

PERSPECTIVE OPEN



Attention deficit hyperactivity disorder: transition to psychotic disorders

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It is well recognized that Attention-deficit/hyperactivity disorder (ADHD) is associated with heightened risk for common psychiatric disorders; early identification and treatment of ADHD may help reduce some of this risk. However, the substantially increased risk of bipolar disorder, psychosis, and schizophrenia (hereafter psychotic disorders) is often overlooked (odds ratios 4.7–8.9). Given how common ADHD is, there is growing pressure for greater involvement of primary care services, especially for less complex forms of ADHD. However, those at highest risk for transition to a psychotic disorder need to be prioritised for secondary care follow up. Currently it is unknown how to stratify ADHD according to risk or indeed why only some develop a psychotic disorder. This perspective examines key hypotheses that may explain why transition occurs only in a subset of individuals. One hypothesis is that features suggestive of ADHD may represent early manifestations of psychotic disorders, although direct support for this is limited. The potential role of ADHD treatment is also considered; current data indicate that therapeutic use of methylphenidate is not associated with increased risk of psychotic disorders, while uncertainty remains for amphetamines. The possible mediating roles of ADHD-evoked environmental exposures are discussed, but evidence for mediation is lacking. We also consider the evidence that ADHD and psychotic disorders result from shared underlying neurodevelopmental processes. We highlight key clinical implications for screening and monitoring individuals with ADHD for psychotic disorders and consider what factors may help in weighting risk. Finally, we identify important evidence gaps for future research.

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INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental condition (NDC) that onsets early in development with a prevalence of 5–7% in childhood [1] and 3% in adult life [2], although prevalence in clinical samples is markedly higher (32% in paediatric settings) [3]. It is associated with multiple adverse mental and physical health, social, educational, and occupational outcomes [4]. Although grouped as an NDC in both DSM-5 and ICD-11 because of its early onset, in our view a complete separation of ADHD from psychiatric disorders is unhelpful from a research and service perspective for multiple reasons.

ADHD has a well-recognised link with later common psychiatric disorders, including anxiety and depression, posttraumatic stress disorder, eating disorders and conduct disorder, among others [5–8]. Around 60% [9] of those with ADHD will develop a psychiatric disorder, especially when ADHD is not recognised or treated in a timely fashion. However, it is less commonly recognised that ADHD is also associated with substantially increased risk for psychotic disorders, including bipolar disorder and schizophrenia [3, 10].

The most recent meta-analysis examining associations between a diagnosis of childhood ADHD (<18 years) as the exposure and bipolar disorder as the outcome estimated a risk ratio of 8.97 (95%

CI = 4.26–18.87) [11]. A different meta-analysis of child ADHD as the exposure and psychotic disorders as the outcome yielded a pooled relative effect (combining odds and risk ratios) of 4.74 (95% CI = 4.11–5.46) [12]. Evidence on the strength of association between later diagnosed ADHD (in adult life) and psychosis is currently lacking. The prevalence of ADHD in individuals with psychotic disorders varies across development [13], and an estimated 18.5% (95% CI = 11.8–27.8%) of people with a psychotic disorder have ADHD [14]. There is remarkably little evidence on the rate of underlying or missed comorbid ADHD in those with a psychotic disorder although one systematic review suggests that around 1 in 4 of those in adult psychiatry services, who presented with a psychiatric disorder, also have ADHD [15]. Rates could also be higher in youth services that span service transition age. However, while the majority of those with ADHD do not transition to a psychotic disorder, it is not known what explains the increased risk and whether it is possible to identify those at highest risk. This has become especially important given growing shifts across high-income countries towards a less specialist-focused model of care for ADHD.

In this perspective article, we consider different possible explanations as to why some people with a diagnosis of ADHD transition to psychotic disorders and discuss whether there is evidence to support these hypotheses (Fig. 1).

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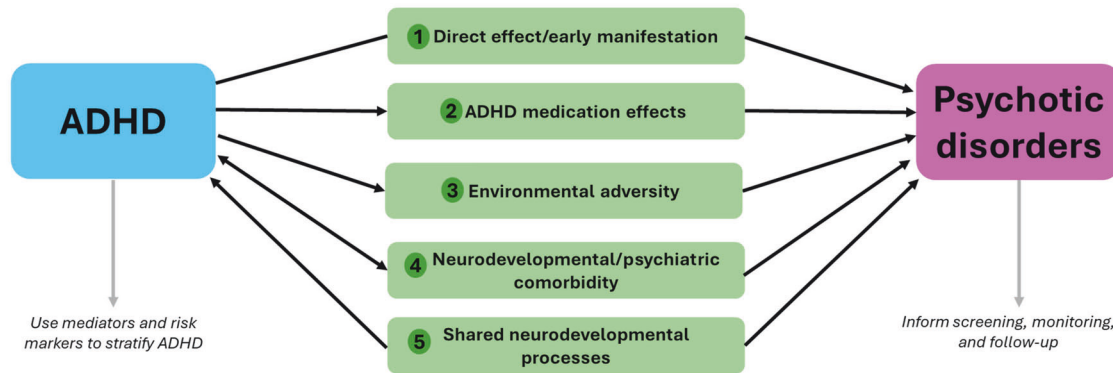


Fig. 1 Hypotheses that may explain links between ADHD and psychotic disorders. Numbers correspond to the five hypotheses detailed in the text and summarised in Table 1.

STRATEGY AND SELECTION CRITERIA

A literature search was conducted in PubMed on the 6th June 2026, covering publications between the 1st January 2020 and 6th June 2026. A single broad title/abstract search combined ADHD-related terms (e.g., ADHD, attention deficit hyperactivity disorder, hyperkinetic disorder, methylphenidate, amphetamine, stimulants) with terms related to psychotic disorders (psychosis, schizophrenia, bipolar disorder, mania). Animal studies and case reports were excluded; otherwise, no language or article-type restrictions were applied. The full search string is provided in Appendix S1.

The search identified 2302 records. After exclusion of duplicates, titles were screened to exclude records clearly unrelated to ADHD or psychotic disorders. The remaining 218 reports were assessed by title and abstract, with full text consulted where necessary, for relevance to the review's aims and evidential weight. Each report was evaluated for methodological strength using an evidence hierarchy (meta-analyses and systematic reviews; randomised controlled trials (RCTs) and large or registry-based cohort studies; observational studies; expert opinion and narrative reviews). These were also categorised by relevance to the review's aims: high relevance (directly examining ADHD–psychotic disorder epidemiology, comorbidity, or causal mechanisms); moderate relevance (studies focusing on ADHD or psychotic disorders alone but contributing indirectly through shared or transdiagnostic mechanisms); and low relevance (topics not informative for ADHD–psychotic disorder transition). Accordingly, 26 articles were retained for the synthesis on the basis of relevance and evidential weight. A PRISMA-style flow diagram summarising record identification and selection is shown in Fig. 2. Additional references were included for general points (e.g. comorbidity in psychiatry, diagnostic challenges in psychiatry).

Features suggestive of ADHD may be early manifestations of psychotic disorders

As most people with ADHD will not develop a psychotic disorder, it is possible that for a subgroup, features of ADHD, such as attentional difficulties, could represent early manifestations of psychotic disorders; and thus represent a phenocopy of ADHD rather than “true” ADHD. Indeed, high-risk cohorts and other longitudinal studies suggest that psychotic disorders, particularly when early-onset, are often preceded by childhood developmental difficulties. These include autistic and ADHD-like features [16–19], as well as childhood motor [20, 21], language [22], attention [23, 24], social [25, 26], and learning difficulties [27]. A recent meta-analysis also suggested that ADHD was more commonly reported in paediatric first episode psychosis (FEP) samples than adult FEP samples [3]. Findings on developmental

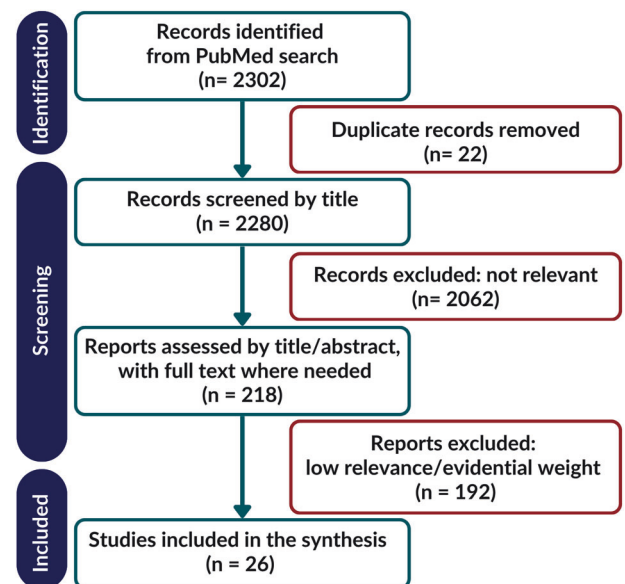


Fig. 2 PRISMA-style flow diagram of the literature search and selection process, showing the number of records identified, screened, assessed, and included in the synthesis at each stage.

difficulties preceding bipolar disorder are more mixed but may be more evident when onset is very early [28–30].

If this hypothesis is correct, then one might expect that when ADHD is diagnosed in those who subsequently develop psychosis it would fail to respond to ADHD-treatment, if treatment has diagnosis specific rather than symptomatic effects. While evidence to support this hypothesis is limited [31, 32], currently it is suggested that when ADHD occurs in the context of bipolar disorder or psychosis, both require treatment [33, 34]. That is, ADHD and psychosis should be managed as two separate comorbid conditions. However, these recommendations are also based on limited evidence, in part because psychosis and bipolar disorder are two of the top three exclusion criteria in RCTs for ADHD medication [35]. In the meantime, it is advisable that this group is managed in secondary care and that ADHD treatment in these situations should be monitored carefully for side effects and worsening of symptoms. Future research needs to examine the clinical features and treatment response of both conditions in the context of comorbidity. The overlaps and comorbidity between different neurodevelopmental and psychiatric disorders are a recognised challenge to psychiatric nosology.

ADHD treatment may have a causal effect on psychotic disorders

For many years, ADHD medication, specifically stimulants, were thought to increase the risk of psychosis. Evidence from registry studies however suggest that therapeutic use of methylphenidate is not associated with increased risk of psychosis (incidence rate ratio = 1.04 (95% CI 0.80–1.34) for psychosis 12 weeks after vs. before initiation of treatment) [36] and a Finnish study suggests that it might even have a protective effect [37]. Nevertheless, a recent meta-analysis observed that 2.3 and 3.7% of those with ADHD who were prescribed stimulants developed a psychotic disorder and bipolar disorder respectively [38]. However, as this article highlights, those with ADHD are at elevated risk for psychotic disorders regardless of medication. In contrast, some studies have suggested an elevated risk of psychosis in those taking prescription amphetamines (meta-analysis odds ratio [OR] = 1.57, 95% CI = 1.15–2.16, amphetamines vs methylphenidate) [38–41], especially where the dose is high (OR = 5.28, 95% CI = 3.06–9.13) [39]. Non-stimulant medications are newer and have not been examined in the same way.

We suggest that where risk for psychotic disorders is elevated (e.g. family or personal history of psychosis), there needs to be caution about prescribing stimulants with careful monitoring regardless of clinical setting, especially relevant in primary care. Also, it is probably preferable to prescribe methylphenidate as first line treatment rather than amphetamines where there is elevated risk. This is especially important as recent findings suggest that methylphenidate treatment of ADHD may reduce risk for future psychosis although this finding requires replication [37]. Non-stimulant ADHD medications are another option [40], although, as already highlighted, evidence here is lacking and further research is needed.

What is clear however is that there are substantial risks of failing to treat ADHD. There is growing evidence from trial emulation studies and other quasi-experimental designs that ADHD has likely causal risk effects on depression [42], suicidal behaviours and suicide [43], criminality [44], and premature mortality [45] and that these risks are reduced by ADHD medication [46]. If there were direct causal effects of ADHD on psychotic disorders, one would expect lower risks of transition to psychotic disorders when ADHD is treated. However, the evidence that therapeutic use of methylphenidate reduces the risk for later psychotic disorders, and that ADHD has direct causal effects on psychotic disorders is inconsistent [34, 47, 48]. In the meantime, current findings highlight the importance of treating ADHD effectively, even in the context of a psychiatric disorder.

ADHD-evoked environmental risks may have causal effects on psychotic disorders

ADHD, as already highlighted, has impacts on multiple stressors and for some, there is evidence of the relationship being causal. Risks relevant to psychotic disorders include illicit substance use [5], and adverse experiences including victimisation [49] and maltreatment [50]. These exposures are associated with psychotic disorders [51, 52], but it is unknown whether they mediate such risk in those with ADHD [53]. If these evoked environmental risks are indeed mediators of psychotic disorders risk, we would expect lower rates in those with ADHD who do not misuse illicit substances or remain unexposed to serious adversity. This should be considered by clinicians who are following up those with ADHD. There also is growing interest in links between the menstrual cycle and ADHD, and its association with premenstrual dysphoric disorder (PMDD) [54]. However, there is no robust evidence to suggest that PMDD is a risk marker for later psychosis, or increases susceptibility to psychosis via other mechanisms, such as cannabis misuse. Hormonal influences require further investigation. Other factors that are associated with psychotic disorder vulnerability and that also may be elevated in those with ADHD,

but not necessarily a direct consequence, include minority group status (e.g. sexual, ethnic) and poverty [55].

Knowledge of risk markers and mediators would be helpful for informing clinicians as to how best to stratify people with ADHD according to risk of later psychotic disorders. Some of these adversities (e.g. substance misuse) are reduced by treatment [56] but the impact of ADHD treatment on reducing psychotic disorders risk, as already discussed is unknown currently. In the meantime, clinicians should note the presence of environmental risk markers when deciding the intensity of follow-up or who should be followed up in secondary rather than primary care.

Risk of psychotic disorders may be mediated by neurodevelopmental or psychiatric conditions that are comorbid with ADHD

ADHD is grouped in DSM-5 and ICD-11 as an NDC with autism spectrum disorder (ASD), intellectual disability, learning, motor and communication difficulties. The different NDCs onset during the developmental period, show marked comorbidity with each other and share genetic liability [3, 57–60]. Thus, it is plausible that a different NDC (e.g. ASD) accounts for the link between ADHD and psychotic disorders [61]; for example, it is ASD rather than ADHD that indexes risk for later psychotic disorders. If risk of psychosis is not due to ADHD, then ADHD treatment should not reduce risk of later psychotic disorder. However, as we have seen, there is emerging evidence that methylphenidate treatment may reduce risk for future psychosis.

As already highlighted, psychiatric comorbidity is common in ADHD and some comorbidities (e.g. depression, irritability) are reduced if ADHD is treated [62–64], so these could potentially behave as risk markers or mediators. Other common comorbidities include PTSD, anxiety, depression, substance misuse, and eating disorders [5–7], that also could simply represent non-specific risk markers for future transition to psychotic disorders. There is evidence that amongst individuals with ADHD, psychiatric comorbidities are associated with an increased risk of schizophrenia [65], and that individuals with a psychotic disorder and ADHD are more likely to have other psychiatric comorbidities than individuals with a psychotic disorder alone [66, 67]. Thus, it may be important for clinicians in primary and secondary care to assess, record, and use other psychiatric diagnoses for weighting risk of ADHD transitioning to a psychotic disorder. It could be argued that those with ADHD and comorbidities should be followed up in secondary care.

If comorbid psychiatric disorders lay on the causal path between ADHD and psychotic disorders, then treating comorbidity would reduce risks of psychotic disorders. However, we did not identify any studies that investigated this hypothesis at present, although treating comorbidity in addition to ADHD remains important for improving other outcomes and functioning.

ADHD and psychotic disorders result from shared underlying neurodevelopmental processes

In common with ADHD and ASD, psychotic disorders, particularly schizophrenia and less so bipolar disorder, are neurodevelopmental in origin [68]. The presence of ADHD might then index neurodevelopmental processes that also confer additional risk to psychotic disorders. Support for this notion, and that ADHD, ASD, and schizophrenia share underlying neurodevelopmental processes, comes from evidence that ADHD shares rare high-risk copy number variants (CNVs) with ASD and schizophrenia even when cases with comorbid schizophrenia or ASD are excluded [69], and also that the two disorders are both associated with pre- and perinatal environmental exposures that impact the developing brain [70, 71]. It is also supported by the evidence for similar cognitive and social impairments mentioned above. For instance, ADHD is seen in around 40% of children with 22q11.2 deletion syndrome [72, 73]. Moreover, a diagnosis of ADHD is associated with

Table 1. A summary of the main hypotheses that may explain the association between ADHD and psychotic disorders, alongside the key assumptions of each hypothesis, evidence for and against each hypothesis, limitations of the evidence, and gaps in the literature.

Hypothesis	Key predictions of hypothesis	Evidence	Key limitations	Gaps/research needs
1. Features suggestive of ADHD are early manifestations of psychotic disorders.	Features of ADHD that occur prior to psychotic disorders are not typical ADHD, so would not respond to ADHD medication.	+ Psychotic disorders are frequently preceded by developmental difficulties across various domains [16–27]. - Comorbid psychosis does not predict ADHD medication non-response [31, 32].	Absence of research that directly tests the hypothesis.	Longitudinal investigation of the efficacy of ADHD medication in individuals who develop a comorbid psychotic disorder, including through RCTs.
2. ADHD treatment has a causal effect on psychotic disorders.	Individuals with ADHD who do not take stimulant medication will not develop psychotic disorders at greater than expected rates. Terminating ADHD pharmacotherapy will resolve psychotic symptoms.	+ Evidence that amphetamine prescriptions increase rates of psychotic disorders. Some evidence indicates increased risk of psychotic disorders with methylphenidate prescription [38–41]. - Large-scale, quasi-experimental studies suggest no increased risk of psychotic disorders with methylphenidate prescription [36–38]. + ADHD predicts many known risk factors for psychotic disorders, including substance misuse [5, 49–53].	Severity of ADHD may confound association. Limited duration of follow-up. Record of a dispensed prescription does not confirm medication taken as prescribed.	Quasi-experimental investigations of stimulant and non-stimulant medication use and psychotic disorder risk. Impact of developmental timing and duration of ADHD pharmacotherapy on psychotic disorder risk.
3. ADHD-evoked environmental risks have causal effects on psychotic disorders	Elevated rates of psychotic disorders do not occur in individuals with ADHD who do not experience environmental risks for psychotic disorders	+ ADHD predicts many known risk factors for psychotic disorders, including substance misuse [5, 49–53].	Absence of research testing mediation models	Mediation models of key environmental risk factors RCTs of interventions to reduce mediators
4. Risk of psychotic disorders is mediated by neurodevelopmental or psychiatric conditions that are comorbid with ADHD	Preventing and treating psychiatric comorbidity in ADHD will reduce the risk of psychotic disorders	+ Evidence that psychiatric comorbidities in ADHD increase the risk of schizophrenia; individuals with ADHD and psychotic disorder are more likely to have other psychiatric comorbidities [65–67].	Absence of research examining the impact of treating comorbidities Evidence is association not causation	Mediation models that test psychiatric comorbidity Longitudinal investigation of the outcomes of treating psychiatric comorbidities and subsequent risk of psychotic disorders
5. ADHD and psychotic disorders result from shared underlying neurodevelopmental processes	Those with a psychotic disorder who also have ADHD will manifest a higher burden of neurodevelopmental liabilities e.g. developmental delay, CNVs and damaging rare mutations, and cognitive impairment than those who do not have ADHD	+ ADHD and psychotic disorders share both common and rare genetic risk factors as well as environmental exposures impacting the developing brain [69–78]. - Evidence that neurodevelopmental liability is less in bipolar disorder than in schizophrenia [86].	Genetic aetiology of psychiatric disorders is a rapidly evolving field, and existing findings (particularly when null) may not replicate as knowledge advances	In-depth and well-powered investigation of genetic architecture of ADHD + psychotic disorders compared to each one alone. Investigation of environmental exposures and de novo mutations affecting the developing brain Prediction of ADHD transition to psychotic disorder using genomic data

subsequent psychotic outcomes in those with 22q11.2DS [74]. There is also evidence supporting a shared biological substrate from common variant overlap between ADHD and psychotic disorders [75–78]. Recent research also points to the importance of non-familial factors in the neurodevelopmental processes that are associated with schizophrenia and childhood NDCs [79, 80]. Common genetic variants capture familial risk, whereas the high-risk CNVs found in these conditions usually occur de novo and contribute to non-familial rather than familial risk [79]. This might explain why the common variant genetic correlation between ADHD and psychotic disorders is relatively modest and suggests that environmental factors and de novo mutations affecting the developing brain might turn out to be shared factors influencing the higher risk of developing psychotic disorders in ADHD. This is clearly an important area for future research.

CONCLUSION AND CLINICAL IMPLICATIONS

ADHD is associated with a higher risk of transition to a psychotic disorder, but this is not well recognised as it only occurs in a minority of cases. Research findings from prospective studies highlight that clinicians in both primary and secondary care need to consider the possibility of psychotic disorder developing in those with ADHD, and at an earlier age than is typical.

This possibility needs to be considered especially for those with a family history of psychotic disorders, those with comorbidity, exposure to environmental risk factors including substance misuse and the presence of a high-risk CNV and also, where ADHD treatments appear to have become less effective over time. In these instances, we suggest that follow-up in secondary rather than primary care is advisable.

As recommended by the Royal College of Psychiatrists, genetic testing is required for those with a neurodevelopmental disorder who also show comorbid dysmorphic features, developmental delay/intellectual disability or an unusual medical presentation, as well as all individuals with early onset psychosis [81]. For those with a psychotic disorder, especially when onset is early, it is crucial to consider the possibility of ADHD and other NDCs. Indeed, it could be argued that all those in contact with a child or adult psychiatric service ought to be screened routinely for NDCs at the outset given the high rates of ADHD in these individuals [3, 82]. This is important given that ADHD is treatable. However, staff in adult psychiatric services may not be trained to recognise or treat ADHD. Given how common ADHD is, we suggest that all mental health clinicians should be trained to recognise and assess NDCs and treat ADHD. Equally, those seeing children with ADHD need to know how to screen for and recognise early onset psychotic disorders and weight risk; this includes paediatricians and primary care practitioners. Undetected psychotic disorder, especially early-onset bipolar disorder is not unknown in those with ADHD [83] and may explain why a young person with ADHD is failing to respond to ADHD treatments.

Service capacity is a current challenge for ADHD services across all higher income countries, with growing interest in shifting beyond specialist services and greater involvement of primary care [84, 85]. As more countries move to a more generalist model of ADHD care, then scientific evidence to help triage and stratify ADHD according to risk and complexity becomes crucial. This includes research on stratification to aid identification of those who can be safely managed in primary care and those who require scarce secondary service support. Yet there is an enormous evidence gap here [84].

In this perspective piece we have highlighted key hypotheses that could be tested and the evidence gaps (see Table 1 for summary). We urge the research community to consider evidence informed ways to stratify and triage ADHD so that expensive specialist care is prioritised for those with the greatest clinical complexity, as well as to identify potentially modifiable

mechanisms that explain the link between ADHD and psychotic disorders. We also suggest that a distinct separation between ADHD and mental health services fragments services and treatment support.

DATA AVAILABILITY

This Perspective article does not include any original data. All sources discussed are publicly available in the published literature.

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AUTHOR CONTRIBUTIONS

AT conceived the article, wrote the first draft, and coordinated the submission and revision process. CD contributed to the first draft, assisted with methodology, managed the references, contributed to figure preparation, and revised the manuscript. AK conducted the literature search, developed the search methodology, contributed to figure preparation, and revised the manuscript. MJO provided senior oversight and critically revised the manuscript for important intellectual content. All authors reviewed and approved the final version of the manuscript.

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ETHICS DECLARATION

Ethical approval was not required as this Perspective article did not involve human participants or animal subjects.

ADDITIONAL INFORMATION

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