Psihološka istraživanja, Vol. XXIX (1) 2026.
103–122

UDK 159.922.76:616.8
616.89-053.2
TIP ČLANKA: Originalni naučni rad
DOI: 10.5937/PSISTRA0-60223

ADHD and Problem Behaviour: A Neuropsychological Approach[1]

Staša Lalatović[2] **(https://orcid.org/0000-0002-9701-2117)**
University of Belgrade, Faculty of Special Education and Rehabilitation

Branislava Popović Ćitić (https://orcid.org/0000-0002-1076-5838)
University of Belgrade, Faculty of Special Education and Rehabilitation

Nadežda Krstić (https://orcid.org/0000-0002-6525-2669)
University of Belgrade, Faculty of Special Education and Rehabilitation

Viktor Pavlović (https://orcid.org/0000-0003-0312-1548)
Institute of Mental Health, Belgrade
University of Singidunum, Faculty of Media and Communication

Evidence suggests that Attention-Deficit/Hyperactivity Disorder (ADHD) occurs more frequently among children and adolescents with problem behaviour than in the general population. This has often led to the conclusion that ADHD represents a specific risk factor for the development of various forms of delinquent behaviour. Rather than accepting this assumption uncritically, a more precise understanding of the complex relationship between ADHD and problem behaviour requires an examination of the underlying neurocognitive mechanisms involved in the emergence and functioning of both ADHD and different forms of problem behaviour. This paper places particular emphasis on executive and verbal functions, which have proven especially important in clarifying this association, as well as on the domain of social cognition, whose relevance in this context has received increasing attention. In addition, neurobiological mechanisms that may contribute to the co-occurrence of ADHD and conduct disorder (CD) are discussed. Beyond the conclusion that ADHD in itself constitutes a (limited) risk factor primarily for impulsive, less violent forms of problem behaviour, this paper underscores the importance of neuropsychological monitoring of children and adolescents with behavioural difficulties. Particular attention should be directed toward individuals with CD, given the implications of such monitoring for the further development of therapeutic approaches.

Keywords: ADHD, problem behaviour, conduct disorder, neuropsychology

1 This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Contract No. 451-03-34/2026-03/200096)

2 stasalalatovic@fasper.bg.ac.rs

Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder which is characterized by a persistent pattern (lasting at least six months) of inattention and/or hyperactivity-impulsivity, which has a direct negative effect on the academic, work or social functioning and which surpasses the limits of normal variability expected for the given age and level of intellectual functioning (World Health Organization, 2022). According to the previous revision of the International Classification of Diseases (ICD-10), which is still applied in the domestic clinical context, this disorder corresponds to the diagnosis of hyperkinetic disorder (World Health Organization, 2016). ADHD increases the risk of different forms of problem behavior (Sibley et al., 2011; Pratt et al., 2002; Wojciechowski, 2021), and the prevalence of ADHD symptoms is significantly increased in delinquent populations (Baggio et al., 2018; Young et al., 2015). Starting from childhood, a high degree of comorbidity between ADHD and disruptive behavior disorders is observed (Elia et al., 2008; Taurines et al., 2010). Children categorized as ADHD + Conduct Disorder – CD/Conduct-dissocial Disorder are, as such, at the highest risk of developing later delinquent forms of behavior, compared to children without a diagnosis, with a diagnosis of ADHD, and even ADHD + Oppositional Defiant Disorder – ODD (Sibley et al., 2011). Later in life, individuals with ADHD are more prone to committing various kinds of violations compared to those without ADHD (Fletcher & Wolfe, 2009). Accordingly, individuals with ADHD are at higher risk of being arrested, convicted, and detained during adolescence and adulthood (Mohr-Jensen & Steinhausen, 2016). The estimated prevalence of ADHD in prison populations is 25,5%, with percentage values for younger and older prisoners being on a similar level (30,1% and 26,2%) (Young et al., 2015). Additionally, an ADHD diagnosis is considered a risk factor for the occurrence of recidivism (Philipp-Wiegmann et al., 2018). At the same time, ADHD is considered to be a heterogeneous disorder that encompasses different clinical types, including predominantly inattentive, predominantly hyperactive-impulsive, and combined types (World Health Organization, 2022). In this context, individuals who belong to a predominantly hyperactive-impulsive type exhibit the highest rate of criminal activity, and the likelihood of being caught is higher in comparison to other types. The thoughtlessness that is characteristic of this type of ADHD is additionally confirmed by the finding that these individuals are most commonly perpetrators of quick criminal acts such as robberies and thefts (Fletcher & Wolfe, 2009).

However, one should be careful in drawing conclusions and cautious in generalizing obtained results. The correlation – in this case between ADHD profiles and different types of problem behavior – does not imply causation (Lynam & Henry, 2004). Also, high comorbidity with all forms of psychopathology, including neurodevelopmental, internalizing, and

externalizing disorders, is almost certainly a feature of ADHD regardless of its basic form (see, for example, Gnanavel et al., 2019). Accordingly, a child with isolated difficulties with impulsivity, attention, or motor activity is most likely an exception rather than the rule. Additionally, the obtained values for such relationships vary from study to study. We encounter the same challenges that we observe when analyzing comorbid disorders of ADHD when it comes, for example, to juvenile delinquent behavior (Beaudry et al., 2021).

How much can understanding the basic cognitive structure of the disorder and its neurobiological basis help us in disentangling the complexity of the inherent connection of ADHD and problem behavior, especially in the context of understanding the origin, nature, and course of delinquent behavior? The potential importance of the neuropsychology of ADHD in clarifying the different categories of problem behavior in both young and old (from behavior contrary to moral norms to violent behavior) was recognized many decades ago. The neurocognitive ("neuropsychological") deficits that form the backbone of ADHD (impulsivity-hyperactivity to a greater degree than inattentiveness) represent a risk factor for the development of several forms of problem behavior (Pratt et al., 2002; Retz et al., 2021). At the same time, disorders related to neurocognitive maturing, many out of the range characteristic for ADHD, have shown to be significant predictors of problem behavior, especially the kind seen in adult populations (Young & Cocallis, 2021), though some of them are closely related to what we consider "basic cognitive deficit", that is, the core of ADHD (Barkley, 1997). Last but not least, considering many authors have described ADHD as one of the possible developmental starting points toward later delinquency (Babinski et al., 1999; Patterson et al., 2000), understanding the nature of this relationship is important from an early intervention standpoint (Pratt et al., 2002).

The idea of behavior that is at odds with social and legal societal norms, even outside the scope of what is described as delinquent, can include numerous and completely heterogenous behavioral dimensions which are additionally dependent on an individual's age, and as such can equally incorporate cases that are vaguely indicated as "bad behavior" in early childhood along with serious criminal acts in youth or adult age. Attempts to unravel and more precisely demarcate such behavior by adding distinct psychopathological categories to large classification systems have resulted only in partial gains. As Michael Rater previously very precisely stated about the criteria for the then valid DSM-III, a child that exhibits symptoms of "socially disruptive" behavior could be (even excluding all children that could be subsumed under any of the, in that time, ADD – "attention deficit disorder" diagnoses) classified into at least 10 other diagnostic categories (Hirshbein, 2021). Problems such as these persist even today, though at a smaller scale, while every glance into the past contains even more challenges. The criteria of "large" classification systems (World Health Organization, along with DSM), though now almost equal, defined participants of studies on which empirical

evidence is based differently at different times. Additionally, parts of many studies lean on criteria borrowed from the field of criminology. Hence, as blurring the line between a "problematic child" and an "incipient delinquent" can, in this context, have a unifying function (Wright, 2017), we've decided on a wider conceptualization of such behavior when analyzing literature. This is why we made the choice to use the term "problem behavior" as a wider conceptual frame that allows the integration of differently defined issues in behavior that are connected to ADHD, including situations where the source material did not precisely define a diagnosis or category of behavior. Nevertheless, it is important to keep in mind that a majority of recent studies (compared to longitudinal studies that began earlier) explicitly rely on the narrow definition of CD and that this, in spite of the obvious benefits, does not always imply the (expected) consistency among samples. Split between terminology that is either overly broad or overly specific, we've decided to use the criteria as they were formulated originally, while striving to clarify the chosen broad term of "problem behavior" wherever possible or necessary. In Table 1, we've given an overview of all forms of "problem behavior" used in this article, in accordance with the terms used in the original literature.

Table 1

Overview of terms used in this article

Term	Definition	Reference
problem behavior	a series of deviations from societal norms defined as problematic, which can lead to different forms of sanctions and are associated with negative consequences or difficulties for the individual	Jessor, 2016
disruptive disorders	a group of conditions characterized by aggression issues, impulse control issues, and difficulties with self-control, whereupon the behavior often puts others at risk and breaks societal norms	Milone & Sesso, 2022
conduct disorder	a repetitive and persistent pattern of behavior that violates the basic rights of others or major age-appropriate cultural or societal norms, rules, or laws	World Health Organization, 2022
oppositional defiant disorder	a persistent pattern of markedly defiant, disobedient, provocative, or vindictive behavior that occurs more frequently than is typical for individuals of comparable age and developmental level	World Health Organization, 2022
delinquent behavior	a wide range of behaviors, ranging from socially unacceptable behavior that occurs in early childhood to violent and destructive illegal behavior	Dryfoos, 1990
criminal behavior	behavior that represents the breaking of a criminal law	Sutherland et al., 1992

Cognitive deficits in ADHD and problem behavior

Numerous warnings had already accumulated until the early 1980s about the existence of "neuropsychological" deficits in adolescent and older delinquent populations. There is a proportionally higher rate of occurrence of neurological soft signs (for example, difficulties in fine or gross motor function, muscle imbalance, presence of associated movements), but also speech impediments (Wolff et al., 1982), cognitive profiles indicating frontal lobe disorder (Yeudall et al., 1982), learning disabilities (McKay & Brumback, 1980). At the same time, in the context of neuropsychological profile, associations are made between delinquency and hyperactivity, whether in the sense of connecting criminal activity with severe symptoms of hyperactivity (Virkkunen & Nuutila, 1976), or by stating that delinquents that are simultaneously hyperactive, apart from their infractions beginning at an earlier age and being more severe than for non-hyperactives, tend to exhibit significantly more precursors of neurodevelopmental disorder (Offord et al., 1979). The data is further confirmed by a neuropsychological study of a sample of nearly seven hundred thirteen-year-olds, whose results show that in the domain of verbal, visuospatial and visuomotor skills adolescent delinquents score significantly lower than non-delinquent counterparts, while those who are simultaneously diagnosed with ADD (a category later replaced by ADHD) have even larger deficits in addition to verbal memory issues (Moffitt & Silva, 1988). Further study of this group showed that the lack of these verbal skills was, in fact, most strongly correlated to delinquent behavior (Moffitt et al., 1994). Additional testing of executive functions on the same sample has shown significant developmental deviations in groups of delinquents with hyperactivity, but not in groups that exhibited only delinquency or only ADD (Moffitt & Henry, 1989). Apart from pointing to the role of neuropsychological deficits as a risk factor for the occurrence of delinquent behavior, Moffitt's study highlights the two cognitive domains potentially most important for understanding different forms of problem behavior, and their association with ADHD – language and executive functions.

Verbal functions. Lower scores on verbal assessment tasks are commonly found among youth with problem behavior (Chow et al., 2022; Moffitt & Silva, 1988; Wolff et al., 1982) and stand out as robust predictors of delinquent outcomes (Moffitt et al., 1994; Walters, 2022). Additionally, it has been shown that delinquents with a history of ADD exhibit more severe verbal skill deficits compared to groups of "pure" delinquents (Moffitt & Silva, 1988). Taking into account these findings and data showing lower verbal reasoning in children with ADHD (Andreou et al., 2005), it is no surprise that many authors have posed the question of whether the connection between a deficit in verbal skills and CD could be explained by a comorbidity of CD and ADHD (Smith et al., 2011). The results of the study by Smith and colleagues (2011) suggest

that low verbal skills are not a significant risk factor for CD after controlling for ADHD. Further, it has been shown that there is a significant covariance between verbal abilities and CD, but the majority of this covariance is related to influences shared with ADHD.

Nevertheless, numerous studies about language impairments suggest a possible role in generating problem behavior, some even postulating a left-hemisphere dysfunction in this population (Lynam & Henry, 2004). Luria (Luria, 1961) also points out the significance of orderly language development for establishing adequate behavioral regulation. According to his findings, the abstract and generalizing function of speech is an essential instance in achieving behavioral self-regulation, ranging from the inhibition of simple behavioral patterns to more complex schemes. Luria's work with children with intellectual impairments has confirmed the importance of speech for behavioral regulation, especially its' role in analyzing new situations and connecting previous and current information to adapt behavior to existing rules (Luria, 1963 as cited by Loney et al., 1998). In accordance with this idea, a deficit in verbal ability has a possible (negative) effect on private/inner speech actualization, which is an important factor of behavioral regulation (Loney et al., 1998). Later studies confirm the role of language skills in establishing self-regulation, with self-regulation emerging as a mediator between verbal abilities and later behavioral outcomes characterized by insufficient attention and hyperactivity (Petersen et al., 2015). Additionally, a deficit in verbal ability can compromise the optimal anticipation of the consequences of future actions, thus encouraging problem behavior (Wilson & Herrnstein, 1985). On a neurobiological level, a dysfunction of the left-hemisphere verbal capacities by the frontal lobe, which is otherwise presumed to have an effect on the adequate guidance of behavior, is possible (Miller, 1988).

Executive functions. Deficits like impulsivity, which characterize ADHD, are also a part of the neuropsychological profile of underage delinquents. The application of more refined measures of executive functions, along with higher levels of impulsivity, reveals various difficulties in this domain – for instance, difficulties in shifting and maintaining attention, working memory functioning, and/or planning problem solving (Patiz & Bayraktar, 2023). Offending behavior in adults is also clearly associated with executive dysfunction (Griffith et al., 2024).

The concept of self-control (somewhat closely related to the previously described notion of self-regulation), presumed to be highly dependent on the status of the executive system, could represent one of the key points in the explanation of this association. As early as Gottfredson and Hirschi (Gottfredson & Hirschi, 1990), in their general theory of crime, a low level of self-control is identified as a key variable for explaining criminal behavior. Individuals with a low degree of self-control are described as "tendecy to

respond to tangible stimuli in the immediate environment, to have a concrete *here and now* orientation" (Gottfredson & Hirschi, 1990, p. 89). According to the authors, such a cognitive mechanism is the result of early familial patterns of behavior control, excluding potential effects of biological factors on self-control, which are redefined by later studies (Jackson & Beaver, 2013). The ability of self-control is examined through the lens of executive mechanisms, with the prefrontal regions of the brain as its neurobiological substrate (Beaver et al., 2007). Early neuropsychological findings about behavioral changes in individuals with prefrontal cortex damage indicate that these parts of the cerebral cortex have a role in self-control (Konow & Pribram, 1970; O'Driscoll & Leach, 1998), which is the basis of what is described in literature as *pseudopsychopathy* (Koenigs & Tranel, 2006). More recent studies confirm the link between the dorsomedial prefrontal cortex and self-control ability (Jin et al., 2024).

If we view self-control as the process of prioritizing abstract rather than concrete motivations, impulse inhibition is one of the more significant mechanisms of realizing this process (Fujita, 2011). In fact, the intentional inhibition of one's own actions represents the core of various abilities that all fall within the scope of self-control (Schel et al., 2014). *Inhibition*, as one of the core components of executive functions (Miyake et al., 2000), stands out as an important cognitive mechanism not only for understanding ADHD (Barkley, 1997; Barkley, 2010), but also for understanding various forms of problem behavior (Oosterlaan et al., 1998; Prateeksha & Roopesh, 2014). Apart from earlier neurophysiological data (Quay, 1993, 1997), more recent studies of brain function imaging (Normal et al., 2016) and characteristic errors on neuropsychological tests in subjects with ADHD (e.g. Epstein et al., 2001; Senkowski et al., 2024; Wodka et al., 2007) as well as those involved in different kinds of delinquent behavior (e.g. Borrani et al., 2019; Patiz & Bayraktar, 2023) indicate that the inactivity of inhibitory functions is a "shared" deficient cognitive mechanism among the aforementioned conditions. Indirectly, the same is indicated by their results in tasks of delayed gratification and working memory (Bayard et al., 2020).

Several theories regarding the genesis of disinhibition as the fundamental cognitive deficit in the aforementioned conditions have been suggested, the largest number of which rely on Gray's model, which postulates three basic systems with their own behavioral and neurobiological substrates (Gray, 1970; Gray, 1991; Gray and McNaughton, 2003). Building upon the existing model, Newmall and Wallace (Newman & Wallace, 1993) consider the basis of disinhibited behavior through the lens of the *behavioral activation system* [BAS] and the *behavioral inhibition system* [BIS] from Gray's model, taking into account the interaction between goal-oriented behavior (via BAS) and the integration of unexpected, but potentially relevant information from the environment (via BIS). In other words, the authors postulate a deficit in

response modulation, a process necessary for self-regulation, characterized by difficulties in the automatic shifting of attention during goal-oriented behavior for the purpose of assimilating relevant environmental information, as one of the possible explanations of "disinhibitory psychopathology". Studies published at different time periods support the hypothesized role of BAS overactivation and response modulation deficits in understanding the cognitive deficits characteristic of ADHD and various forms of conduct disorders (Gomez & Corr, 2010; Mitchell & Nelson-Gray, 2006; Quay, 1993; Walker et al., 1991).

Though there is a certain degree of overlap, both on the behavioral and neural level, between ADHD and other categories of problem behavior (i.e., ODD/CD), there are differences that make them independent entities with their own inherent pathophysiological and neurocognitive mechanisms (Bayard et al., 2020; Rubia, 2011). In the context of considering frontal control functions, a more pronounced abnormality of those neural structures involved in supporting "hot" executive functions (for instance, affective decision-making or the ability to delay gratification), primarily the amygdala, has proven to be specifically associated with ODD/CD symptomatology compared to ADHD (Bayard et al., 2020; Noordemer et al., 2016; Rubia, 2011), which is also recorded on testing material (Hobson et al., 2011). These differences have important implications for planning further interventions, especially keeping in mind the neurodevelopmental nature of ADHD and the early onset of symptoms, which is why ADHD can be viewed as a primary candidate for early intervention (for examples of some intervention possibilities, see Krstić, 2002). Due to this, programmes such as "Reasoning and Rehabilitation 2 for ADHD" [R&R2ADHD], whose primary goal is reducing future behavioral problems, precisely recognize the importance of targeting the individual's neurocognitive profile (Young & Ross, 2007) and report initial successes (Young et al., 2017, Young et al., 2018).

Social cognition, ADHD, and problem behavior

In a sample of 138 children and youth (ages 9-18), categorized for the purposes of this study into CD, ADHD, ADHD+CD, and typically developing groups, an fMRI study investigated decision-making ability depending on whether it is reinforced with a reward or punishment (Baumann et al., 2022). The results of the study have shown that, in conditions where decision-making is based on reward or punishment, youth with ADHD+CD exhibit a lower degree of brain activity in the caudate and dorsal striatum, middle temporal gyrus, inferior frontal gyrus, and lateral occipital cortex relative to typically developing youth. Compared to youth with ADHD, lower activity is registered in the orbitofrontal cortex, dorsal striatum and putamen, as

well as in the inferior frontal gyrus. In addition to these results supporting the hypothesis that ADHD+CD is neurobiologically a proportionately more aberrant disorder than in cases where such comorbidity is absent, they also speak to the existence of deficits in the functioning of cerebral networks responsible for affective decision-making, primarily associated with the behavioral characteristics of CD. The finding is generally consistent with previous evidence suggesting that ADHD is primarily characterized by dysfunction in cerebral networks that support so-called "cool" executive functions, such as inhibition, attention or timing (impairments typical for ADHD), while in CD the abnormalities affect the neurobiological substrate of the "hot" executive system that regulates affect and motivation (inferior fronto-striato-cerebellar rather than orbitofrontal-paralimbic) (Rubia, 2011). In other words, the deficit typical for CD (but not for ADHD) points toward probable problems in the field of social cognition. Accordingly, studies have shown that adolescents with ADHD+CD exhibit difficulties in emotion recognition compared to age-matched peers with only ADHD or those with typical development, suggesting that these deficits are related specifically to CD (Airdrie et al., 2018). The literature review confirms the hypothesis of a deficit in emotional content processing in individuals with CD, with findings pointing to impaired amygdala function in response to negative valence stimuli (Li et al., 2024).

Factors associated with impaired social cognition in children with disruptive behavior are diverse and, among others, relate to deficits in executive functioning, as well as the presence of callous-unemotional [CU] traits, characterised by a lack of empathy, remorse, and guilt, along with limited emotional expressiveness. The presence of CU traits negatively affects the optimal development of a child and may increase the risk of future disruptive behavior (Lakshmi et al., 2023).

As a relatively new field of study that has been developing intensely since the 1970s (Hamilton & Stroessner, 2021), social cognition creates new perspectives for understanding and treating problem behavior in youth and adults, but also requires further elaboration (Li et al., 2024).

The neurobiological basis of problem behavior associated with ADHD

Based on the findings that young delinquents with previously diagnosed ADD exhibit more extensive and significantly more pronounced cognitive deficits than those without comorbid ADD, obtained in a cross-sectional study (Moffitt & Silva, 1988), Moffitt presupposes that there are other differences between these two groups, in this case related to the chronological order of symptom onset. She distinguishes between two types of delinquents

– those who begin exhibiting problematic behavior in early childhood, with a tendency for this pattern of behavior to persist later in life (life-course-persistent delinquents), and those whose delinquent behavior is limited to adolescence after which it disappears (adolescence-limited delinquent behavior). Compared to the second type, the first type of delinquent is characterised by pronounced early neuropsychological deficits, as well as the comorbid presence of ADHD (Moffitt, 1993). Moffitt explains the observed status and assumed development of this type of disorder with the hypothesis that life-course-persistent delinquent behavior arises through a process of reciprocal interaction between neuropsychological status and an inadequate social environment, testing this assumption through further longitudinal follow-up of youth from the original sample (Moffitt et al., 1994, 1996, 2002). For example, the subgroup of boys from the study who achieved the lowest results on a set of neuropsychological tests at the age of thirteen, exhibited the highest scores across various measures of delinquency five years later (Moffitt et al., 1994). Longitudinal follow-ups validated the assumption that there are two different trajectories in the evolution of delinquent behavior – insufficient neuropsychological status in early childhood predicted delinquent behavior with onset before age thirteen and subsequent worsening, unrelated to antisocial behavior that begins in adolescence. Moffitt, accordingly, concludes that what we describe as juvenile delinquency in fact encompasses two different subgroups, each possessing a unique etiology and developmental trajectory (Moffitt et al., 1994).

Both of Moffitt's ideas – the specific implications of the association between delinquency and ADHD, and the concept of different developmental trajectories dependent on early neurocognitive factors – largely influenced the direction in which subsequent research evolved (Popović-Ćitić & Đurić, 2010). One of the outcomes is certainly the widely accepted view that ADHD is a significant risk factor for the occurrence of delinquent behavior (Babinski et al., 1999; Patterson et al., 2000). Nevertheless, this claim has not remained unquestioned, nor is it consistently confirmed. For example, while we would expect that treatment of ADHD has a significant effect on problem behavior, only about half of the studies in this field report the expected results (Shaw et al., 2012). Different findings are accumulating, especially those suggesting that the trajectories of (particularly violent) forms of problem behavior are strongly correlated to early onset (typically prior to age ten or earlier) conduct problems (Lichenstain et al., 2020; Moffitt et al., 1993; Tärnhäll et al., 2022). Combined with previous findings, some studies suggest that an ADHD diagnosis is a significant predictor of future delinquent behavior only in cases where behavioral disorders are also present in the child (Breuer et al., 2022), or decidedly conclude that it is not possible to establish a direct link between ADHD and criminality (Mordre et al., 2011).

We must not forget the effects of additional risk factors on the occurrence of violent and delinquent behavior, such as, for instance, adverse family environment, low general cognitive ability, peer delinquency, and similar factors (Fazel et al., 2018; Murray & Farrington, 2010; Popović-Ćitić, 2007).

The interactive triad consisting of problem behavior, ADHD, and early onset CD is certainly worthy of deeper analysis. Numerous studies suggest that ADHD must have at least a modulating effect on later occurrence of delinquency (Sibley et al., 2011; Pratt et al., 2002; Wojciechowski, 2021), and that the presence of ADHD is linked to a specific type of socially disruptive manifestations, primarily within the category of impulsive-aggressive behavior (Retz et al., 2021). The question of what mechanisms form the basis of the co-occurrence of ADHD and CD points toward research on the neurobiology of both disorders, but so far, answers are inconsistent. Some studies suggest that ADHD+CD is a distinct, more severe variant of the disorder, while others conversely indicate that it is possible to differentiate between the two. For instance, some twin genetic studies suggest a shared genetic origin of both phenotypes, and results have shown that in twins, it is impossible to predict one disorder based on the presence of the other, and vice versa (Thapar et al., 2001). Structural and functional brain imaging has shown similar results. The findings of several studies of gray matter volume and surface area in the prefrontal cortex have successfully inversely linked ADHD symptoms with the dorsolateral and dorsomedial prefrontal cortex, as well as the caudal part of the anterior cingulate, whereas CD symptoms were linked with the rostral regions of the anterior cingulate (Bayard et al., 2020). A differently structured study of gray matter volume (68 cortical and 19 subcortical regions), which separately considered internalizing problems, ADHD, and behavioral issues, suggested that the significance of the general psychopathological factor that reflects the shared characteristics across groups is greater than that of the specific factors. At the same time, findings indicated the possibility of potential specific associations with structures such as the hippocampus, amygdala, or cerebral cortex (Durham et al., 2021). Considering what we know about the development of (interactive) cerebral networks that our psychological capabilities are based on, especially when there are deviations in development, such findings may not necessarily be conflicting.

Conclusion

ADHD occurs significantly more frequently in children and youth who exhibit problem behavior than in the general population. However, the claim that ADHD constitutes a distinct risk factor should be interpreted with caution. On a cognitive level, the behavioral characteristics of ADHD can lead a child toward various forms of risky behavior (substance abuse, school expulsions, injuries, and so on), which can be prevented with

adequate treatment, but the effects of these treatments only barely relate to CD. Nevertheless, particular attention should be paid to cases where ADHD occurs simultaneously as early manifestations of socially disruptive behavior, as such a combination indicates poorer outcomes.

When addressing the mechanisms underlying the co-occurrence of ADHD and CD, it is meaningful to seek answers at the neurobiological level. It is hypothesized that the proximity of neural networks involved in either condition, as well as the degree of neurobiological atypicality, may play an important role, with genetic factors also likely constituting a significant risk factor. The prognosis of future delinquency is particularly linked to early forms of disruptive behavior, especially when there are CU traits that involve a lack of empathy, remorse, and guilt. Generally, deficits in prosocial behavior are increasingly recognized as a key risk factor for later delinquent behavior.

Though various neuropsychological factors have been recognized as significant, the presented components of executive and verbal functioning – along with their characteristic neurobiological mechanisms – have emerged as particularly important for understanding the relationship between ADHD and different categories of problem behavior. Additionally, social cognition warrants special attention, considering its' significance for understanding problem behavior. Overall, findings suggest that neuropsychological follow-up of children with problem behavior could potentially improve therapeutic interventions.

References

Airdrie, J. N., Langley, K., Thapar, A., & van Goozen, S. H. M. (2018). Facial Emotion Recognition and Eye Gaze in Attention-Deficit/Hyperactivity Disorder With and Without Comorbid Conduct Disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, *57*(8), 561–570. https://doi.org/10.1016/j.jaac.2018.04.016

Andreou, G., Agapitou, P., & Karapetsas, A. (2005). Verbal skills in children with ADHD. *European Journal of Special Needs Education, 20*(2), 231–238. https://doi.org/10.1080/08856250500055743

Baggio, S., Fructuoso, A., Guimaraes, M., Fois, E., Golay, D., Heller, P., Perroud, N., Aubry, C., Young, S., Delessert, D., Gétaz, L., Tran, N. T., & Wolff, H. (2018). Prevalence of Attention Deficit Hyperactivity Disorder in Detention Settings: A Systematic Review and Meta-Analysis. *Frontiers in psychiatry*, *9*, 331. https://doi.org/10.3389/fpsyt.2018.00331

Barkley R. A. (1997). Behavioral inhibition, sustained attention, and executive functions: constructing a unifying theory of ADHD. *Psychological bulletin*, *121*(1), 65–94. https://doi.org/10.1037/0033-2909.121.1.65

Barkley R. A. (2010). Differential diagnosis of adults with ADHD: the role of executive function and self-regulation. *The Journal of clinical psychiatry*, *71*(7), e17. https://doi.org/10.4088/JCP.9066tx1c

Babinski, L. M., Hartsough, C. S., & Lambert, N. M. (1999). Childhood conduct problems, hyperactivity-impulsivity, and inattention as predictors of adult criminal

activity. *Journal of child psychology and psychiatry, and allied disciplines*, *40*(3), 347–355. https://doi.org/10.1111/1469-7610.00452

Bayard, F., Nymberg Thunell, C., Abé, C., Almeida, R., Banaschewski, T., Barker, G., Bokde, A. L. W., Bromberg, U., Büchel, C., Quinlan, E. B., Desrivières, S., Flor, H., Frouin, V., Garavan, H., Gowland, P., Heinz, A., Ittermann, B., Martinot, J. L., Martinot, M. P., Nees, F., ... IMAGEN Consortium (2020). Distinct brain structure and behavior related to ADHD and conduct disorder traits. *Molecular psychiatry*, *25*(11), 3020–3033. https://doi.org/10.1038/s41380-018-0202-6

Baumann, S., Hartz, A., Scharke, W., De Brito, S. A., Fairchild, G., Herpertz-Dahlmann, B., Konrad, K., & Kohls, G. (2022). Differentiating brain function of punishment versus reward processing in conduct disorder with and without attention deficit hyperactivity disorder. *The world journal of biological psychiatry: the official journal of the World Federation of Societies of Biological Psychiatry*, *23*(5), 349–360. https://doi.org/10.1080/15622975.2021.1995809

Beaver, K. M., Wright, J. P., & Delisi, M. (2007). Self-Control as an Executive Function: Reformulating Gottfredson and Hirschi's Parental Socialization Thesis. *Criminal Justice and Behavior, 34*(10), 1345-1361. https://doi.org/10.1177/0093854807302049

Beaudry, G., Yu, R., Långström, N., & Fazel, S. (2021). An Updated Systematic Review and Meta-regression Analysis: Mental Disorders Among Adolescents in Juvenile Detention and Correctional Facilities. *Journal of the American Academy of Child and Adolescent Psychiatry*, *60*(1), 46–60. https://doi.org/10.1016/j.jaac.2020.01.015

Borrani, J., Frías, M., Alemán, B., García, A., Ramírez, C., & Valdez, P. (2019). Neuropsychological disorders in juvenile delinquents. *Revista Mexicana de Neurociencia*, *20*(5)*,* 244–252. 10.24875/RMN.19000064

Breuer, D., von Wirth, E., Mandler, J., Schürmann, S., & Döpfner, M. (2022). Predicting delinquent behavior in young adults with a childhood diagnosis of ADHD: results from the Cologne Adaptive Multimodal Treatment (CAMT) Study. *European child & adolescent psychiatry*, *31*(4), 553–564. https://doi.org/10.1007/s00787-020-01698-y

Chow, J. C., Wallace, E. S., Senter, R., Kumm, S., & Mason, C. Q. (2022). A Systematic Review and Meta-Analysis of the Language Skills of Youth Offenders. *Journal of speech, language, and hearing research: JSLHR*, *65*(3), 1166–1182. https://doi.org/10.1044/2021_JSLHR-20-00308

Durham, E. L., Jeong, H. J., Moore, T. M., Dupont, R. M., Cardenas-Iniguez, C., Cui, Z., Stone, F. E., Berman, M. G., Lahey, B. B., & Kaczkurkin, A. N. (2021). Association of gray matter volumes with general and specific dimensions of psychopathology in children. *Neuropsychopharmacology: official publication of the American College of Neuropsychopharmacology*, *46*(7), 1333–1339. https://doi.org/10.1038/s41386-020-00952-w

Dryfoos, J. G. (1990). *Adolescents at risk: Prevalence and prevention*. Oxford University Press.

Elia, J., Ambrosini, P., & Berrettini, W. (2008). ADHD characteristics: I. Concurrent co-morbidity patterns in children & adolescents. *Child and adolescent psychiatry and mental health*, *2*(1), 15. https://doi.org/10.1186/1753-2000-2-15

Epstein, J. N., Johnson, D. E., Varia, I. M., & Conners, C. K. (2001). Neuropsychological assessment of response inhibition in adults with ADHD. *Journal of clinical and experimental neuropsychology*, *23*(3), 362–371. https://doi.org/10.1076/jcen.23.3.362.1186

Fazel, S., Smith, E. N., Chang, Z., & Geddes, J. R. (2018). Risk factors for interpersonal violence: an umbrella review of meta-analyses. *The British Journal of Psychiatry, 213*(4), 609–614. https://doi.org/10.1192/bjp.2018.145

Fletcher, J., & Wolfe, B. (2009). Long-term consequences of childhood ADHD on criminal activities. *The journal of mental health policy and economics*, *12*(3), 119–138. https://doi.org/10.2139/ssrn.1489147

Fujita K. (2011). On conceptualizing self-control as more than the effortful inhibition of impulses. *Personality and social psychology review: an official journal of the Society for Personality and Social Psychology, Inc*, *15*(4), 352–366. https://doi.org/10.1177/1088868311411165

Gottfredson, M. R., & Hirschi, T. (1990). *A general theory of crime.* Stanford University Press.

Gnanavel, S., Sharma, P., Kaushal, P., & Hussain, S. (2019). Attention deficit hyperactivity disorder and comorbidity: A review of literature. *World journal of clinical cases*, *7*(17), 2420–2426. https://doi.org/10.12998/wjcc.v7.i17.2420

Gray J. A. (1970). The psychophysiological basis of introversion-extraversion. *Behaviour research and therapy*, *8*(3), 249–266. https://doi.org/10.1016/0005-7967(70)90069-0

Gray, J. A. (1991). The neuropsychology of temperament. In J. Strelau & A. Angleitner (Eds.), *Explorations in temperament: International perspectives on theory and measurement* (pp. 105–128). Plenum Press. https://doi.org/10.1007/978-1-4899-0643-4_8

Gray, J.A., & McNaughton, N. (2003). *The Neuropsychology of Anxiety: An Enquiry into the Functions of the Septo-Hippocampal System*. Oxford University Press.

Griffith, R. L., Nowalis, S., & Monroe-Gulick, A. (2024). Executive Functioning and Offending Behavior: An Updated Meta-Analysis. *Criminal Justice and Behavior*, *51*(4), 528–551. https://doi.org/10.1177/00938548231225260

Gomez, R., & Corr, P. J. (2010). Attention-Deficit/Hyperactive Disorder symptoms: Associations with Gray's and Tellegen's models of personality. *Personality and Individual Differences*, *49*(8), 902–906. https://doi.org/10.1016/j.paid.2010.06.033

Hamilton, D. L., & Stroessner, S. N. (2021). *Social cognition: Understanding people and events* (1st ed.). SAGE Publications Ltd.

Hobson, C. W., Scott, S., & Rubia, K. (2011). Investigation of cool and hot executive function in ODD/CD independently of ADHD. *Journal of child psychology and psychiatry, and allied disciplines*, *52*(10), 1035–1043. https://doi.org/10.1111/j.1469-7610.2011.02454.x

Hirshbein, L. D. (2021). Assessing the conduct of juveniles: diagnosis and delinquency, 1900–2013. *Medical History*, *65*(4), 347–365. doi:10.1017/mdh.2021.27

Jackson, D. B., & Beaver, K. M. (2013). The Influence of Neuropsychological Deficits in Early Childhood on Low Self-Control and Misconduct through Early Adolescence. *Journal of Criminal Justice, 41*, 243–251. https://doi.org/10.1016/j.jcrimjus.2013.05.002

Jessor, R. (2016). *The Origins and Development of Problem Behavior Theory: The Collected Works of Richard Jessor*. Springer International Publishing. https://doi.org/10.1007/978-3-319-40886-6

Jin, C., Li, Y., Yin, Y., Ma, T., Hong, W., Liu, Y., Li, N., Zhang, X., Gao, J. H., Zhang, X., & Zha, R. (2024). The dorsomedial prefrontal cortex promotes self-control by inhibiting the egocentric perspective. *NeuroImage*, *301*, 120879. https://doi.org/10.1016/j.neuroimage.2024.120879

Konow, A., & Pribram, K. H. (1970). Error recognition and utilization produced by injury to the frontal cortex in man. *Neuropsychologia*, *8*(4), 489–491. https://doi.org/10.1016/0028-3932(70)90044-8

Koenigs, M., & Tranel, D. (2006). Pseudopsychopathy: a perspective from cognitive neuroscience. In Zald, D.H., Rauch, S.L. (Eds.), *The Orbitofrontal Cortex*. Oxford University Press, New York

Krstić, N. (2002). Specifični razvojni poremećaji-otkrivanje i intervencije. *Psihijatrija danas*, *34*(3-4), 215–235.

Lakshmi, S. M. T., Jayakumar, N., Natarajan, G., Edward, M., Shaju, & Ashish, E. (2023). A scoping review of research on attributes of social cognition impairment among children with disruptive behaviours. *Online Journal of Health and Allied Sciences, 22*(2), 2. https://www.ojhas.org/issue86/2023-2-2.html

Lichtenstein, P., Cederlöf, M., Lundström, S., D'Onofrio, B. M., Anckarsäter, H., Larsson, H., & Pettersson, E. (2020). Associations between conduct problems in childhood and adverse outcomes in emerging adulthood: a longitudinal Swedish nationwide twin cohort. *Journal of child psychology and psychiatry, and allied disciplines*, *61*(7), 798–806. https://doi.org/10.1111/jcpp.13169

Li, X., Kou, H., Bi, T., & Peng, Z. (2024). Deficits in emotional cognition among individuals with conduct disorder: theoretical perspectives. *Frontiers in psychiatry*, *15*, 1507695. https://doi.org/10.3389/fpsyt.2024.1507695

Loney, B.R., Frick, P.J., Ellis, M., & McCoy, M.G. (1998). Intelligence, Callous-Unemotional Traits, and Antisocial Behavior. *Journal of Psychopathology and Behavioral Assessment, 20*, 231–247. https://doi.org/10.1023/A:1023015318156

Luria, A.R. (1961). *The Role of Speech in the Regulation of Normal and Abnormal Behavior.* Liveright publishing corporation. https://doi.org/10.1016/C2013-0-05275-9

Lynam, D. R., & Henry, B. (2001). The role of neuropsychological deficits in conduct disorders. In J. Hill & B. Maughan (Eds.), *Conduct disorders in childhood and adolescence* (pp. 235–263). Cambridge University Press.

McKay, S., & Brumback, R. A. (1980). Relationship between learning disabilities and juvenile delinquency. *Perceptual and motor skills*, *51*(3 Pt 2), 1223–1226. https://doi.org/10.2466/pms.1980.51.3f.1223

Mitchell, J. T., & Nelson-Gray, R. O. (2006). Attention-Deficit/Hyperactivity Disorder symptoms in adults: Relationship to Gray's Behavioral Approach System. *Personality and Individual Differences, 40*(4), 749–760. https://doi.org/10.1016/j.paid.2005.08.011

Miller, L. (1988). Neuropsychological perspectives on delinquency. *Behavioural Science and the Law, 6*, 409–428. https://doi.org/10.1002/bsl.2370060309

Milone, A., & Sesso, G. (2022). Disruptive Behavior Disorders: Symptoms, Evaluation and Treatment. *Brain Sciences*, *12*(2), 225. https://doi.org/10.3390/brainsci12020225

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The unity and diversity of executive functions and their contributions to complex "Frontal Lobe" tasks: a latent variable analysis. *Cognitive psychology*, *41*(1), 49–100. https://doi.org/10.1006/cogp.1999.0734

Moffitt, T. E., & Silva, P. A. (1988). Self-reported delinquency, neuropsychological deficit, and history of attention deficit disorder. *Journal of abnormal child psychology*, *16*(5), 553–569. https://doi.org/10.1007/BF00914266

Moffitt, T. E., & Henry, B. (1989). Neuropsychological assessment of executive functions in self-reported delinquents. *Development and Psychopathology, 1*(2), 105–118. https://doi.org/10.1017/S0954579400000298

Moffitt T. E. (1993). Adolescence-limited and life-course-persistent antisocial behavior: a developmental taxonomy. *Psychological review*, *100*(4), 674–701. https://doi.org/10.1037/0033-295X.100.4.674

Moffitt, T. E., Lynam, D. R., & Silva, P. A. (1994). Neuropsychological tests predicting persistent male delinquency. *Criminology, 32*(2), 277–300. https://doi.org/10.1111/j.1745-9125.1994. tb01155.x

Moffit, T. E., Caspi, A., Dickson, N., Silva, P., & Stanton, W. (1996). Childhood-onset versus adolescent-onset antisocial conduct problems in males: Natural history from ages 3 to 18 years. *Development and Psychopathology, 8*(2), 399–424. https://doi.org/10.1017/S0954579400007161

Moffitt, T. E., Caspi, A., Harrington, H., & Milne, B. J. (2002). Males on the life-course-persistent and adolescence-limited antisocial pathways: follow-up at age 26 years. *Development and psychopathology*, *14*(1), 179–207. https://doi.org/10.1017/s0954579402001104

Mordre, M., Groholt, B., Kjelsberg, E., Sandstad, B., & Myhre, A. M. (2011). The impact of ADHD and conduct disorder in childhood on adult delinquency: a 30 years follow-up study using official crime records. *BMC psychiatry*, *11*, 57. https://doi.org/10.1186/1471-244X-11-57

Mohr-Jensen, C., & Steinhausen, H. C. (2016). 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. *Clinical psychology review*, *48*, 32–42. https://doi.org/10.1016/j.cpr.2016.05.002

Murray, J., & Farrington, D. P. (2010). Risk factors for conduct disorder and delinquency: key findings from longitudinal studies. *Canadian journal of psychiatry. Revue canadienne de psychiatrie*, *55*(10), 633–642. https://doi.org/10.1177/070674371005501003

Newman, J.P., & Wallace, J.F. (1993). Diverse pathways to deficient self-regulation: Implications for disinhibitory psychopathology in children. *Clinical Psychology Review, 13*, 699–720. https://doi.org/10.1016/S0272-7358(05)80002-9

Norman, L. J., Carlisi, C., Lukito, S., Hart, H., Mataix-Cols, D., Radua, J., & Rubia, K. (2016). Structural and Functional Brain Abnormalities in Attention-Deficit/Hyperactivity Disorder and Obsessive-Compulsive Disorder: A Comparative Meta-analysis. *JAMA psychiatry*, *73*(8), 815–825. https://doi.org/10.1001/jamapsychiatry.2016.0700

Noordermeer, S. D., Luman, M., & Oosterlaan, J. (2016). A Systematic Review and Meta-analysis of Neuroimaging in Oppositional Defiant Disorder (ODD) and Conduct Disorder (CD) Taking Attention-Deficit Hyperactivity Disorder (ADHD) Into Account. *Neuropsychology review*, *26*(1), 44–72. https://doi.org/10.1007/s11065-015-9315-8

Offord, D. R., Sullivan, K., Allen, N., & Abrams, N. (1979). Delinquency and hyperactivity. *The Journal of nervous and mental disease*, *167*(12), 734–741. https://doi.org/10.1097/00005053-197912000-00003

O'Driscoll, K., & Leach, J. P. (1998). "No longer Gage": an iron bar through the head. Early observations of personality change after injury to the prefrontal cortex. *BMJ (Clinical research ed.)*, *317*(7174), 1673–1674. https://doi.org/10.1136/bmj.317.7174.1673a

Oosterlaan, J., Logan, G. D., & Sergeant, J. A. (1998). Response inhibition in AD/HD, CD, comorbid AD/HD + CD, anxious, and control children: A meta-analysis of studies with the stop task. *Journal of Child Psychology and Psychiatry, 39*(3), 411–425. https://doi.org/10.1017/S0021963097002072

Patiz, B., & Bayraktar, S. (2023). Evaluation of neuropsychological characteristics and attention bias in juvenile offenders, juvenile victims, and juveniles who have not participated in the criminal justice system. *Frontiers in psychology*, *14*, 1229044. https://doi.org/10.3389/fpsyg.2023.1229044

Patterson, G. R., DeGarmo, D. S., & Knutson, N. (2000). Hyperactive and antisocial behaviors: comorbid or two points in the same process? *Development and psychopathology*, *12*(1), 91–106. https://doi.org/10.1017/s0954579400001061

Petersen, I. T., Bates, J. E., & Staples, A. D. (2015). The role of language ability and self-regulation in the development of inattentive-hyperactive behavior problems. *Development and psychopathology*, *27*(1), 221–237. https://doi.org/10.1017/S0954579414000698

Philipp-Wiegmann, F., Rösler, M., Clasen, O., Zinnow, T., Retz-Junginger, P., & Retz, W. (2018). ADHD modulates the course of delinquency: a 15-year follow-up study of young incarcerated man. *European archives of psychiatry and clinical neuroscience*, *268*(4), 391–399. https://doi.org/10.1007/s00406-017-0816-8

Popović-Ćitić, B. (2007). Family risk factors of children and adolescents' violent behavior. *Socijalna misao*, *14*(2), 27-50.

Popović-Ćitić, B., & Đurić, S. (2010). Integrativni razvojni teorijski modeli u etiologiji delinkventnog ponašanja. *Sociološki pregled*, *44*(1), 99–117

Pratt, T. C., Cullen, F. T., Blevins, K. R., Daigle, L., & Unnever, J. D. (2002). The Relationship of Attention Deficit Hyperactivity Disorder to Crime and Delinquency: A Meta-Analysis. *International Journal of Police Science & Management, 4*(4), 344–360. https://doi.org/10.1350/ijps.4.4.344.10873

Prateeksha, S., & Roopesh, B. (2014). Response Inhibition in Children with Conduct Disorder: A Preliminary Report. *Indian Journal Of Health And Wellbeing, 5*(11), 1325–1330. Retrieved from https://www.i-scholar.in/index.php/ijhw/article/view/88675.

Quay, H. C. (1993). The psychobiology of undersocialized aggressive conduct disorder: A theoretical perspective. *Development and Psychopathology, 5*(1-2), 165–180. https://doi.org/10.1017/S0954579400004326

Quay H. C. (1997). Inhibition and attention deficit hyperactivity disorder. *Journal of abnormal child psychology*, *25*(1), 7–13. https://doi.org/10.1023/a:1025799122529

Rubia K. (2011). "Cool" inferior frontostriatal dysfunction in attention-deficit/hyperactivity disorder versus "hot" ventromedial orbitofrontal-limbic dysfunction in conduct disorder: a review. *Biological psychiatry*, *69*(12), e69–e87. https://doi.org/10.1016/j.biopsych.2010.09.023

Retz, W., Ginsberg, Y., Turner, D., Barra, S., Retz-Junginger, P., Larsson, H., & Asherson, P. (2021). Attention-Deficit/Hyperactivity Disorder (ADHD), antisociality and delinquent behavior over the lifespan. *Neuroscience and biobehavioral reviews*, *120*, 236–248. https://doi.org/10.1016/j.neubiorev.2020.11.025

Senkowski, D., Ziegler, T., Singh, M., Heinz, A., He, J., Silk, T., & Lorenz, R. C. (2024). Assessing Inhibitory Control Deficits in Adult ADHD: A Systematic Review and Meta-analysis of the Stop-signal Task. *Neuropsychology review*, *34*(2), 548–567. https://doi.org/10.1007/s11065-023-09592-5

Schel, M. A., Scheres, A., & Crone, E. A. (2014). New perspectives on self-control development: highlighting the role of intentional inhibition. *Neuropsychologia*, *65*, 236–246. https://doi.org/10.1016/j.neuropsychologia.2014.08.022

Shaw, M., Hodgkins, P., Caci, H., Young, S., Kahle, J., Woods, A. G., & Arnold, L. E. (2012). A systematic review and analysis of long-term outcomes in attention deficit hyperactivity disorder: effects of treatment and non-treatment. *BMC medicine*, *10*, 99. https://doi.org/10.1186/1741-7015-10-99

Sibley, M. H., Pelham, W. E., Molina, B. S., Gnagy, E. M., Waschbusch, D. A., Biswas, A., MacLean, M. G., Babinski, D. E., & Karch, K. M. (2011). The delinquency outcomes of boys with ADHD with and without comorbidity. *Journal of abnormal child psychology*, *39*(1), 21–32. https://doi.org/10.1007/s10802-010-9443-9

Smith, A. K., Stasi, S. M., Rhee, S. H., Corley, R. P., Young, S. E., & Hewitt, J. K. (2011). The Role of Attention-Deficit/hyperactivity Disorder in the Association between Verbal Ability and Conduct Disorder. *Frontiers in psychiatry*, *2*, 3. https://doi.org/10.3389/fpsyt.2011.00003

Sutherland, E. H., Cressey, D. R., & Luckenbill, D. F. (1992). *Principles of criminology* (11th ed.). General Hall.

Taurines, R., Schmitt, J., Renner, T., Conner, A. C., Warnke, A., & Romanos, M. (2010). Developmental comorbidity in attention-deficit/hyperactivity disorder. *Attention deficit and hyperactivity disorders*, *2*(4), 267–289. https://doi.org/10.1007/s12402-010-0040-0

Tärnhäll, A., Björk, J., Wallinius, M., Gustafsson, P., & Hofvander, B. (2022). Offending Trajectories in Violent Offenders: Criminal History and Early Life Risk Factors. *International Journal of Offender Therapy and Comparative Criminology*, *67*(2–3), 270–290. https://doi.org/10.1177/0306624X221086565

Thapar, A., Harrington, R., & McGuffin, P. (2001). Examining the comorbidity of ADHD-related behaviours and conduct problems using a twin study design. *The British journal of psychiatry: the journal of mental science*, *179*, 224–229. https://doi.org/10.1192/bjp.179.3.224

Virkkunen, M., & Nuutila, A. (1976). Specific reading retardation, hyperactive child syndrome, and juvenile delinquency. *Acta Psychiatrica Scandinavica*, *54*(1), 25–28. https://doi.org/10.1111/j.1600-0447.1976.tb00091.x

Walker, J. L., Lahey, B. B., Russo, M. F., Frick, P. J., Christ, M. A., McBurnett, K., Loeber, R., Stouthamer-Loeber, M., & Green, S. M. (1991). Anxiety, inhibition, and conduct disorder in children: I. Relations to social impairment. *Journal of the American Academy of Child and Adolescent Psychiatry*, *30*(2), 187–191. https://doi.org/10.1097/00004583-199103000-00004

Walters, G. D. (2022). Mediating the Low Verbal Intelligence–Early Adult Offending Relationship With Pro-Aggression Attitudes. *Criminal Justice and Behavior, 49*(4), 513–529. https://doi.org/10.1177/00938548211034220

Wilson, J.Q., & Herrnstein, R.J. (1985). *Crime and Human Nature*. New York: Simon & Schuster.

Wodka, E. L., Mahone, E. M., Blankner, J. G., Larson, J. C., Fotedar, S., Denckla, M. B., & Mostofsky, S. H. (2007). Evidence that response inhibition is a primary deficit in ADHD. *Journal of clinical and experimental neuropsychology*, *29*(4), 345–356. https://doi.org/10.1080/13803390600678046

Wojciechowski T. W. (2021). The Role of ADHD in Predicting the Development of Violent Behavior Among Juvenile Offenders: Participation Versus Frequency. *Journal of interpersonal violence*, *36*(1–2), NP625–NP642. https://doi.org/10.1177/0886260517734225

Wolff, P. H., Waber, D., Bauermeister, M., Cohen, C., & Ferber, R. (1982). The neuropsychological status of adolescent delinquent boys. *Journal of child psychology and psychiatry, and allied disciplines*, *23*(3), 267–279. https://doi.org/10.1111/j.1469-7610.1982.tb00072.x

World Health Organization. (2016). *ICD-10: International statistical classification of diseases and related health problems* (10th revision). https://icd.who.int/browse10/2016/en

World Health Organization. (2022). *ICD-11: International classification of diseases and related health problems* (11th revision). https://icd.who.int/

Wright, K. (2017). Inventing the 'normal' child: Psychology, delinquency, and the promise of early intervention, *History of the Human Sciences, 30*(5), 48–67.

Yeudall, L. T., Fromm-Auch, D., & Davies, P. (1982). Neuropsychological impairment of persistent delinquency. *The Journal of nervous and mental disease*, *170*(5), 257–265. https://doi.org/10.1097/00005053-198205000-00001

Young, S., & Ross, R.R. (2007). *R&R2 for youths and adults with ADHD: a prosocial competence training program (Program Handbook).* Cognitive Centre of Canada, Ottawa

Young, S., Moss, D., Sedgwick, O., Fridman, M., & Hodgkins, P. (2015). A meta-analysis of the prevalence of attention deficit hyperactivity disorder in incarcerated populations. *Psychological medicine*, *45*(2), 247–258. https://doi.org/10.1017/S0033291714000762

Young, S., Emilsson, B., Sigurdsson, J. F., Khondoker, M., Philipp-Wiegmann, F., Baldursson, G., Olafsdottir, H., & Gudjonsson, G. (2017). A randomized controlled trial reporting functional outcomes of cognitive-behavioural therapy in medication-treated adults with ADHD and comorbid psychopathology. *European archives of psychiatry and clinical neuroscience*, *267*(3), 267–276. https://doi.org/10.1007/s00406-016-0735-0

Young, S., Gudjonsson, G., Chitsabesan, P., Colley, B., Farrag, E., Forrester, A., Hollingdale, J., Kim, K., Lewis, A., Maginn, S., Mason, P., Ryan, S., Smith, J., Woodhouse, E., & Asherson, P. (2018). Identification and treatment of offenders

with attention-deficit/hyperactivity disorder in the prison population: a practical approach based upon expert consensus. *BMC psychiatry*, *18*(1), 281. https://doi.org/10.1186/s12888-018-1858-9

Young, S., & Cocallis, K. (2021). ADHD and offending. *Journal of neural transmission*, *128*(7), 1009–1019. https://doi.org/10.1007/s00702-021-02308-0

RECEIVED: 2025/07/17 ACCEPTED: 2025/12/23

ADHD i problematično ponašanje: neuropsihološki pristup

Staša Lalatović (https://orcid.org/0000-0002-9701-2117)
Univerzitet u Beogradu, Fakultet za specijalnu edukaciju i rehabilitaciju

Branislava Popović Ćitić (https://orcid.org/0000-0002-1076-5838)
Univerzitet u Beogradu, Fakultet za specijalnu edukaciju i rehabilitaciju

Nadežda Krstić (https://orcid.org/0000-0002-6525-2669)
Univerzitet u Beogradu, Fakultet za specijalnu edukaciju i rehabilitaciju

Viktor Pavlović (https://orcid.org/0000-0003-0312-1548)
Institut za mentalno zdravlje, Beograd
Univerzitet Singidunum, Fakultet za medije i komunikacije

Iz obimne evidencije da se poremećaj pažnje i hiperaktivnosti (ADHD) znatno češće javlja kod dece i mladih problematičnog ponašanja nego u opštoj populaciji, često se zaključuje da ADHD predstavlja poseban faktor rizika za razvoj delinkventnog ponašanja. Umesto jednostavnog prihvatanja ovakvog stava, kako bi se rasvetlila priroda složene veze između ADHD-a i problematičnog ponašanja, potrebno je razumeti osnovne neurokognitivne mehanizme nastanka i funkcionisanja ADHD-a, kao i raznovrsnih formi problematičnog ponašanja. U radu je posebna pažnja posvećena egzekutivnim i verbalnim funkcijama koje su se pokazale naročito važnim za razjašnjenje ove povezanosti, kao i domenu socijalne kognicije, čiji značaj u ovom kontekstu postaje sve izraženiji. Takođe, razmatraju se neurobiološki mehanizmi koji bi mogli doprinositi zajedničkom javljanju ADHD-a i poremećaja ponašanja (CD). Osim zaključka da je ADHD sam po sebi pre ograničeni faktor rizika za impulsivne, manje nasilne oblike problematičnog ponašanja, ova analiza sugeriše važnost neuropsihološkog praćenja dece i mladih sa ponašajnim teškoćama. Posebna pažnja treba da bude usmerena na populaciju sa CD-om, s obzirom na implikacije ovakvog praćenja za dalji razvoj terapijskih pristupa.

Ključne reči: ADHD, problematično ponašanje, poremećaj ponašanja, neuropsihologija