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ADHD, Impulsivity, and Rule-Breaking Behaviour: Neurodevelopmental and Psychosocial Pathways to Forensic Vulnerability

TDAH, impulsividad y conducta transgresora: vías neuroevolutivas y psicosociales hacia la vulnerabilidad forense

TDAH, impulsivité et comportements transgressifs : parcours neurodéveloppementaux et psychosociaux menant à la vulnérabilité médico-légale

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## ABSTRACT

Attention-deficit/hyperactivity disorder (ADHD) is characterised by developmentally inappropriate patterns of inattention and/or hyperactivity-impulsivity, yet its behavioural expression frequently extends beyond these core symptom domains. Difficulties in inhibitory control, executive functioning and emotion regulation may contribute to rapid, poorly modulated responses that are externally interpreted as deliberate non-compliance, oppositionality or rule-breaking. This narrative review considers how neurodevelopmental vulnerabilities associated with ADHD may interact with childhood adversity, affective dysregulation and contextual risk factors to increase behavioural and, in some individuals, forensic vulnerability. The review emphasises that ADHD should not be conceptualised as a direct or deterministic cause of offending. Rather, superficially similar rule-violating behaviours may arise through heterogeneous

pathways, including impaired response inhibition, heightened emotional reactivity, trauma-related threat processing, psychiatric comorbidity and adverse social environments. A formulation-based approach is therefore required to distinguish purposeful rule violation from behaviour occurring in the context of compromised self-regulation. Such differentiation has implications for assessment, education, rehabilitation and prevention. Understanding the mechanisms that precede behaviour may support proportionate accountability while also identifying modifiable targets for intervention.

**Keywords:** attention-deficit/hyperactivity disorder; impulsivity; inhibitory control; emotion dysregulation; adverse childhood experiences; rule-breaking; offending behaviour; forensic formulation

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**RESUMEN**

El trastorno por déficit de atención e hiperactividad (TDAH) se caracteriza por patrones de falta de atención y/o hiperactividad-impulsividad inadecuados para la etapa de desarrollo, aunque su manifestación conductual suele ir más allá de estos ámbitos sintomáticos fundamentales. Las dificultades en el control inhibitorio, el funcionamiento ejecutivo y la regulación emocional pueden contribuir a respuestas rápidas y mal moduladas que se interpretan externamente como desobediencia deliberada, actitud oposicionista o incumplimiento de las normas. Esta revisión narrativa analiza cómo las vulnerabilidades del desarrollo neurológico asociadas al TDAH pueden interactuar con las adversidades de la infancia, la desregulación afectiva y los factores de riesgo contextuales para aumentar la vulnerabilidad conductual y, en algunas personas, la vulnerabilidad forense. La revisión hace hincapié en que el TDAH no debe conceptualizarse como una causa directa o determinista de la delincuencia. Más bien, los comportamientos de incumplimiento de las normas, aunque superficialmente similares, pueden surgir a través de vías heterogéneas, entre las que se incluyen la alteración de la inhibición de la respuesta, una mayor reactividad emocional, el procesamiento de amenazas relacionado con el trauma, la comorbilidad psiquiátrica y los entornos sociales adversos. Por lo tanto, se requiere un enfoque basado en la formulación para distinguir la infracción deliberada de las normas del comportamiento que se produce en el contexto de una autorregulación comprometida. Dicha diferenciación tiene implicaciones para la evaluación, la educación, la rehabilitación y la prevención. Comprender los mecanismos que preceden al comportamiento puede favorecer una responsabilidad proporcional, al tiempo que permite identificar objetivos modificables para la intervención.

**Palabras clave:** trastorno por déficit de atención e hiperactividad; impulsividad; control inhibitorio; desregulación emocional; experiencias adversas en la infancia; incumplimiento de las normas; comportamiento delictivo; formulación forense

**RÉSUMÉ**

Le trouble déficitaire de l'attention avec hyperactivité (TDAH) se caractérise par des schémas d'inattention et/ou d'hyperactivité-impulsivité inadaptés au stade de développement de l'enfant ; cependant, son expression comportementale dépasse souvent ces domaines symptomatiques fondamentaux. Des difficultés au niveau du contrôle inhibiteur, des fonctions exécutives et de la régulation émotionnelle peuvent contribuer à des réactions rapides et mal modulées, qui sont interprétées par l'entourage comme un refus délibéré de se conformer, une attitude oppositionnelle ou une transgression des règles. Cette revue narrative examine comment les vulnérabilités neurodéveloppementales associées au TDAH peuvent interagir avec les difficultés vécues pendant l'enfance, la dérégulation affective et les facteurs de risque contextuels pour accroître la vulnérabilité comportementale et, chez certaines personnes, la vulnérabilité sur le plan judiciaire. Cette revue souligne que le TDAH ne doit pas être conceptualisé comme une cause directe ou déterministe de la délinquance. Au contraire, des comportements de transgression des règles, superficiellement similaires, peuvent résulter de mécanismes hétérogènes, notamment une inhibition de la réponse altérée, une réactivité émotionnelle accrue, un traitement des menaces lié à un traumatisme, une comorbidité psychiatrique et des environnements sociaux défavorables. Une approche fondée sur la formulation est donc nécessaire pour distinguer la transgression délibérée des règles des comportements survenant dans un contexte d'autorégulation compromise. Une telle différenciation a des implications pour l'évaluation, l'éducation, la réinsertion et la prévention. La compréhension des mécanismes qui précèdent le comportement peut favoriser une responsabilisation proportionnée tout en identifiant des cibles modifiables pour l'intervention.

**Mots-clés :** trouble déficitaire de l'attention/hyperactivité ; impulsivité ; contrôle inhibiteur ; dérégulation émotionnelle ; expériences défavorables durant l'enfance ; transgression des règles ; comportement délictueux ; formulation médico-légale



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## INTRODUCTION

Behavioural manifestations such as excessive verbal intrusions, impaired response inhibition, affective reactivity and recurrent rule-violating behaviour may be interpreted as intentional non-compliance or oppositionality. Within ADHD, however, some of these presentations may also reflect underlying neurocognitive and self-regulatory difficulties, particularly impairments in inhibitory control, executive functioning and emotion regulation (Barkley, 1997; Shaw et al., 2014). The distinction is clinically important because observable behaviour alone does not establish the psychological mechanism through which that behaviour emerged.

ADHD is a neurodevelopmental disorder with substantial heterogeneity in symptom presentation, functional impairment and developmental course (Thapar & Cooper, 2016). Impulsivity is central to the disorder, but impulsive behaviour is not synonymous with antisociality, intentional defiance or criminality. Equally, a diagnosis of ADHD does not provide a sufficient explanation for persistent rule-breaking. Behavioural outcomes develop within broader

developmental systems in which neurocognitive vulnerabilities interact with family context, educational experiences, adversity, comorbidity, substance use, peer relationships and socioeconomic conditions. A clinically useful account must therefore move beyond diagnostic labelling and examine the functional processes that precede and maintain behaviour.

The present narrative review synthesises literature concerning inhibitory control, emotion dysregulation, adverse childhood experiences (ACEs), rule-breaking and offending in ADHD. Its central argument is that phenotypically similar behaviours may arise through distinct pathways and should therefore be understood through differential, formulation-informed assessment. Particular attention is given to the implications of this position for forensic vulnerability, educational responses and prevention.

## Impulsivity, Executive Control, and Behavioural Inhibition

Impulsivity represents a core neurobehavioural dimension of ADHD and has long been associated with difficulties in behavioural inhibition and executive control (Barkley, 1997). Inhibitory control enables an individual to suppress a dominant or immediately rewarding response long enough to evaluate contextual demands, anticipate consequences and select a more adaptive

alternative. When this process is inefficient, behaviour may become more stimulus-driven and less responsive to delayed consequences.

This framework provides one explanation for why some behaviours that appear oppositional may not be fully planned or instrumental. Interrupting, acting before instructions are completed, leaving a situation abruptly, reacting physically or verbally during heightened arousal, and repeatedly breaching expectations may sometimes reflect failures of response inhibition rather than a stable intention to challenge authority. This distinction does not imply an absence of agency or responsibility. Instead, it highlights the need to assess the degree of planning, emotional arousal, situational triggers, reinforcement history and capacity for behavioural control in the period immediately preceding an incident.

Executive dysfunction is also unlikely to operate in isolation. Difficulties with working memory, prospective planning and sustained attention may reduce the salience of rules that are temporally distant from immediate environmental cues. Consequently, an individual may understand a rule when calm and still fail to apply it consistently in fast-moving or emotionally charged contexts. This discrepancy between knowledge and performance is particularly relevant to behavioural formulation because it cautions against inferring motivation solely from repeated failure to comply.

### **Emotion Dysregulation as an Amplifying Mechanism**

Emotion dysregulation may intensify the behavioural consequences of reduced inhibitory control. Meta-analytic evidence indicates that adults with ADHD experience greater emotion dysregulation than non-ADHD comparison groups, including difficul-

ties involving emotional lability and negative emotional responses (Beheshti et al., 2020). A later systematic review similarly identified recurrent difficulties in emotion regulation among adults with ADHD, while also emphasising heterogeneity in measurement, comorbidity and study design (Soler-Gutiérrez et al., 2023). These findings support the clinical relevance of emotion regulation without requiring it to be treated as a simple or universal feature of every individual with ADHD.

Affective arousal can narrow attention, increase urgency and reduce the time available for reflective decision-making. Where heightened emotional reactivity co-occurs with weak inhibitory control, behavioural responses may become rapid and contextually maladaptive. Anger, perceived criticism, frustration or interpersonal rejection may therefore function as proximal triggers for impulsive acts in some individuals. Importantly, the same observable act may have a different psychological function when it occurs after escalating affect than when it is planned in advance for instrumental gain.

This distinction has direct forensic relevance. Risk formulation benefits from differentiating affectively driven, disinhibited behaviour from deliberate and goal-directed behaviour because the mechanisms, warning signs and potentially modifiable targets differ. Interventions focused on emotion identification, delay of response, environmental structure and coping may be relevant where dysregulation predominates, whereas other patterns of rule-breaking may require a different formulation entirely.

### **ADHD, Childhood Adversity, and Developmental Complexity**

The relationship between ADHD and behavioural dysregulation becomes more complex when childhood adversity is con-

sidered. A systematic review and meta-analysis of 70 studies involving nearly four million participants reported an association between ACE exposure and subsequent ADHD, with greater exposure associated with greater vulnerability; however, the included observational literature was highly heterogeneous and cannot by itself establish a simple causal pathway (Zhang et al., 2022). A subsequent systematic review likewise concluded that ACEs and ADHD are positively associated while stressing questions of temporality, bidirectionality, comorbidity and confounding (Wojtara et al., 2023).

Clinically, this complexity matters because ADHD and trauma-related difficulties may share partially overlapping behavioural features, including attentional disruption, affective reactivity, impulsivity, sleep disturbance and problems with behavioural self-regulation. Developmental adversity may additionally shape threat appraisal, interpersonal expectations and emotional processing. Consequently, a behaviour such as abruptly leaving a classroom, responding aggressively to perceived criticism or refusing an instruction cannot be assumed to have a single diagnostic meaning.

A differential formulation should therefore consider whether a presentation is primarily associated with neurodevelopmental disinhibition, trauma-related hypervigilance, learned behavioural contingencies, affective dysregulation, comorbid psychopathology or some interaction among these processes. This is particularly important where adverse experiences are extensive, because diagnostic overshadowing can occur in either direction: trauma-related responses may be attributed to ADHD, while neurodevelopmental difficulties may be interpreted solely through a trauma framework.

### **From Rule-Breaking to Forensic Vulnerability**

ADHD is disproportionately represented in criminal justice populations. Meta-analytic evidence has demonstrated elevated prevalence among incarcerated populations relative to general population estimates (Young et al., 2015), and longitudinal evidence indicates that childhood ADHD is associated with increased risk of later arrests, convictions and incarceration (Mohr-Jensen & Steinhausen, 2016). These associations are clinically important, but they should not be interpreted as evidence that ADHD directly causes offending.

Forensic vulnerability is more appropriately conceptualised within a multifactorial developmental framework. Difficulties in inhibitory control, executive functioning and emotion regulation may coexist with childhood adversity, educational disruption, substance misuse, unstable relationships, socioeconomic disadvantage and psychiatric comorbidity. Some of these factors may compound one another across development. Repeated school exclusion, for example, may reduce access to protective educational environments while increasing exposure to deviant peer contexts; substance use may further weaken behavioural control; and chronic interpersonal conflict may increase the frequency of high-arousal situations in which impulsive responding is most likely.

The practical implication is that diagnosis should not substitute for risk formulation. Forensic case formulation seeks to organise developmental, psychological, situational and contextual information into an account of how harmful behaviour emerged and what may maintain or interrupt it (Hart et al., 2011). In an individual with ADHD, the relevant question is therefore not whether ADHD “explains” an offence, but whether specific ADHD-related impairments contributed to a particular pathway to harm-

ful behaviour and how they interacted with other risk and protective factors.

Psychological explanation should also be distinguished from exculpation. Identifying neurodevelopmental or trauma-related mechanisms does not remove individual accountability. Rather, mechanism-focused assessment may improve the precision of rehabilitation by identifying modifiable factors that can be targeted to reduce recurrence. Community work with offenders with ADHD similarly highlights the importance of recognising and managing ADHD-related needs within broader rehabilitation and probation contexts (Young et al., 2014).

### **Educational and Preventive Implications**

The distinction between intentional non-compliance and behaviour arising in the context of compromised self-regulation is equally important in educational settings. Children and adolescents with ADHD may display impulsivity, attentional dysregulation, reduced inhibitory control and difficulty modulating affective responses, behaviours that can be experienced by adults and peers as disruptive or deliberately oppositional (DuPaul & Stoner, 2014). If the response is exclusively punitive, the immediate consequence may be addressed without identifying the process that made the behaviour more likely.

This does not mean that boundaries should be removed. Predictable expectations and proportionate consequences can be important components of behavioural support. The critical issue is whether consequences are combined with assessment of antecedents, skills deficits, environmental demands and reinforcement patterns. Evidence-based psychosocial approaches for children and adolescents with ADHD support interventions that address behavioural functioning and environmental contingencies

rather than relying solely on punishment (Evans et al., 2018). Clinical guidelines similarly emphasise multimodal assessment and management, including behavioural and environmental strategies alongside other indicated interventions (Wolraich et al., 2019).

Prevention is therefore best understood as more than early diagnosis. It includes reducing repeated cycles in which neurodevelopmental difficulty leads to behavioural incidents, punitive responses, exclusion, deteriorating self-concept and further disengagement. A formulation-informed approach can preserve accountability while increasing the probability that the response addresses the mechanism responsible for the behaviour.

### **Clinical and Forensic Formulation**

A formulation-based assessment of recurrent rule-breaking should examine several dimensions. First, the temporal characteristics of the behaviour are relevant: rapid acts occurring during high arousal may suggest different mechanisms from behaviour involving preparation and concealment. Second, the assessor should consider the individual's capacity to anticipate consequences in the relevant context rather than relying only on retrospective knowledge of rules. Third, patterns of emotional activation, perceived threat, rejection or frustration should be examined alongside executive functioning and attentional demands. Fourth, developmental adversity, comorbidity, substance use, peer context and reinforcement contingencies should be integrated rather than treated as peripheral background variables.

Such an approach also guards against two opposing errors. The first is moral over-attribution, in which dysregulated behaviour is assumed to reflect deliberate

defiance or antisocial motivation. The second is diagnostic over-attribution, in which ADHD is used as a global explanation for behaviour that may be planned, reinforced, trauma-related or better accounted for by another condition or contextual process. Both errors reduce clinical precision. Functional understanding requires attention to the individual pathway rather than the surface form of the behavior alone.

### **Limitations and Directions for Future Research**

Several limitations in literature constrain strong conclusions. ADHD is heterogeneous, and studies vary in diagnostic procedures, age, sex distribution, comorbidity and treatment status. Emotion regulation is also operationalised inconsistently, making it difficult to determine whether observed difficulties represent a core dimension of ADHD, a transdiagnostic process or the influence of common comorbid conditions. Similarly, associations between ACEs and ADHD are largely derived from observational research and are vulnerable to residual confounding, retrospective reporting bias and uncertainty concerning temporal direction (Zhang et al., 2022; Wojtara et al., 2023).

The literature linking ADHD with offending also requires careful interpretation. Elevated group-level risk does not permit accurate inference about any particular individual, and criminal justice samples may disproportionately represent people with multiple co-occurring disadvantages. Future research would benefit from longitudinal designs capable of separating neurodevelopmental symptoms, adversity, comorbidity and environmental processes across developmental stages. Greater attention should also be paid to protective factors, including

supportive relationships, educational engagement, treatment access and adaptive coping, because vulnerability is not equivalent to inevitability.

Further work is needed to test pathway-specific models of rule-breaking. Studies distinguishing impulsive, affectively driven, reactive and instrumental forms of harmful behaviour may clarify when ADHD-related impairments are most clinically relevant. This would strengthen both forensic formulation and prevention by moving the literature away from broad diagnostic associations toward mechanisms that can be assessed and modified.

### **CONCLUSION**

ADHD should neither be treated as a direct explanation for rule-breaking nor excluded from consideration when behavioural dysregulation is recurrent. Difficulties in inhibitory control, executive functioning and emotion regulation may contribute to rapid or poorly modulated behaviour, particularly when they interact with developmental adversity and adverse environmental conditions. At the same time, superficially similar rule violations may arise through trauma-related threat processing, learned contingencies, comorbidity or deliberate instrumental behaviour.

The most clinically defensible position is therefore one of differential formulation. Understanding what precedes, reinforces and maintains behaviour allows practitioners to distinguish explanation from excuse, preserve proportionate accountability and identify modifiable targets for intervention. In educational and forensic contexts alike, this approach offers a more precise basis for prevention and rehabilitation than either punitive interpretation or diagnostic reductionism.



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