Review* 32.

person.<sup>225</sup> Of particular note, Silva et al found that those youths with ADHD in their Australian sample were twice as likely to commit property and burglary-related crimes than matched controls.<sup>226</sup>

### ***5 Post Offence Trajectories and Vulnerabilities for those with ADHD***

Studies have uncovered a range of additional criminal and youth justice processes which work to the disadvantage of those with ADHD. For example, in Silva et al's study, Western Australian female youths with ADHD were found to be three times more likely, and male youths two and a half times more likely, to receive non-custodial offender contact records (as opposed to lesser penalties) than matched controls in similar circumstances.<sup>227</sup> In their 2016 meta-analysis, Erskine et al found that those with ADHD were approximately 2.5 times as likely to be arrested, twice as likely to receive a court conviction, and 2.5 times more likely to be incarcerated than individuals without an ADHD diagnosis.<sup>228</sup> Mohr-Jensen and Steinhausen, in their 2016 meta-analysis of longitudinal studies involving 15,442 individuals, uncovered a slightly higher relative risk in relation to their findings concerning convictions and incarcerations.<sup>229</sup> Specifically, they found that, when compared to non-ADHD individuals, those with ADHD had nearly a 3.5 times greater likelihood of receiving a court conviction, and nearly three times greater likelihood of being incarcerated.

When in police custody, youths with ADHD also face a series of disadvantages. Cunial and her colleagues conducted a series of studies into Queensland Police Service Detectives' perception of the quality of training and their own skills in identifying and managing juvenile offenders with ADHD.<sup>230</sup> They found that the detectives did not believe that they received sufficient training regarding identifying and managing juvenile offenders with ADHD.<sup>231</sup> They were found to have a perception that interviews with ADHD youths were laborious and

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<sup>225</sup> Ibid. Christina Mohr-Jensen et al, 'Attention-Deficit/Hyperactivity Disorder in Childhood and Adolescence and the Risk of Crime in Young Adulthood in a Danish Nationwide Study' (2019) 58(4) *Journal of the American Academy of Child & Adolescent Psychiatry* 443.

<sup>226</sup> Silva et al (n 178).

<sup>227</sup> Ibid.

<sup>228</sup> Erskine et al (n 57).

<sup>229</sup> Ibid.

<sup>230</sup> Kimberley J Cunial et al, 'Police Perceptions of Training in Interviewing Youth with ADHD' (2021) 22(1) *Police Practice & Research* 491; Kimberley J Cunial et al, 'Investigative Interviewing of Youth with ADHD – Recommendations for Detective Training' (2020) 27(5) *Psychiatry, Psychology and Law* 797; Kimberley J Cunial et al, 'Police Perceptions of the Impact that ADHD has on Conducting Cognitive Interviews with Youth' (2019) 26(2) *Psychiatry, Psychology and Law* 252; Kimberley J Cunial and Mark R Keibell, 'Police Perceptions of ADHD in Youth Interviewees' (2017) 23(5) *Psychology, Crime & Law* 509.

<sup>231</sup> Cunial et al, 'Investigative Interviewing of Youth with ADHD – Recommendations for Detective Training' (n 230).



difficult.<sup>232</sup> It was also found that the detectives ‘could not identify ADHD as the most likely explanation over and above other possibilities’<sup>233</sup> when presented with hypothetical scenarios involving youths exhibiting problematic behaviour. Other research has found that those with ADHD are up to three times more likely to make false confessions than those who do not have ADHD.<sup>234</sup> Furthermore, given memory and other executive function deficits, those with ADHD have been found to be more likely to express ‘don’t know’ answers to questions asked by police, giving the impression that they are being intentionally obstructive and difficult.<sup>235</sup>

In police watchhouse custody and/or prison contexts, those with ADHD have been found to be involved in an increased number of behavioural disturbances and are more demanding of staff.<sup>236</sup> They are also at an increased risk of being involved in incidences of significant verbal/aggression and property damage.<sup>237</sup> These occurrences adversely impact on the ADHD offender’s likelihood of parole or early release from prison.<sup>238</sup> All-in-all, those with ADHD are significantly more resource intensive in a criminal justice context than those who do not have ADHD.<sup>239</sup> Further, those with ADHD are potentially likely to face a variety of other, as yet uninvestigated, disadvantages in criminal justice processes. These may include, for instance, being excluded from or not being able to engage more fully in diversionary processes, such as police cautioning and restorative justice conferencing, which require a complex interplay between emotion processing and cognitive decision making.<sup>240</sup> Giving evidence in court and providing witness or victim

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<sup>232</sup> Cunial et al, 'Police Perceptions of the Impact that ADHD has on Conducting Cognitive Interviews with Youth' (n 230).

<sup>233</sup> Cunial and Kebbelle (n 230) 509.

<sup>234</sup> Gisli H Gudjonsson, *The Psychology of False Confessions: Forty Years of Science and Practice* (John Wiley & Sons, 2018). See also, Gisli Hannes Gudjonsson, Rafael A Gonzalez and Susan Young, 'The Risk of Making False Confessions: The Role of Developmental Disorders, Conduct Disorder, Psychiatric Symptoms, and Compliance' (2021) 25(5) *Journal of Attention Disorders* 715.

<sup>235</sup> Gisli Gudjonsson and Susan Young, 'An Investigation of ‘Don’t Know’ and ‘Direct Explanation’ Response Styles on the Gudjonsson Suggestibility Scale: A Comparison of Three Different Vulnerable Adult Groups' (2021) 168 *Personality and Individual Differences* 110385.

<sup>236</sup> Susan Young et al, 'Predictors of Institutional Behavioural Disturbance and Offending in the Community Among Young Offenders' (2011) 22(1) *The Journal of Forensic Psychiatry & Psychology* 72; Susan Young et al, 'Attention Deficit Hyperactivity Disorder (ADHD) in Personality Disordered Offenders and the Association with Disruptive Behavioural Problems' (2003) 14(3) *The Journal of Forensic Psychiatry* 491.

<sup>237</sup> Young et al (n 46) 3.

<sup>238</sup> *Ibid* 3.

<sup>239</sup> *Ibid* 3.

<sup>240</sup> Troy Allard et al, *The Use and Impact of Police Diversion for Reducing Indigenous Over-Representation: Report to the Criminology Research Council* (Criminology Research Council, 2009); Corey J Lane, 'An Application of Cognitive Dissonance Theory to Youth Justice Conferencing in Queensland' (2008) <<https://aic.gov.au/sites/default/files/2020-05/15-0708.pdf>>.

statements to police are also likely to be more difficult for individuals with ADHD.<sup>241</sup> These areas should be the focus of future further research.

## ***6 Reoffending and Recidivism***

Not surprisingly, studies have also shown that there is an elevated risk of re-offending or recidivism for those with ADHD. For example, in a longitudinal study of 15 years that involved 74 ADHD-participants and 33 non-ADHD participants, Philipp-Wiegmann and colleagues reported in 2018 that the ADHD group tended to have a higher rate of recidivism and re-offended 2.5 times faster than those in the non-ADHD category.<sup>242</sup> These findings also showed that it generally took about 6 to 7 months before the ADHD participants re-offended as compared to around 25 months for those in the non-ADHD group.<sup>243</sup> It should be noted, however, that this study contradicts the 2012 findings of Grieger and Hosser.<sup>244</sup> That said, Young and Cocallis distinguish these two studies on the basis that the latter ‘was restricted in age range (15–24 years) and only used a 5-year follow-up period’, and hence, it could be ‘possible that the predictive validity of ADHD for recidivism may be more prominent in the adult population’.<sup>245</sup> In a 2021 study, Dagistan et al conducted an analysis of 356 Turkish prison inmates which revealed that inmates with suspected ADHD had a mean number of offences and convictions in excess of those who were not suspected of having ADHD.<sup>246</sup>

## ***D ADHD Treatment in Youth and Criminal Justice Offender Populations***

There is some, albeit limited, evidence of the efficacy of pharmacological interventions for ADHD in criminal justice offender population settings.<sup>247</sup> In a seminal study conducted to assess the effectiveness of a methylphenidate intervention on 30 Swedish prison inmates suffering from ADHD, it was found that the treatment significantly reduced the severity of the participants’ symptoms as well

<sup>241</sup> Freckelton (n 15).

<sup>242</sup> Florence Philipp-Wiegmann et al, 'ADHD Modulates the Course of Delinquency: A 15-Year Follow-Up Study of Young Incarcerated Man' (2018) 268(4) *European Archives of Psychiatry and Clinical Neuroscience* 391.

<sup>243</sup> *Ibid* 397.

<sup>244</sup> Lena Grieger and Daniela Hosser, 'Attention Deficit Hyperactivity Disorder Does Not Predict Criminal Recidivism in Young Adult Offenders: Results from a Prospective Study' (2012) 35(1) *International Journal of Law and Psychiatry* 27.

<sup>245</sup> Young and Cocallis (n 46) 4.

<sup>246</sup> *Ibid*.

<sup>247</sup> Alper Adnan Dagistan et al, 'Prevalence of Probable Attention-Deficit/Hyperactivity Disorder in Inmates and its Relationship with Recidivism' (2022) 67(1) *Journal of Forensic Sciences* 289.

as enhanced their global functioning.<sup>248</sup> Chang et al found similarly positive results in their 2016 study analysing the effects of a pharmacological stimulant treatment provided to participants post prison release in Sweden.<sup>249</sup> Here, the dispensed psychostimulants resulted in the participants being 42.8 percent less likely to commit a violent offence during the medication period as compared to the non-medication period.<sup>250</sup> Despite growing evidence of their widespread efficacy and success,<sup>251</sup> the use of stimulant medications on prisoners and ex-convicts is somewhat controversial. This is perhaps due to the potential for these medications to be misused, or diverted from their original purpose.<sup>252</sup>

In a recent study, Widding-Havneraas et al examined the impact of pharmacological ADHD treatments on criminal behaviour.<sup>253</sup> Using an instrumental variable design, the researchers examined medication use and subsequent criminal charges for a population of 5,624 Norwegian individuals aged 10 to 18 years. According to these researchers, although individuals with ADHD were more likely to commit crimes than the general population, treatment with pharmacological medications (such as methylphenidate, dexamphetamine, lisdexamphetamine, and atomoxetine) significantly reduced the amount of crime they committed.<sup>254</sup> Specifically, public order and violence-related crimes were reduced. Widding-Havneraas et al concluded that pharmacological interventions were most effective in treating impulsive-reactive behaviour - a core symptom of ADHD.<sup>255</sup> Their results highlight the need to identify and treat those with ADHD as early as possible, as well as the potential protective impact that pharmacological treatment may have in preventing those with ADHD from becoming youth or adult offenders.

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<sup>248</sup> Ylva Ginsberg and Nils Lindefors, 'Methylphenidate Treatment of Adult Male Prison Inmates with Attention-Deficit Hyperactivity Disorder: Randomised Double-Blind Placebo-Controlled Trial with Open-Label Extension' (2012) 200(1) *British Journal of Psychiatry* 68.

<sup>249</sup> Zheng Chang et al, 'Association Between Prescription of Major Psychotropic Medications and Violent Reoffending After Prison Release' (2016) 316(17) *JAMA: The Journal of the American Medical Association* 1798.

<sup>250</sup> *Ibid.*

<sup>251</sup> Maija Konstenius et al, 'Methylphenidate for Attention Deficit Hyperactivity Disorder and Drug Relapse in Criminal Offenders with Substance Dependence: A 24-Week Randomized Placebo-Controlled Trial' (2014) 109(3) *Addiction* 440.

<sup>252</sup> John Tully, 'Management of ADHD in Prisoners-Evidence Gaps and Reasons for Caution' (2022) 13 *Frontiers in Psychiatry* 771525. See also, James A Foulds and Giles Newton-Howes, 'Don't Put the Cart Before the Horse: Response to Young et al 'Assessment of ADHD in People with Substance Use Disorder'' (2021) 55(8) *Australian & New Zealand Journal of Psychiatry* 747.

<sup>253</sup> Tarjei Widding-Havneraas et al, 'Effect of Pharmacological Treatment of Attention-Deficit/Hyperactivity Disorder on Criminality' (2024) 63(4) *Journal of the American Academy of Child & Adolescent Psychiatry* 1.

<sup>254</sup> *Ibid* 440.

<sup>255</sup> *Ibid* 440.

Young and Cocallis noted that a paucity of research also exists in attesting to the efficacy of non-pharmacological interventions for ADHD in criminal justice offender population settings.<sup>256</sup> Young and Cocallis highlighted that the only known program that has been developed to treat those with ADHD and/or those who exhibit antisocial behaviour is the Reasoning and Rehabilitation 2 ADHD (R&R2ADHD) program.<sup>257</sup> This manualised Cognitive Behavioural Therapy group program is specifically designed for adults and adolescents who suffer from ADHD, with the aim of helping them build their pro-social competence.<sup>258</sup> Whilst meta-analytic evidence attesting to an initial R&R program exists,<sup>259</sup> only one study of the efficacy of the R&R2ADHD for problematic/antisocial populations appears in the literature.<sup>260</sup> In this study, 95 community and inpatient adults completed the program. The results indicated that there were significant reductions in problematic outcomes including antisocial behaviour for those who undertook the program. Young and Cocallis proposed that, optimally, treatment for individuals with ADHD in prisoner populations should involve a non-pharmacological measure used in conjunction with a pharmacological intervention, so that the patient-offender will be better able to follow, complete and appreciate the non-pharmacological programs.<sup>261</sup>

### E *Comorbidity in the Criminal Justice Context*

It is important to note at this point, that the identified empirical links between ADHD and the increased risk of coming into contact with the criminal and youth justice systems may be complicated by the fact that ADHD is often comorbid (as previously discussed) with a range of other conditions that are likewise potentially criminogenic.<sup>262</sup> As noted above, such syndromes include CD, ODD, ASPD and SUD to name a few.<sup>263</sup> As such, some key actors have not supported the effort to

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<sup>256</sup> Young and Cocallis (n 46).

<sup>257</sup> Ibid.

<sup>258</sup> Susan Young et al, 'Identification and Treatment of Offenders with Attention-Deficit/Hyperactivity Disorder in the Prison Population: A Practical Approach Based Upon Expert Consensus' (2018) 18(1) *BMC Psychiatry* 1.

<sup>259</sup> LS Joy Tong and David P Farrington, 'How Effective is the "Reasoning and Rehabilitation" Programme in Reducing Reoffending? A Meta-Analysis of Evaluations in Four Countries' (2006) 12(1) *Psychology, Crime & Law* 3.

<sup>260</sup> Susan Young et al, 'A Randomized Controlled Trial Reporting Functional Outcomes of Cognitive-Behavioural Therapy in Medication-Treated Adults with ADHD and Comorbid Psychopathology' (2017) 267(3) *European Archives of Psychiatry and Clinical Neuroscience* 267.

<sup>261</sup> Young et al (n 46).

<sup>262</sup> Wolfgang Retz et al, 'Attention-Deficit/Hyperactivity Disorder (ADHD), Antisociality and Delinquent Behavior over the Lifespan' (2021) 120 *Neuroscience & Biobehavioral Reviews* 236.

<sup>263</sup> Ibid.

address ADHD as an important part of remedying the mental health difficulties in offender populations.<sup>264</sup> Recently, for example, Tully has even suggested that ‘well-intentioned initiatives should not be allowed to create a disproportionate and misguided focus on ADHD as a primary problem in prison mental healthcare.’<sup>265</sup>

We think that, in the circumstances, arguments that ADHD should not be a major focus of criminal justice or criminal justice offender health initiatives, on the basis that it is highly comorbid with other disorders, misses the central proposition of many of the studies and reviews on this topic, that have been conducted thus far.<sup>266</sup> The major thrust of the argument being made by those advocating for a focus on ADHD in the criminal justice area is that there has been little to no current focus or emphasis on it at all. That is certainly the case in Australia as we discuss below. Furthermore, ADHD, ODD, CD and ASPD have highly overlapping symptoms, which begs the question as to how we might best understand them.

Heritability studies comparing many of these disorders point to there being significantly high co-heritability among them. In their 2018 systematic review, Azeredo, Moereira and Barbosa pointed out:

regarding the comorbidity between CD, ODD and ADHD, existing literature seems to be sufficiently consistent to conclude that it may be primarily attributed to genetic influence and unique environmental effects.... There also seems to be sufficient literature to say children with ADHD have a predisposition to manifest behaviours that are common to ODD and CD including antisocial behaviour that these children often display.<sup>267</sup>

In addition, in 2020, van Buitenen et al pointed out that ‘comorbid mental disorders can be described, at least in part, as connected networks.’<sup>268</sup> Furthermore, there is a large amount of research that supports the notion that the comorbidity between ADHD, ODD, CD and ASPD should be conceived through a model of developmental precursors.<sup>269</sup> That is, the experience of ADHD in early childhood can

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<sup>264</sup> Tully (n 252); Foulds and Newton-Howes (n 252).

<sup>265</sup> Tully (n 252).

<sup>266</sup> Eg, Stéphanie Baggio et al, 'Attention Deficit Hyperactivity Disorder as a Neglected Psychiatric Disease in Prison: Call for Identification and Treatment' (2022) 3 *Forensic Science International: Mind and Law* 100071; Young et al (n 260); Baggio et al (n 8); Young et al (n 7).

<sup>267</sup> Andreia Azeredo, Diana Moreira and Fernando Barbosa, 'ADHD, CD, and ODD: Systematic Review of Genetic and Environmental Risk Factors' (2018) 82 *Research in Developmental Disabilities* 10, 14.

<sup>268</sup> Nora van Buitenen et al, 'The Prevalence of Mental Disorders and Patterns of Comorbidity Within a Large Sample of Mentally Ill Prisoners: A Network Analysis' (2020) 63(1) *European Psychiatry* 1.

<sup>269</sup> Theodore P Beauchaine, Stephen P Hinshaw and Karen L Pang, 'Comorbidity of Attention-Deficit/Hyperactivity Disorder and Early-Onset Conduct Disorder: Biological, Environmental, and Developmental Mechanisms' (2010) 17(4) *Clinical Psychology: Science*

be justifiably seen as the starting point of a probabilistic developmental pathway that disproportionately leads toward a series of problematic syndromes represented by ODD, CD and ultimately ASPD.<sup>270</sup> It must be stressed that this pathway is probabilistic, not deterministic.<sup>271</sup> Nevertheless, evidence exists indicating that as an individual continues along this problematic trajectory, the disadvantageous interplay between genetic liabilities and problematic environmental factors increases exponentially the likelihood of increasingly worse outcomes.<sup>272</sup>

In his attempt to downplay the focus of ADHD in criminal justice offender settings, Tully rightly acknowledges that ‘the large majority of individuals with ADHD do not offend.’<sup>273</sup> Nevertheless, it is arguable that the treatment of comorbid mental health conditions, especially mood disorders, is clearly a worthwhile endeavour in attempting to produce the most optimally ‘well’ offender, with a view to reducing the likelihood of potential reoffending. This is particularly pertinent here, given that ADHD will disproportionately be the precursor for the potential development of a series of worse syndromes that are heavily associated with offending, for example, CD and ASPD. Hence, ADHD appears to us to be an ideal focus point for the development of new criminal and youth justice policy aimed at reducing related criminal justice problems, as well as optimising societal functioning.

## **F The Current State of Play and Motivation to Change**

### **1 Acknowledgement of the problem in Australia**

Lane and Chong have previously provided an analysis concerning the level of institutional acknowledgement of the impact that ADHD has had in criminal justice settings across Australia.<sup>274</sup> Their review of the relevant policy and key reports into youth and criminal justice, revealed little to no recognition of the disorder, let alone its impact or any substantive and/or sustained institutional interest in this matter being the subject of further consideration. In the rare circumstances where

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and Practice 327. See also, Elizabeth A Harvey, Rosanna P Breaux and Claudia I Lugo-Candelas, 'Early Development of Comorbidity Between Symptoms of Attention-Deficit/Hyperactivity Disorder (ADHD) and Oppositional Defiant Disorder (ODD)' (2016) 125(2) *Journal of Abnormal Psychology* 154; Wakaho Hayashi and Akira Iwanami, 'Biological Mechanisms of ADHD' (2018) 70(11) *Brain and Nerve = Shinkei Kenkyu No Shinpo* 1265; Azeredo, Moreira and Barbosa (n 267); Atherton et al (n 205).

<sup>270</sup> Eme (n 205).

<sup>271</sup> Ibid.

<sup>272</sup> Andreia Azeredo, Diana Moreira and Fernando Barbosa, 'ADHD, CD, and ODD: Systematic Review of Genetic and Environmental Risk Factors' (2018) 82 *Research in Developmental Disabilities* 10.

<sup>273</sup> Tully (n 252) 2.

<sup>274</sup> Lane and Chong (n 2).

ADHD might be mentioned in the relevant reviews or policy, ADHD is sometimes inconsistently categorised and is rarely acknowledged to be a neurodevelopmental disorder. Dated prevalence statistics, that are quite different to those revealed through recent meta-analyses, also seem to be relied upon often. The application of a consistent and accurate representation of ADHD as a neurodevelopmental disorder, as well as the use of up-to-date international and local research, are both key steps to arriving at a legitimate and accurate understanding of ADHD.

Since Lane and Chong's review, encouraging developments including the publication of the *Australian Evidence-Based Clinical Practice Guideline for ADHD*<sup>275</sup> and the report related to the Senate inquiry into *ADHD Assessment and Support Services*<sup>276</sup> have occurred. Both publications highlight the crucial need for those with ADHD in youth and criminal offender populations to be identified and provided with appropriate treatment and care.<sup>277</sup> Nevertheless, the risk of those with ADHD becoming involved as offenders in youth and criminal justice systems requires significantly more acknowledgment and serious consideration by policy makers. This would be to the benefit of both individuals with ADHD who are at risk of becoming youth or adult offenders, as well as wider society which may be potentially impacted upon by their offending behaviour.

## 2 Motivation for Change

Lane and Chong have also emphasised that one significant motivation towards addressing the overrepresentation of those with ADHD is cost.<sup>278</sup> As noted above, the total cost of ADHD to Australia was estimated to be nearly US\$13 billion for the period 2018 to 2019.<sup>279</sup> ADHD-related criminal justice annual costs in Australia were estimated to be A\$215 million in 2019.<sup>280</sup> Young and Cocallis have suggested that the motivation for redressing the issue of ADHD overrepresentation in criminal justice populations could also lie in reducing the cost associated with ADHD in prison populations.<sup>281</sup> In a relevant 2018 study, Young and colleagues discovered that costs associated with behaviour-related problems and medical treatment in the Scottish prison system appeared to amount to £590 greater per annum for individual prisoners with ADHD when compared to those individuals

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<sup>275</sup> Australian ADHD Guideline Development Group (n 127)

<sup>276</sup> Senate Community Affairs References Committee (n 167)

<sup>277</sup> *Ibid* xi; Australian ADHD Guideline Development Group (n 127) 152-155.

<sup>278</sup> Lane and Chong (n 2)

<sup>279</sup> Sciberras et al (n 32).

<sup>280</sup> Deloitte Access Economics (n 31).

<sup>281</sup> Young and Cocallis (n 46).

without ADHD.<sup>282</sup> Furthermore, when taking into account ADHD prison prevalence rates, they estimated that the annual medical and behaviour-related cost for the Scottish prison system would amount to £11.7 million.

Additionally, Young and Cocallis stress that the appropriate provision of treatment for prisoners with ADHD would likely result in a highly beneficial rate of return for wider society.<sup>283</sup> The same argument may be made for those with ADHD who are considered offenders within youth and criminal justice systems as a whole. As might be assumed, Young and Cocallis base this proposition on the observed efficacy of ADHD treatments outside and inside prison populations.<sup>284</sup> Support for the reduced costs associated with treating ADHD in criminal justice populations is provided in a 2019 study by Freriks et al.<sup>285</sup> Treatment cost effectiveness was measured by using the 'Net Monetary Benefit' (NMB) which represents the fiscal worth of reduced quality-adjusted life years less total treatment costs. It is worth noting that the costs associated with serious delinquency were included in this analysis. Freriks et al found a NMB of US\$95,449 for medication management, US\$88,553 for behavioural treatment, and US\$90,536 for combined treatments.<sup>286</sup> ADHD treatment cost effectiveness in a wider sense was also highlighted in a 2021 systematic review by Dijk et al.<sup>287</sup> They found that:

almost all studies that compared medication or psychosocial treatment to no treatment, placebo, or care as usual indicated that medication and psychosocial treatment were cost-effective compared to the control group. Stimulant treatment appeared to be cost-effective for the treatment of ADHD in children and adolescents.<sup>288</sup>

### **G The Development of Responsible Policy Relating to ADHD and Youth/Criminal Justice**

As Young, Cocallis, Lane and Chong assert in their 2022 review, a 'critical need exists across international jurisdictions for the development and systematic employment of approaches aimed at

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<sup>282</sup> Susan Young et al, 'The Economic Consequences of Attention-Deficit Hyperactivity Disorder in the Scottish Prison System' (2018) 18(1) *BMC Psychiatry* 1.

<sup>283</sup> Young and Cocallis (n 46).

<sup>284</sup> *Ibid.*

<sup>285</sup> Roel D Freriks et al, 'Cost-Effectiveness of Treatments in Children with Attention-Deficit/Hyperactivity Disorder: A Continuous-Time Markov Modeling Approach' (2019) 4(2) *MDM Policy & Practice* 2381468319867629.

<sup>286</sup> *Ibid.*

<sup>287</sup> Hermien H Dijk et al, 'Cost-Effectiveness and Cost Utility of Treatment of Attention-Deficit/Hyperactivity Disorder: A Systematic Review' (2021) 31(9) *Journal of Child and Adolescent Psychopharmacology* 578.

<sup>288</sup> *Ibid* 578.



optimising early identification and treatment of ADHD.’<sup>289</sup> To those ends, there are some encouraging aspects of the *Australian Evidence-Based Clinical Practice Guidelines for Attention-Deficit Hyperactivity Disorder (ADHD)* that recommend treatment approaches for correctional settings. However, this guideline is arguably underdeveloped and insufficiently tailored to the particularities of State and Territorial jurisdictions in Australia. Consequently, detailed Australian ADHD youth and criminal justice ‘Expert Consensus Statements’ are needed to provide specific guidance on how to best identify, treat and support those with ADHD within the Australian jurisdiction. The 2018 UK Expert Consensus Statement is an excellent example of a comprehensive detail-oriented, reasonable, responsible, and systematic approach to the management of ADHD, that could potentially prevent involvement or further involvement of those with ADHD in youth and criminal justice systems as offenders.

### ***1 UK Expert Consensus Statement of 2018***

While developed with reference to reducing the prevalence of individuals with ADHD in adult prison settings, the UK ‘Expert Consensus Statement’ provides a comprehensive framework for the reduction of prevalence of those with ADHD in criminal and youth justice populations as a whole.<sup>290</sup> In reporting on the development of this statement, Young et al outline the deliberations of a collaborative meeting hosted by the UK ADHD Partnership ([www.UKADHD.com](http://www.UKADHD.com)) in November 2016 of researchers, clinicians, criminal justice staff, and ADHD sufferers who possessed expertise in ADHD and mental health in offender populations.<sup>291</sup> This meeting resulted in the development of an ‘Expert Consensus Statement’ that intended to provide practitioners with practical advice around optimising ADHD identification in offender populations, attending to the needs of those diagnosed, providing effective treatment and acknowledging the need for multiagency liaison in relation to the problem.<sup>292</sup> The Consensus Statement identified the following three main areas as requiring consistent future attention: (a) identification and assessment; (b) interventions and treatment; and (c) care management and multiagency liaison.<sup>293</sup>

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<sup>289</sup> Young et al (n ) 44.

<sup>290</sup> Young et al (n 260).

<sup>291</sup> Ibid.

<sup>292</sup> Ibid.

<sup>293</sup> Ibid.

A more detailed representation of how those with ADHD in prison systems might be better managed according to the Consensus Statement is illustrated below in figure 2.<sup>294</sup>

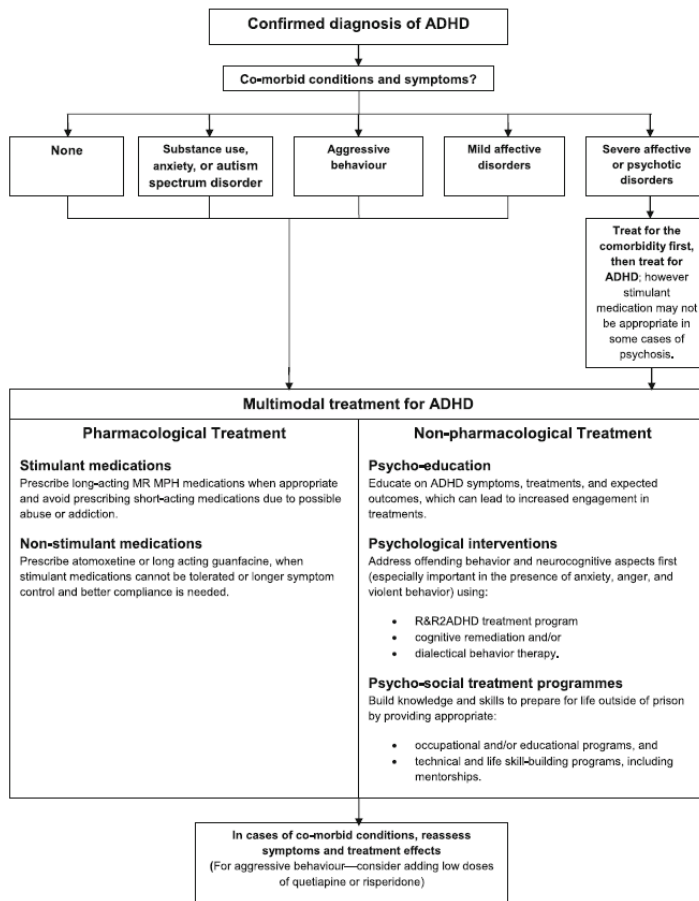


Figure 2: Optimal processing of prisoners with ADHD

## 2 A Responsible Path Forward for Managing the Relationship Between ADHD and Criminal Justice in Australia

In November 2020, the ADHD Foundation ([www.adhdfoundation.org.au](http://www.adhdfoundation.org.au)) hosted the ‘ADHD, Youth, Justice and the Law’ virtual conference. The conference involved presentations from professionals in the relevant fields including Criminology, Psychology, Psychiatry, Law, Policing, Paediatrics, and Government.

<sup>294</sup> Ibid.

These presentations covered a variety of topics including the biological mechanisms related to ADHD, criminal and youth justice offender population overrepresentation, family and relationship legal issues, healthcare service provision, forensic setting management, as well as comorbidity with substance use. The conference ended with an agreement to pursue the idea of designing Australian Consensus Statements with respect to the identification and treatment of offenders with ADHD in youth and criminal justice populations. We certainly endorse any effort towards professionals coming together to produce these consensus statements. Such an endeavour will be crucial in advocating for needed change and potentially convincing youth and criminal justice policy makers and managers that such change is necessary.

The UK example provides a good template for the type of processes that should be taken into account when producing our national consensus statements. However, ideas and agreements on best policy and practice within Australia specifically need to be addressed. The elements of: (a) identification and assessment; (b) interventions and treatment; and (c) care management and multiagency liaison, in our local context will specifically need to be discussed. For instance, Australia as a Federation does not have a single criminal or youth justice system, but several. Criminal justice systems, as well as health and education regimes are state-based and therefore several state-specific strategies might need to be developed.

Given the overrepresentation of First Nations people in criminal and youth justice offender populations, appropriate considerations and consultations need to be had in that regard. First Nations representatives need to be involved in both the development of the consensus statements, and the management of any accompanying policy. Similarly, the development of specific culturally sensitive psychosocial interventions will need to be discussed given the unfavourable perceptions of ADHD pharmacological interventions held by some quarters of the First Nations communities.<sup>295</sup>

Facilitating local capacities around continued research and development of efficacious interventions as well as the possibility of building international alliances to achieve this, must be considered. Capacities, policy, and procedure to aid in the early detection and treatment of ADHD prior to any potential criminal justice contact, or at least at the earliest level of an individual's contact with Australian criminal justice systems will need to be considered. In addition, best mechanisms for support of those identified and their family should be contemplated. Finally, consideration of ways to deliver relevant

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<sup>295</sup> Lane and Chong (n 2).

psychoeducation to those at every level of our criminal justice systems should be placed on the agenda.

#### **IV Conclusion**

In this article, we provided an extensive description of ADHD, its historical, biological, and environmental underpinnings. We discussed the overrepresentation of those with ADHD in youth and criminal justice populations, the associated costs for society, ways in which the problem is currently acknowledged, and a potential way forward. Not all of those with ADHD will end up in the criminal justice system. This is good news. Nevertheless, ADHD may be the starting point for an upward escalation of problem behaviours that are the basis for more serious syndromes and potentially, ultimately high-level criminality. Efficacious treatments for ADHD exist, yet their appropriate use and application, both generally, as well as in offender populations, is complicated by a lack of appropriate identification of those with the disorder. A plan to address the issue of ADHD in Australian criminal justice settings is desperately needed. We believe the development and promulgation of youth and criminal justice consensus statements by youth and criminal justice policy makers and managers, may be the best way to bring about necessary change.