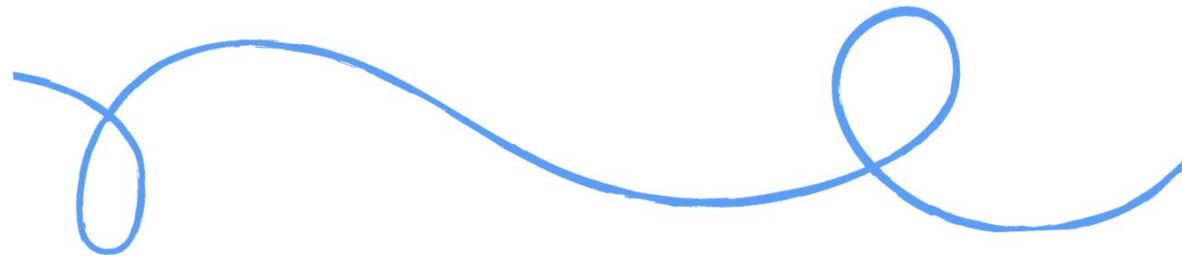


ADHD and co-occurring mental health conditions



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Overview

- Background: Attention Deficit Hyperactivity Disorder (ADHD)
- How common are psychiatric disorders in ADHD?
- Presentation of common psychiatric disorders in ADHD
- Why might psychiatric disorders co-occur with ADHD
- Summary and implications



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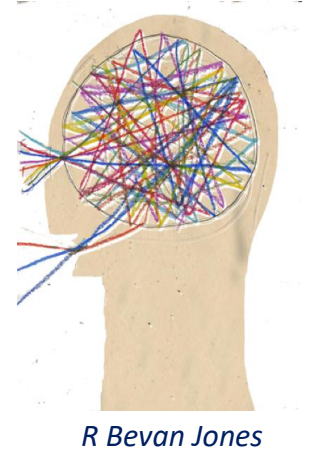
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Attention Deficit Hyperactivity Disorder

- Characterised by inattention, hyperactivity and impulsivity
- Symptoms present from childhood, across settings
- Associated with impairment in social, academic and family functioning, difficulties often continue into adult life
- Prevalence around 3-5% in children and 2-3 % in adults
- More common in males in childhood (M:F ratio 4:1 in population samples), gender difference less prominent in adulthood



Polanczyk *et al* 2014; Ayano *et al* 2024; Thapar and Cooper, 2016.



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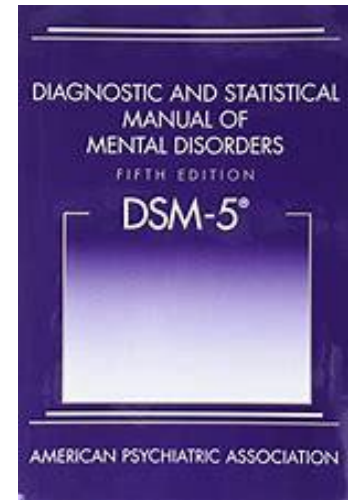
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Attention Deficit Hyperactivity Disorder

- ADHD is a neurodevelopmental (ND) condition
- ND conditions also include:
 - Intellectual disability (ID)
 - Communication disorders
 - Autism spectrum disorder (ASD)
 - Specific learning disorders
 - Motor disorders



American Psychiatric Association (2013)



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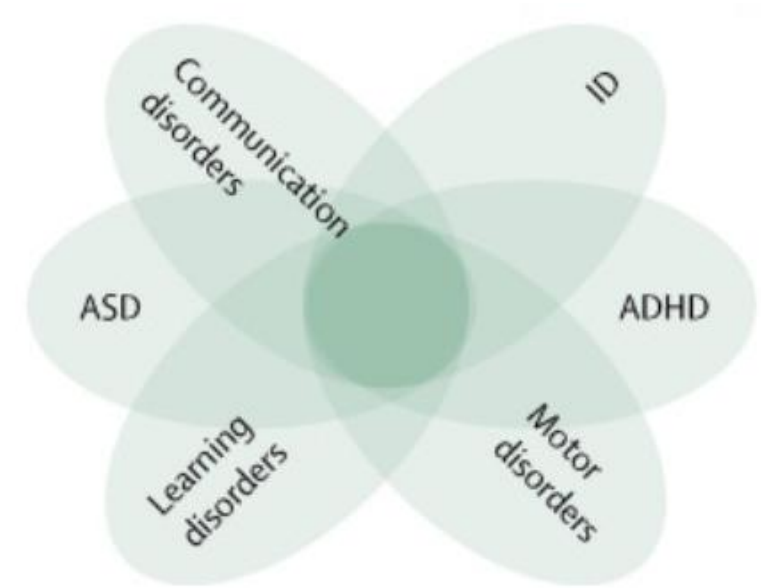
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Neurodevelopmental Conditions Overlap

- Core features differ, but clinical overlap is high:
 - 20-50% with ADHD have ASD
 - Nearly 50% with ADHD have Developmental Coordination Disorder
 - 50-90% with ADHD have coexisting language problems



Thapar and Cooper, 2017



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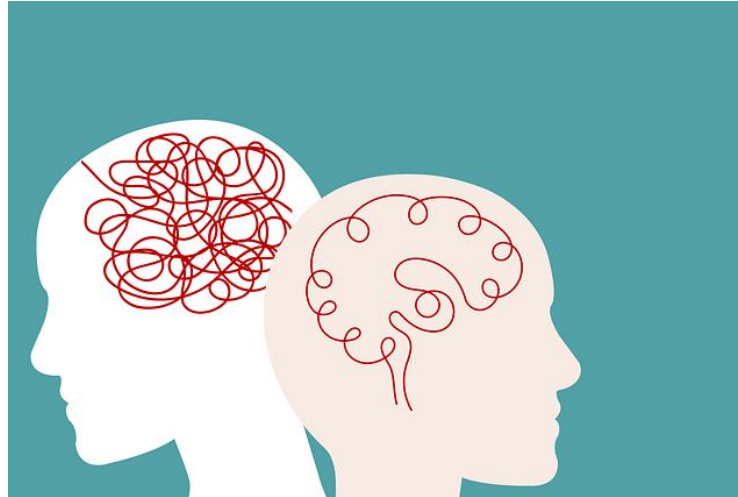


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How common are co-occurring psychiatric disorders in ADHD?



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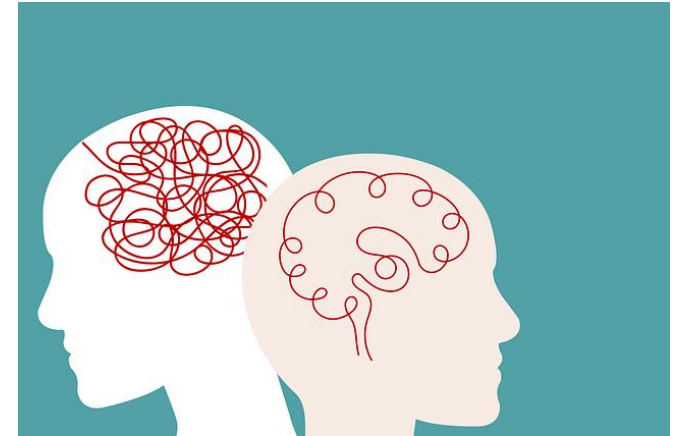
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ADHD and co-occurring psychiatric disorders

- Important to understand how commonly psychiatric disorders occur in ADHD
- Comorbid psychiatric disorders may complicate diagnosis, influence management of ADHD, impact on prognosis



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ADHD and co-occurring psychiatric disorders

- Psychiatric disorders commonly co-occur in individuals with ADHD
- More than 60% of children and up to 80% of adults with ADHD have one or more co-occurring psychiatric disorder
- ***But which psychiatric disorders?***



Cuffe *et al.*, 2020; Choi *et al.*, 2022



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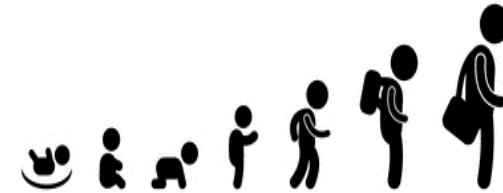
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ADHD and co-occurring psychiatric disorders

Different conditions onset at different ages



Development

Childhood:

Anxiety disorders

Adolescence:

Eating disorders

Early adulthood:

Mood disorders

Psychotic disorders

Solmi *et al.*, 2022



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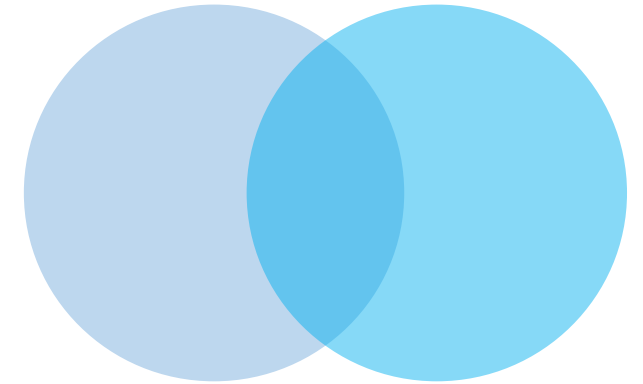
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ADHD and co-occurring psychiatric disorders

- Most common co-occurring psychiatric disorders in *children and adolescents* with ADHD:
 - Behavioural disorders (10 x more common):
 - Oppositional Defiant Disorder ~30-50%
 - Conduct Disorder ~3.5-10%
 - Depression ~12-50% (5 x more common)
 - Anxiety disorders ~5-35% (3 x more common)



Angold *et al.*, 1999; Spencer *et al.*, 2006; Gnanavel *et al.*, 2019.



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Study of ADHD, Genes and Environment (SAGE)

- Around 700 children with clinical diagnosis of ADHD recruited mainly from CAMHS clinics in South Wales in 2007-2011
- Average age 10 years; most male (84%)
- Research diagnostic interviews- rates of comorbid conditions established

Most had a comorbid condition:

- 34.4% ADHD only
- 59.1% ADHD + 1 comorbidity
- 6.5% ADHD + ≥ 2 comorbidities

Most common:

- Oppositional Defiant Disorder (39.2%)
- Conduct Disorder (17.6%)
- Anxiety disorder (6.4%)



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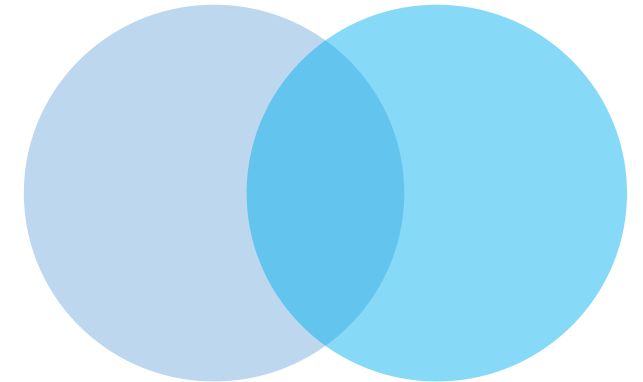
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ADHD and co-occurring psychiatric disorders

- Most common co-occurring psychiatric disorders *in adults* with ADHD:
 - Substance use disorder ~ 2-80 %
 - Mood disorders
 - Depression ~ 10-50%
 - Bipolar affective disorder ~ 5-80%
 - Anxiety disorders ~ 4-80%
 - Personality disorders ~ 0.5-65%



Choi *et al.*, 2022



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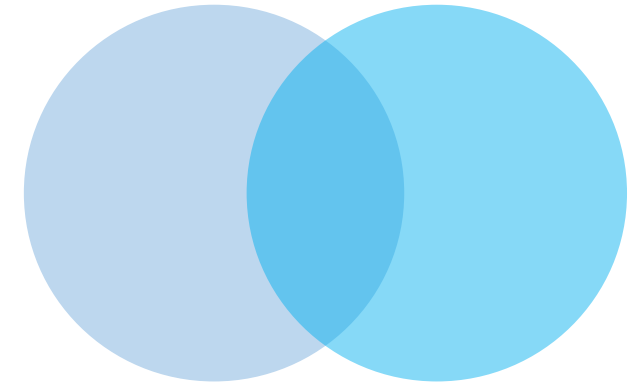
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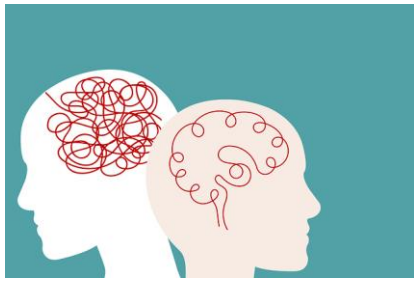


ADHD and co-occurring psychiatric disorders

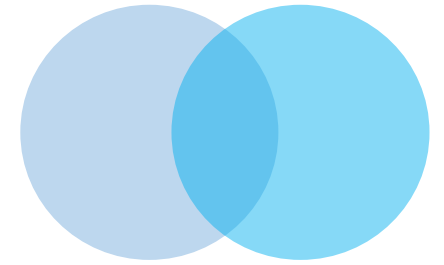
- ADHD in childhood associated with bipolar disorder in adulthood (odd ratio 8.97)
- ADHD in childhood associated with later psychotic disorder (pooled relative effect 4.74)
- Increased risk of suicide attempts, suicidal ideation, completed suicide in young people and adults with ADHD



Brancati *et al.*, 2021; Nourredine *et al.*, 2021; Septier *et al.* 2019.



Summary: part 1



- ADHD is common and impairing and overlaps with other neurodevelopmental conditions
- Psychiatric disorders are more common in individuals with ADHD
- The most commonly co-occurring disorders vary across development
- Anxiety and depression among most common across childhood, adolescence and adulthood



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Presentation of common mental disorders

- Understanding how psychiatric disorders present in ADHD is important
- Having ADHD and a comorbid psychiatric disorder is associated with more severe presentation, greater impairment and poorer outcomes
 - *ADHD + depression* increases risk of psychosocial impairment, psychiatric hospital admission, suicidality
 - *ADHD + conduct disorder* is associated with school exclusion, drug use, criminal behavior, and later antisocial personality disorder
- Understanding presentation helps with identification and treatment

Biederman *et al.*, 2006; Chronis-Tuscano *et al.*, 2010



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Things to consider...

- ADHD may affect recognition of comorbid psychiatric disorders
 - People with ADHD may have difficulties describing mental health symptoms
 - Symptom overlap between ADHD and psychiatric disorders may complicate presentation
 - Measures used to assess psychiatric disorders, not designed for use in those with ADHD

Fraser *et al.*, 2018



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Focus on presentation of depression in ADHD

Depression symptoms:

- Depressed/irritable mood
- Anhedonia
- Change in appetite
- Change in sleep pattern
- Psychomotor agitation/retardation
- Loss of energy
- Feelings of worthlessness/guilt
- Diminished concentration
- Recurrent thoughts of death/suicidality



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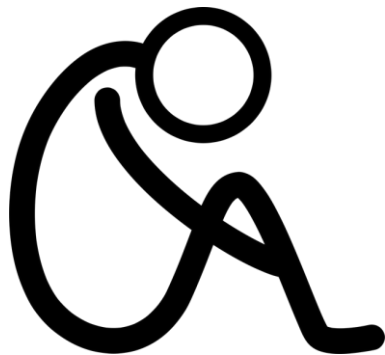
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Presentation of depression in ADHD: age of onset

- Evidence that depression presents earlier in ADHD
- Individuals with early onset emotional problems more likely to have ADHD than those with later onset emotional problems



Dennison *et al.*, 2024



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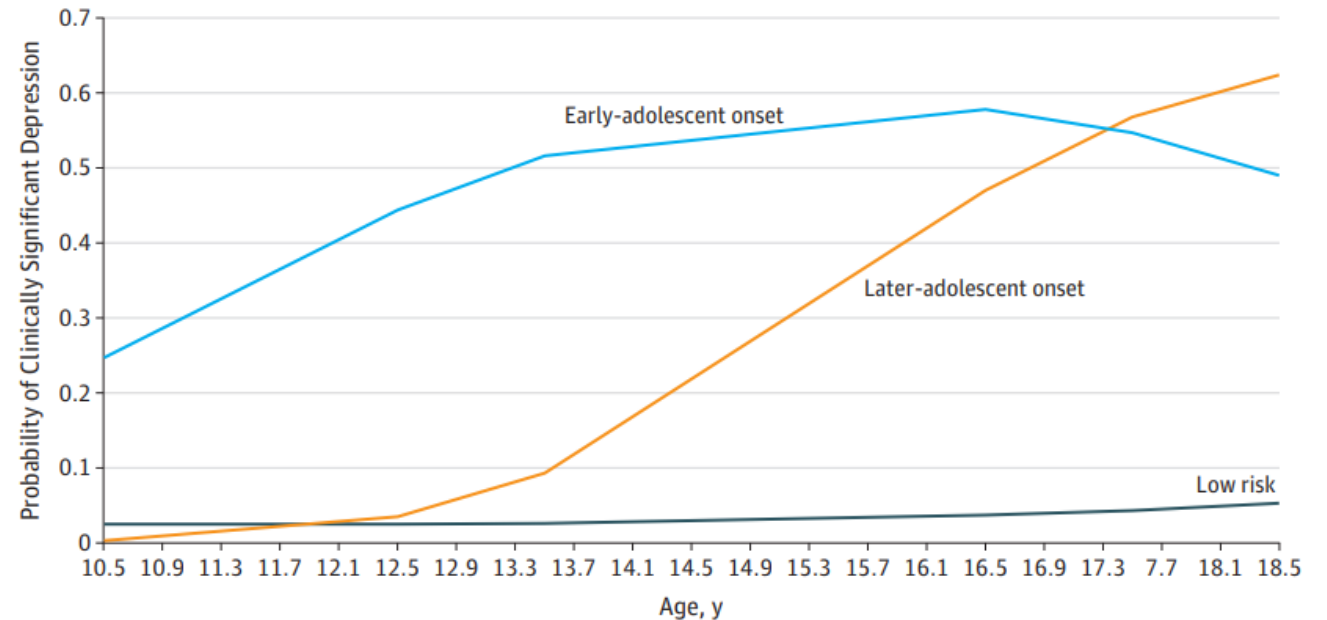
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Presentation of depression in ADHD: age of onset

- Depression from childhood to early adulthood
- Earlier onset associated with ADHD symptoms and ADHD genetic risk

Figure. Developmental Trajectories of Depressive Symptoms



Rice *et al.*, 2018



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Presentation of depression in ADHD: symptoms

What about presentation of symptoms?

- Compared the frequency of depression symptoms in our Welsh clinical ADHD sample to a general population sample
- Depression symptoms were much more common in the ADHD sample (average pMFQ total= 24.5 vs 9.39)
- The profile of depression symptoms (which presented most commonly) was similar to those in general population

Fraser et al., 2018



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Presentation of depression in ADHD: symptoms

Top 5 depression symptom in population sample vs ADHD sample

Population sample:

1. **S/he felt grumpy and cross with his/her parents**
2. **S/he felt miserable or unhappy**
3. **It was hard for him/her to make up his/her mind**
4. S/he ate more than usual
5. S/he worried about aches and pains

ADHD sample:

1. **S/he felt grumpy and cross with his/her parents**
2. S/he found it hard to think properly or concentrate
3. S/he was very restless
4. **S/he felt miserable or unhappy**
5. **It was hard for him/her to make up his/her mind**

Fraser et al., CAMH, 2018



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Presentation of depression in ADHD: symptoms

- Some overlap between ADHD symptoms and depression symptoms e.g. difficulty concentrating, restlessness
- How can we identify those with depression?

Are there particular symptoms of depression that we are more likely to see in individuals with ADHD who have a depression diagnosis?



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Presentation of depression in ADHD: symptoms

- Depression symptoms in children with ADHD + depression, compared to depression symptoms in children with ADHD but no depression diagnosis
- Symptoms that discriminate depression from ADHD are:
 - **Depressive cognitions** (guilt, worthlessness, hopelessness, suicidal thoughts)
 - **Anhedonia** (lack of pleasure/enjoyment)
 - **Psychomotor retardation** (being slowed down)
- **Onset of symptoms and change in presentation important to consider**

Diler *et al.*, 2007



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Presentation of depression in ADHD: adults

How do depression symptoms present in adults with ADHD?

- Depression characteristics in women with depression and high ADHD symptoms:
 - Earlier age of onset of depression
 - Higher depression associated impairment
 - Greater recurrence of depressive episodes
 - Higher levels of irritability
 - Increased risk of self harm and suicide attempt
 - Increased risk of hospitalization
 - Receiving non first line depression medication

Worth considering ADHD
in adults that present with
these depression
characteristics?

Powell et al., 2021



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Identifying ADHD in the presence of depression

- Evidence suggests diagnosis of ADHD can be delayed or missed in the presence of emotional problems in young people
- Martin et al., 2024 used national healthcare records in Wales to explore this
- Looked at recognition and treatment of ADHD and co-occurring mental health conditions, comparing girls and boys



Young *et al.*, 2020; Martin *et al.*, 2024



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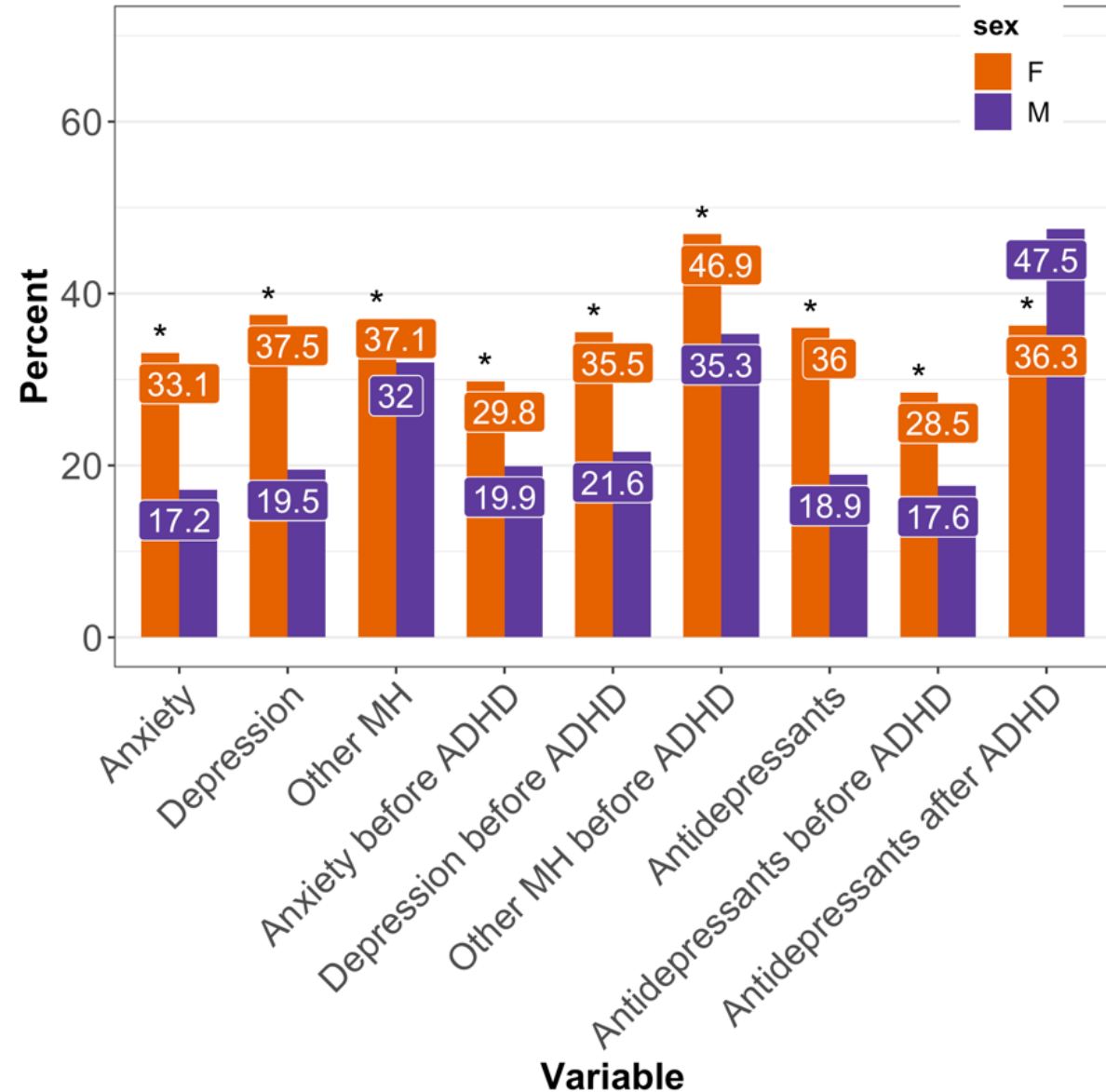
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Identifying ADHD in the presence of depression

- ADHD diagnosis later in girls (boys: 10.9, girls: 12.6 years)
- Girls more likely to be diagnosed with depression before ADHD
- Girls more likely to be prescribed antidepressants, but less likely to continue with them after ADHD diagnosis
- ADHD possibly overshadowed by emotional problems in girls



Summary: part 2

- Comorbid psychiatric disorders onset earlier and have a more severe course in the presence of ADHD

Focus on depression in ADHD:

- Depressive cognitions, anhedonia and psychomotor retardation are suggestive of depression in ADHD
- Think about change in symptoms
- Be aware of possibility of depression in ADHD, and of ADHD in those diagnosed with depression



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Why might psychiatric disorders co-occur with ADHD?

- Understanding why comorbid psychiatric disorders occur in ADHD is important
- Understanding mechanisms through which ADHD and comorbid conditions are linked can help identify targets for interventions and prevention



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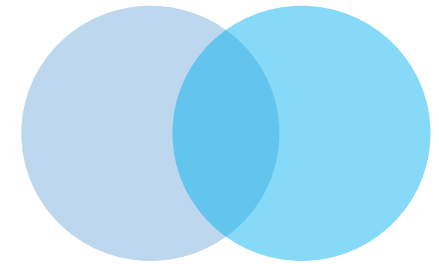
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Why might psychiatric disorders co-occur with ADHD?

- Possible explanations include:
 1. Symptom overlap
 2. Shared risk factors
 3. Causal association
 4. As a result of a third disorder/difficulty



Caron and Rutter, 1991



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Focus on links between ADHD and Depression



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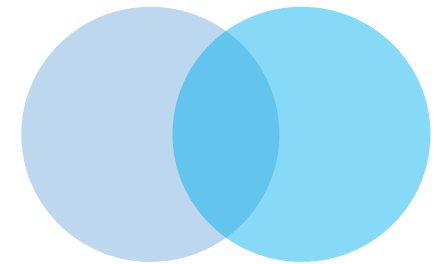
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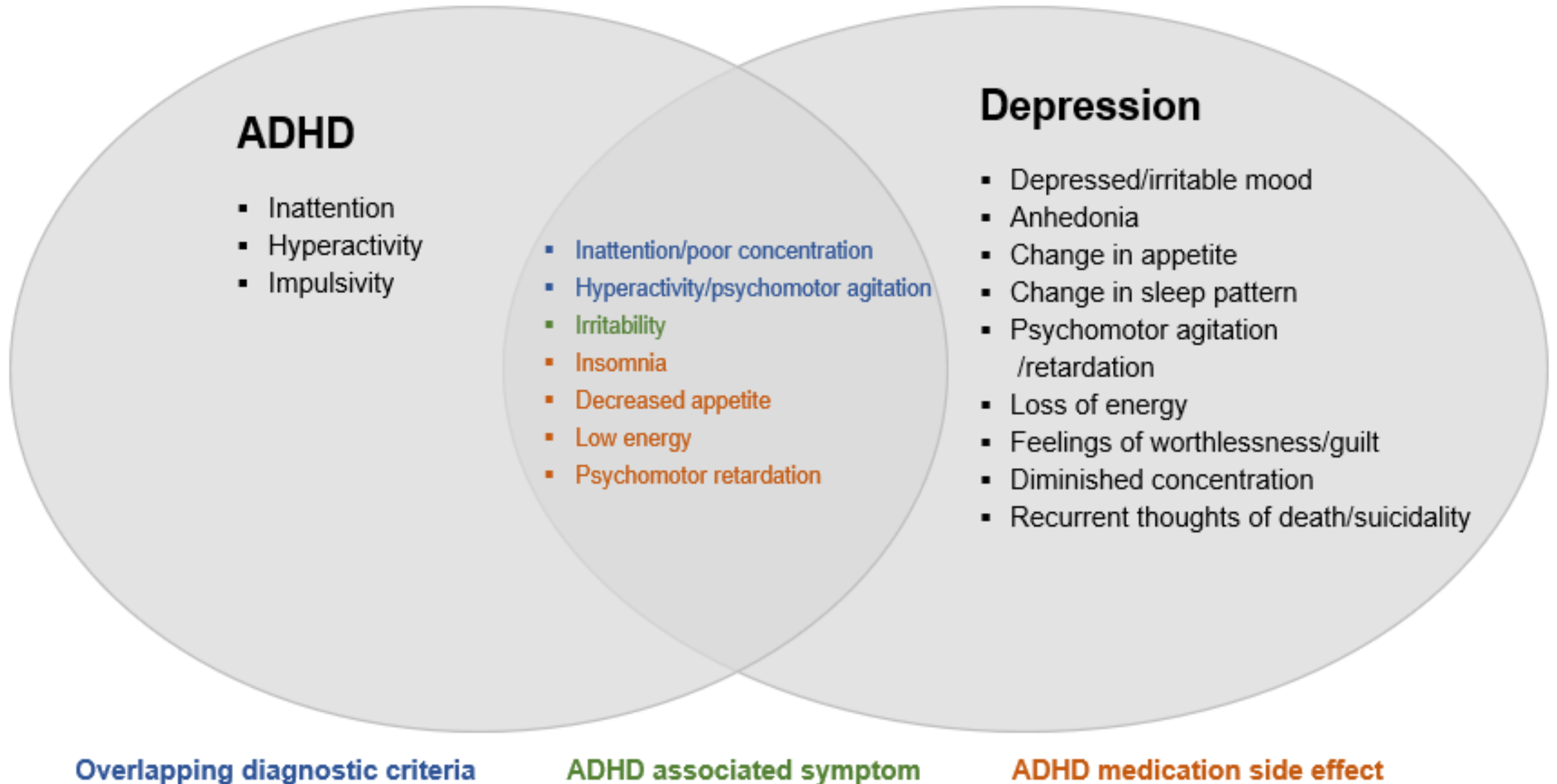
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Symptom overlap: ADHD and depression



Symptom Overlap: ADHD and depression

Symptom	Depression	ADHD
Poor Concentration/distractibility	D	D
Hyperactivity/psychomotor agitation	D	D
Impulsivity	A	D
Mood swings	A, S	A, S
Irritability	D, S	A, S
Insomnia	D, S	A, S
Decreased appetite	D, S	S
Low energy/psychomotor retardation	D, S	S
Low self esteem	D	A

- D=diagnostic criteria, A=associated symptom, S=side effect of ADHD medication

Daviss, 2016



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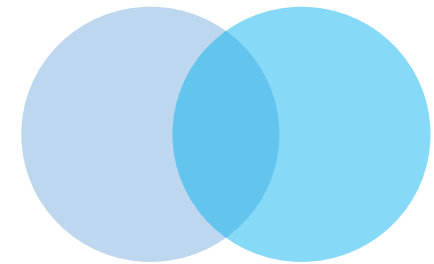
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Caron and Rutter, 1991



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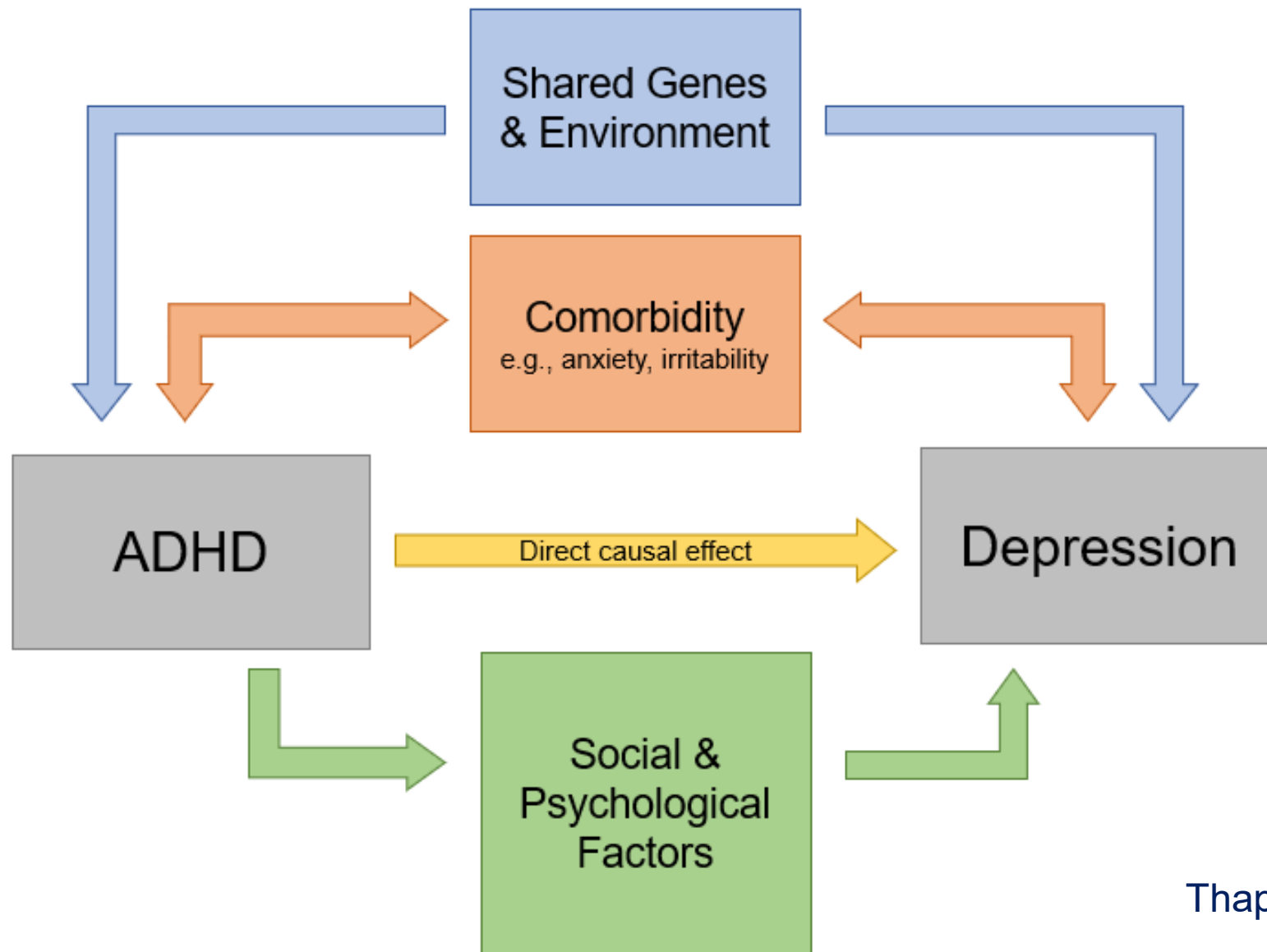


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Thapar *et al.*, 2023



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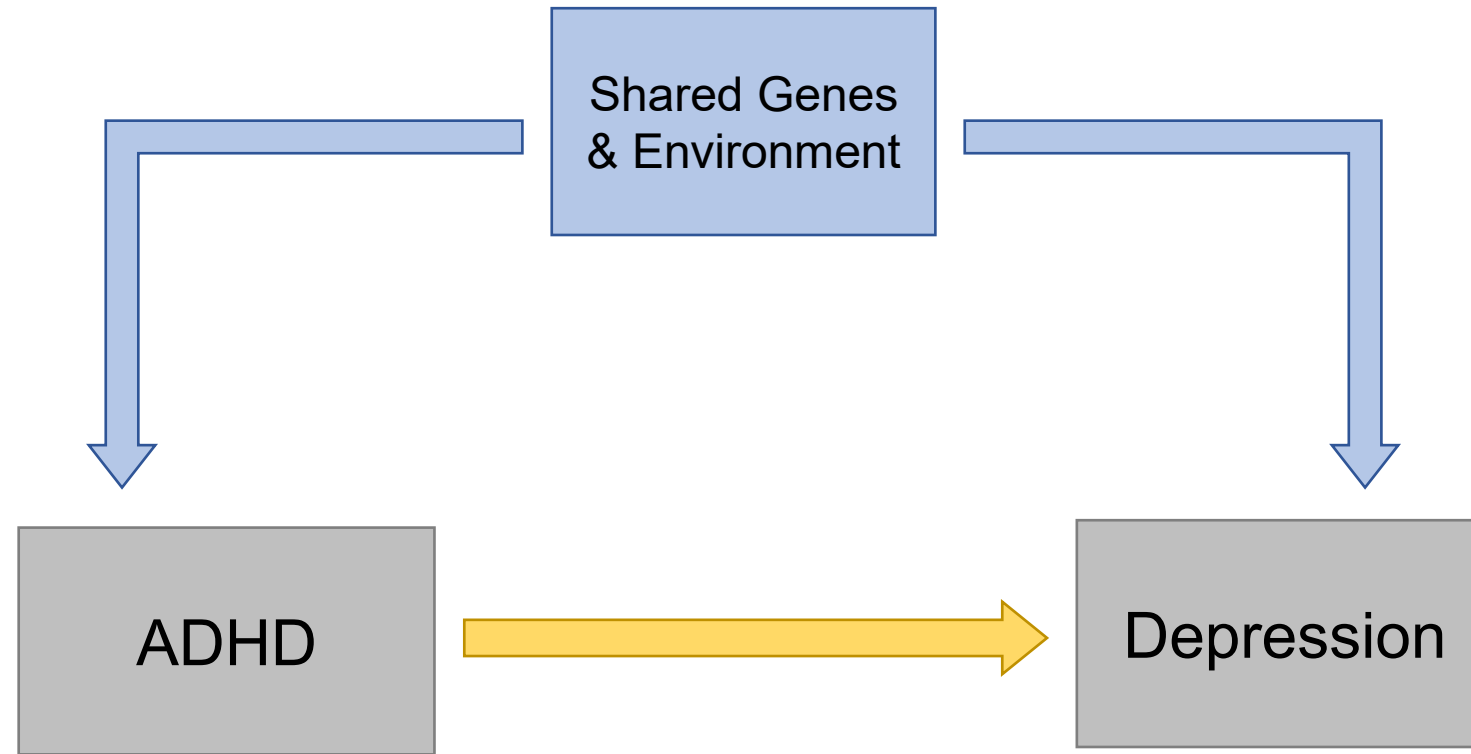


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Shared Risk Factors?



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Shared Risk Factors?



- **Shared genetic risk:**
 - Family members of those with ADHD are more likely to have depression than those without
 - Twin studies suggest familial links between ADHD and depression are mainly explained by shared genetic liability
 - Molecular genetic studies suggest genetic overlap between ADHD and depression

Chen *et al.*, 2019; Wang *et al.*, 2022; Stern *et al.*, 2020; Demontis *et al.*, 2019.



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Shared Risk Factors?

- **Shared environmental risk:**
 - Little evidence that shared environmental risk factors contribute to ADHD and depression
 - Environmental risk factors that contribute to depression (e.g. stressful life events, bullying) typically occur after age of onset for ADHD

Thapar *et al.*, 2022



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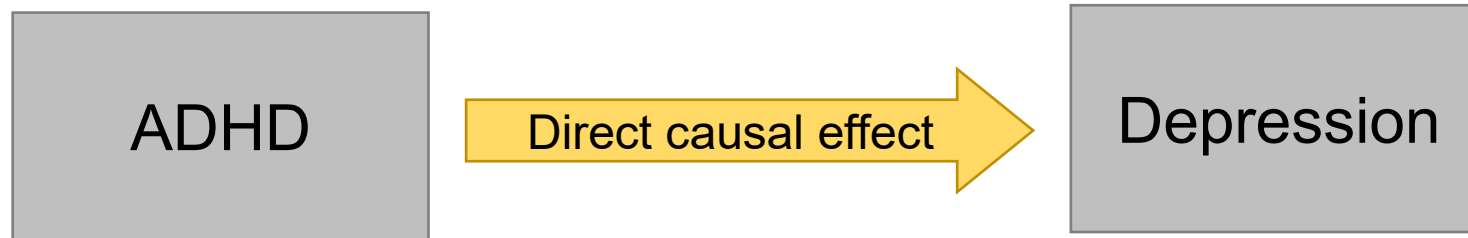
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Causal Association?



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Causal association?

- ***Treatment based study designs:***
 - If ADHD has a causal effect on depression, then treating core symptoms of ADHD should reduce the risk of depression
 - Young people with ADHD treated with stimulants less likely to develop depression compared with ADHD subjects who were not treated
 - Individuals with ADHD had a lower rate of depression when receiving ADHD medication than when they were not

Daviss et al., 2008; Chang et al., 2016.



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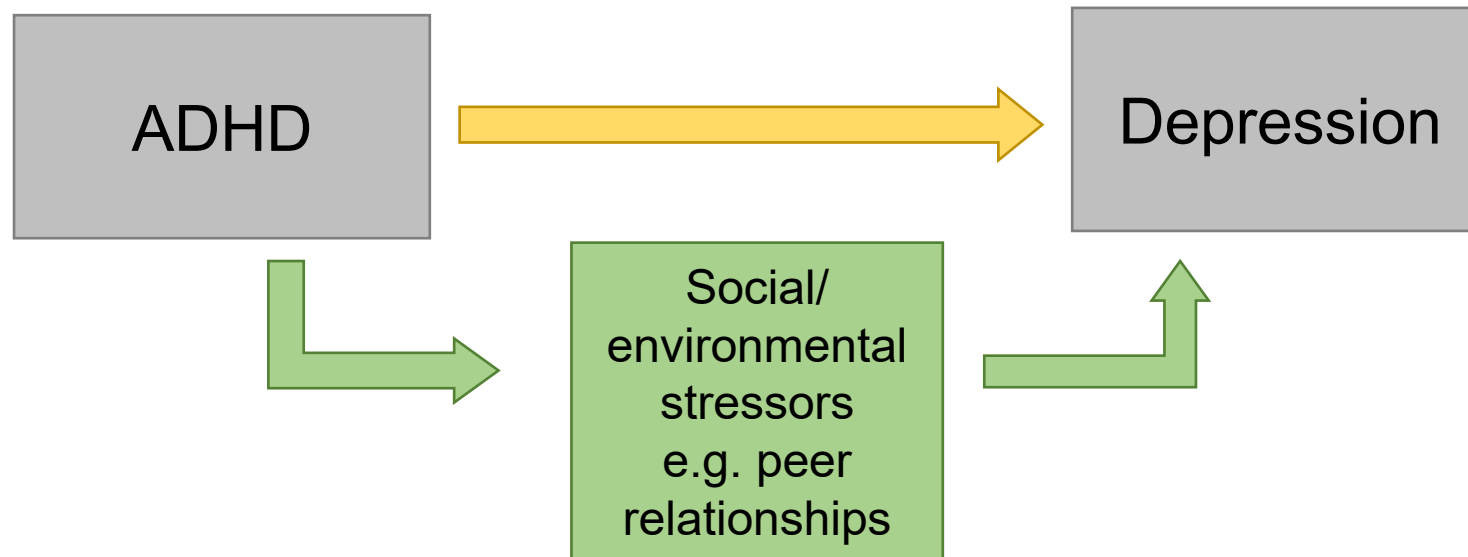
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Indirect association?



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Indirect association?

- Parent child relationship difficulties partially mediate association between ADHD symptoms and depression
- Friendship quality and peer problems partially mediate association between ADHD and depression symptoms
- Academic ability/attainment- found by some to partially mediate association between ADHD and depression

Humphreys *et al.*, 2013; Meizner *et al.*, 2020; Roy *et al.*, 2015.



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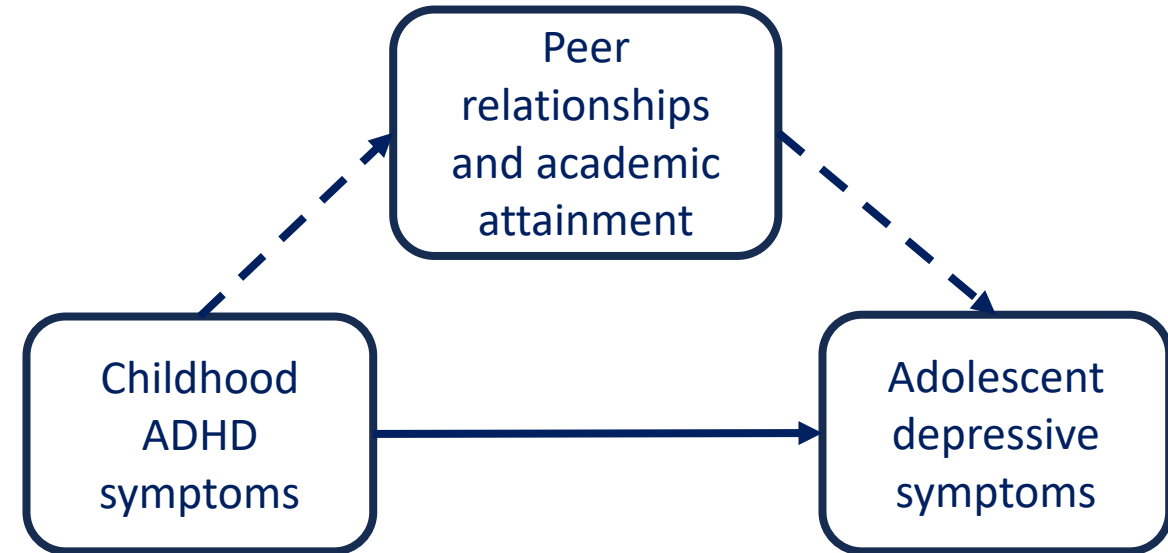
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Indirect association?

- Large longitudinal population sample
- Childhood ADHD symptoms associated with higher depressive symptoms
- Association mediated in part by peer problems and academic attainment



Powell et al., 2020



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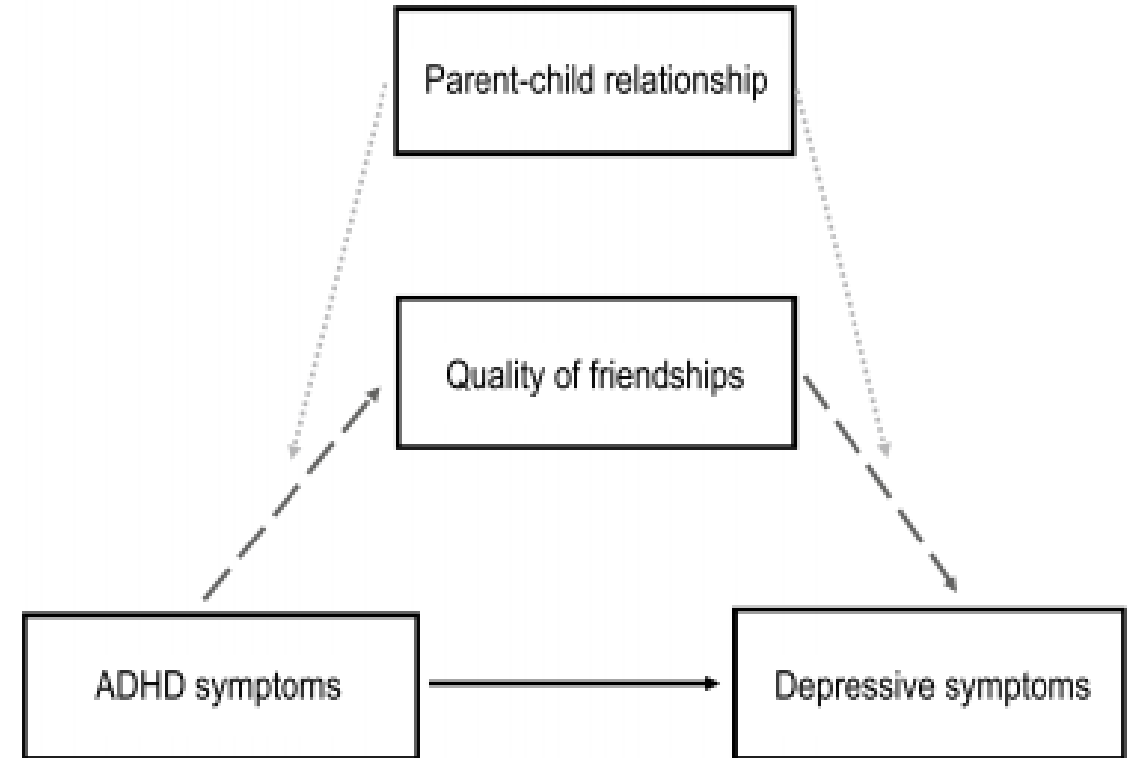
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Indirect association?

- In a UK school sample
- Friendship quality found to be a mediator of association between ADHD symptoms and depression
- Effects via friendship quality attenuated slightly as children reported warmer parent child relationships



Powell *et al.*, 2021



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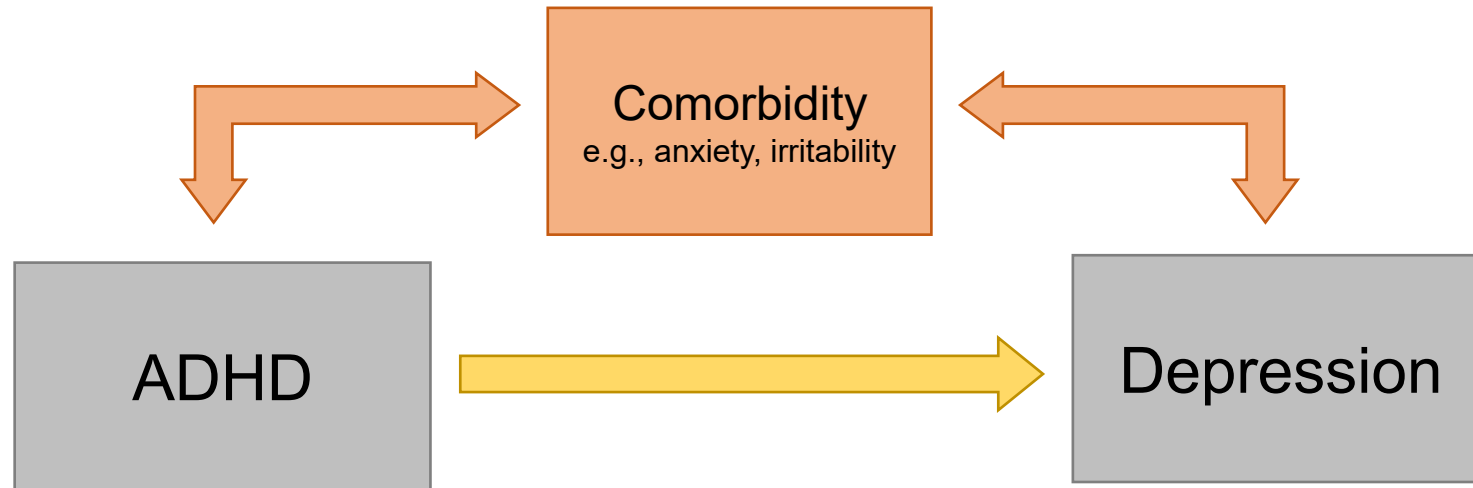


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As a result of a third disorder/difficulty?



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As a result of a third disorder/difficulty?

- Association between ADHD and depression may be due to a third disorder or difficulty that commonly accompanies ADHD
- Anxiety and conduct disorder are common in ADHD and also associated with depression
- Some studies find the association between ADHD and depression is explained by the presence of one of these disorders
- Others show association between ADHD and depression remain when controlling for anxiety and conduct problems

Angold *et al.*, 2009; Copeland *et al.*, 2003; Meinzer *et al.*, 2013



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As a result of a third disorder/difficulty?

- Irritability found to mediate the association between ADHD and depression cross sectionally and longitudinally

Seymour *et al.*, 2012 and 2014.



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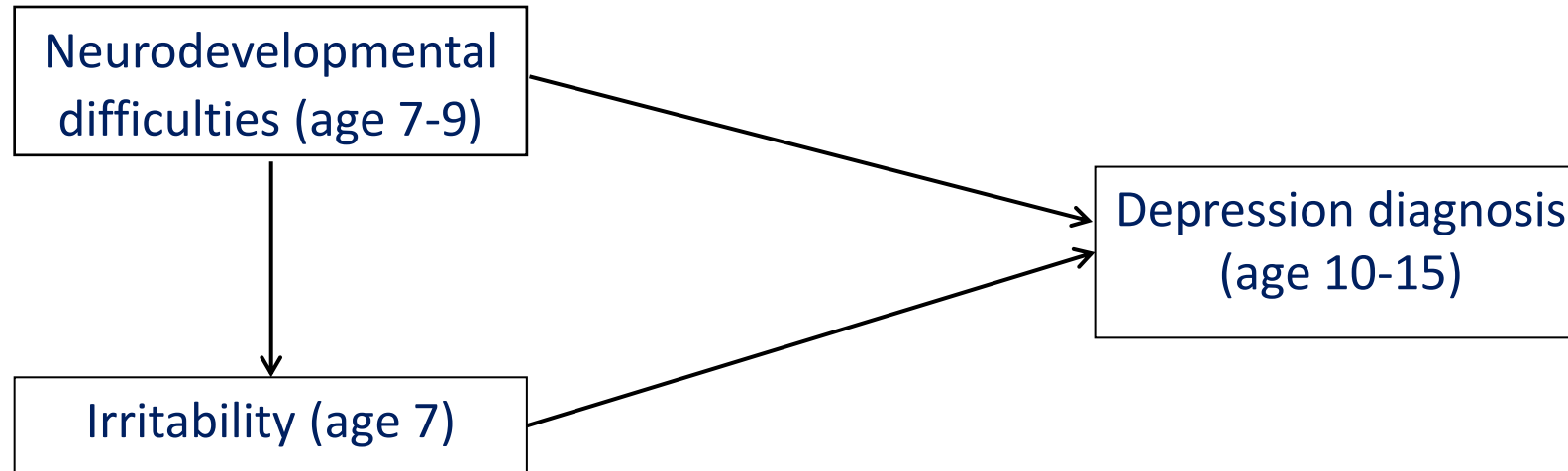
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Understanding link between ADHD and Depression

In a large longitudinal population sample



- Irritability explained ***almost half*** of association between Neurodevelopmental difficulties (including ADHD) and depression

Eyre *et al.*, 2019



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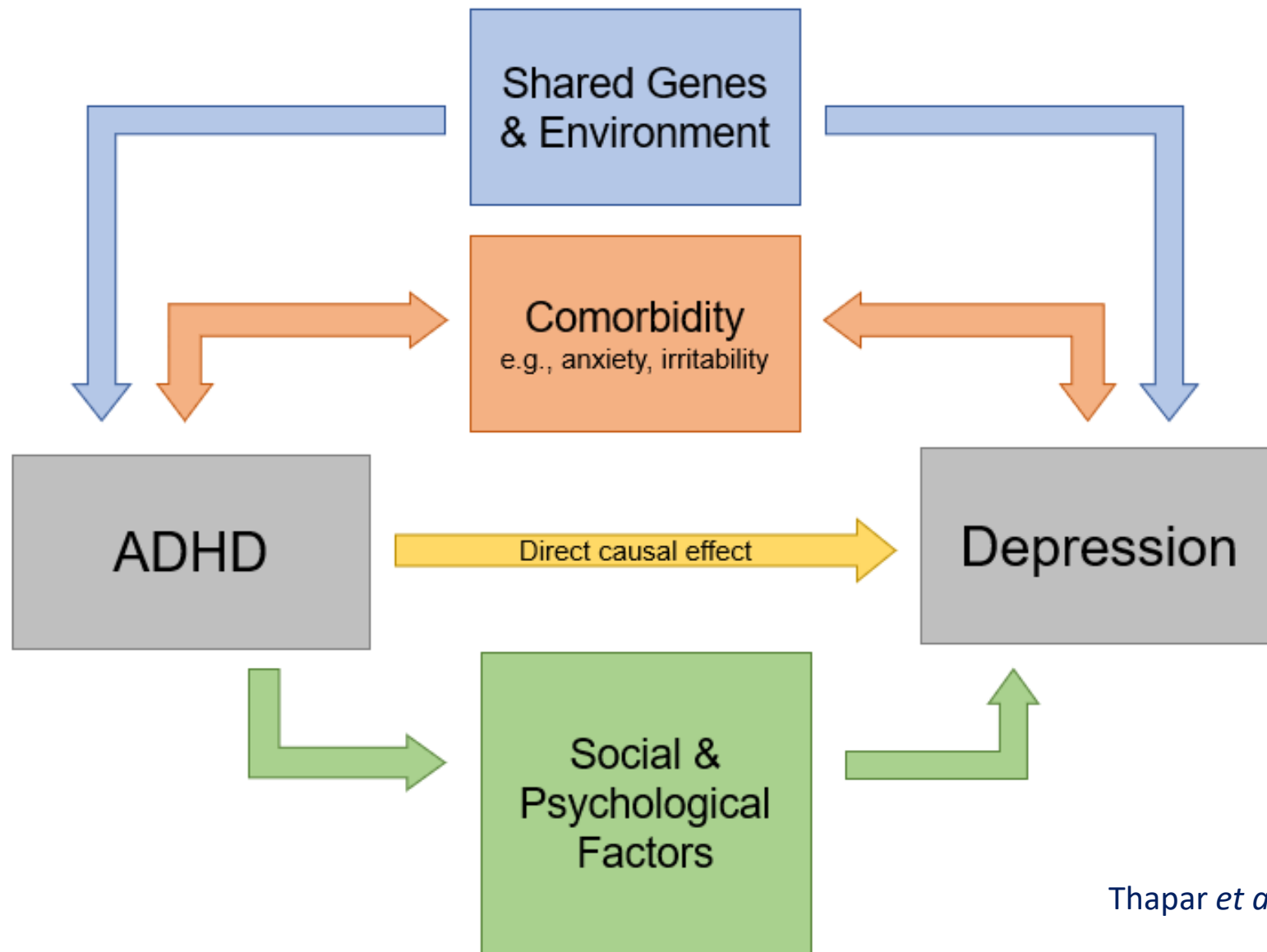


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Thapar *et al.*, 2022



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What about other psychiatric disorders?

- Possible reasons for association between ADHD in childhood and later severe mental illness (eg Bipolar Disorder) have been considered



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Other psychiatric disorders e.g. Bipolar affective disorder



- *Symptom overlap*: hyperactivity, distractibility, lack of inhibition, restlessness, racing thoughts, rapid speech, talkativeness, irritability
- *Shared Risk factors*: Bipolar disorder more common in relatives of those with ADHD, and vice versa
- *Causal association*: Less evidence for this
- *Result of third disorder/difficulty*: Neurodevelopmental comorbidity (eg ASD), or other comorbid mental health problems (eg anxiety, substance misuse)

Comparelli *et al.*, 2022



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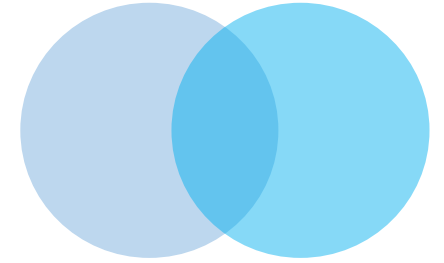
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Summary- part 3



- Understanding mechanisms through which ADHD and comorbid conditions are linked is important to help identify targets for interventions and prevention
- Possible explanations for increased comorbid psychiatric disorder in ADHD include: symptom overlap, shared risk factors, causal association, result or 3rd disorder/difficulty
- Focus on depression: number of these explanations plausible



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Overview

- Background: Attention Deficit Hyperactivity Disorder (ADHD)
- How common are psychiatric disorders in ADHD?
- Presentation of common psychiatric disorders in ADHD
- Why might psychiatric disorders co-occur with ADHD
- **Summary and implications**



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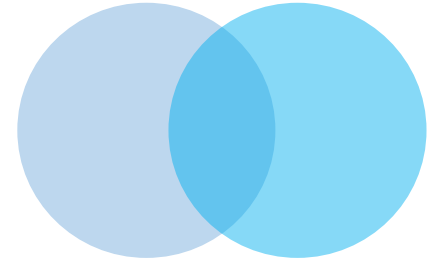
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Summary and implications (1)



- Psychiatric disorders are common in young people with ADHD
- They result in impairment and poor long-term outcomes
- Important to be aware of the possibility of comorbid conditions in individuals with ADHD



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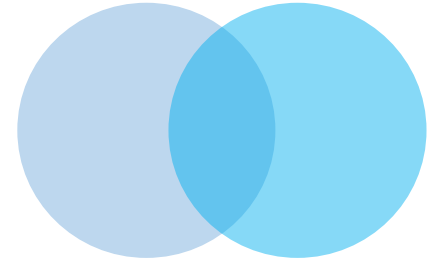
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Summary and implications (2)



- It can be complex to identify comorbid psychiatric disorders in the presence of ADHD
- Overlapping symptoms and possible under-reporting of symptoms may impact on identification
- Consider the onset and course of symptoms
- Presence of psychiatric disorders (e.g. anxiety and depression) may also delay recognition of ADHD
- Can't focus on ADHD and psychiatric disorders in isolation



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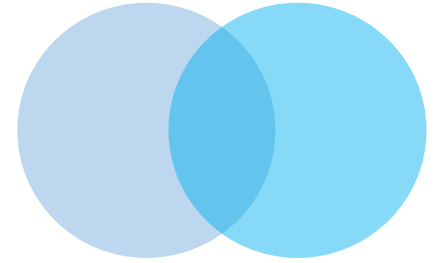
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Summary and implications (3)



- Understanding why psychiatric disorders commonly occur in individuals with ADHD may help with early intervention and prevention
- There are a number of possible explanations for high rates of comorbidity including symptom overlap, shared risk factors, one disorder causing another
- Treating ADHD effectively important if it is a possible causal risk factor
- Further research needed, possible targets for intervention exist



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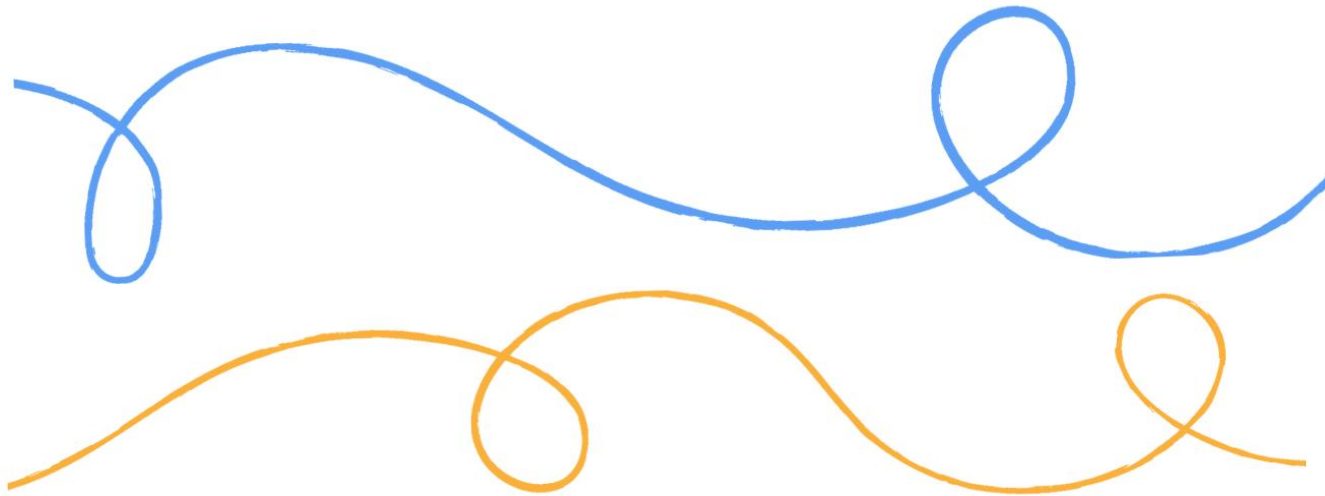
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Thankyou

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