

Overview

Attention Deficit Hyperactivity Disorder

ADHD is the most common neurobehavioral disorder in children.

The chief features of ADHD are: inattention, hyperactivity, and impulsiveness.

This disorder is often associated with substantial impairments, including:

- low self-esteem
- poor family relationships
- poor peer relationships
- school difficulties
- academic underachievement

The American Academy of Pediatrics has recommended that a diagnosis of ADHD be established based on the following core criteria as defined by the American Psychiatric Association in the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV).

ADHD symptoms must:

**Present
before
age 7**

**Persist for
at least 6
months**

**Be more frequent
and severe than is
typical for children
at comparable
developmental stages**

**Manifest in
multiple settings,
such as school
and home**

**Adversely affect
functioning in
school or social
settings**

ADHD is estimated to affect between 4% and 12% of all school-aged children.

Erroneous Beliefs/Assumptions About ADHD

- Minor disorder if it even exists
- Affects almost solely males
- Has little impact beyond the classroom
- Disappears spontaneously after grade school

Erroneous Beliefs/Assumptions About ADHD

- Overdiagnosed
 - Diagnosis made about any energetic or “different” child
 - Medication is only a form of chemical control
- Misdiagnosed in cases of
 - Poor parenting
 - Rigid, misguided teachers
- Overtreated by physicians who used powerful and potentially addicting drugs for a minor, temporary ailment

Erroneous Beliefs/Assumptions About ADHD

- Produced a pattern of treatment in which clinicians did not use medications
 - or
 - Used low doses of medications
 - Only Monday through Friday
 - Only during school hours
 - Gave "drug holidays"
 - Stopped medications in adolescence

Evidence

- In the beginning, the diagnosis of ADHD was unclear due to
 - Different names
 - Inconsistent nature of impairments
 - Feedback from 3rd parties (ie, children are poor historians)
 - Media controversy
 - Lack of validated diagnostic instruments

- But by 1998, the AMA called ADHD

“...one of the best-researched disorders in medicine, and the overall data on its validity are far more compelling than for many medical conditions.”

Evidence

Genetics

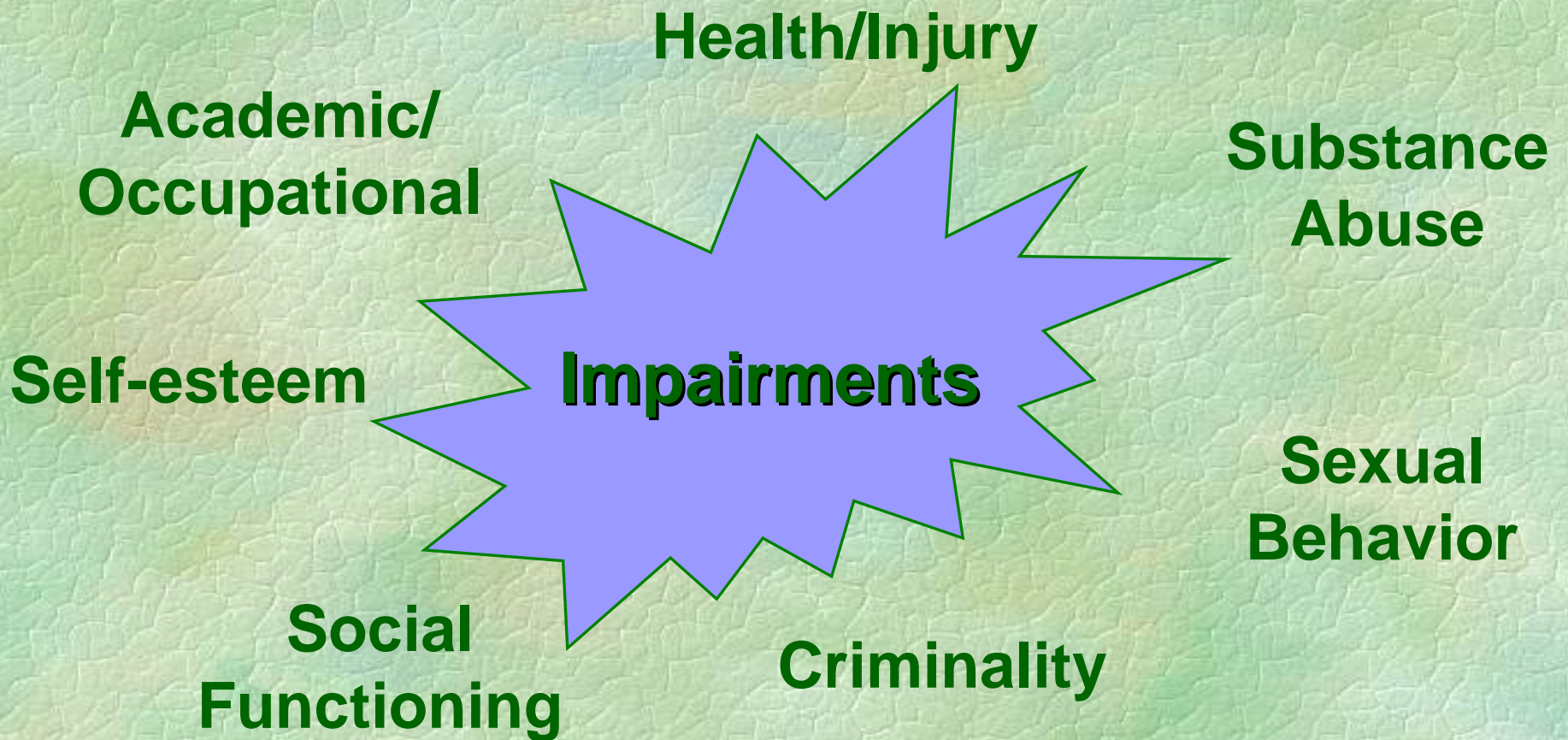
- Numerous twin studies report the average heritability index to be approximately 0.75 across various sets of diagnostic criteria
- Adoption and family studies further support the genetic basis for ADHD
- Stressors and bad parenting can exacerbate impairment but do not cause ADHD

Impairment

- DSM-IV-TR: ADHD symptoms must be consistently and persistently impairing in at least 2 areas of life functioning
 - Much more than personality traits and quirks
 - Must significantly impair major aspects of day-to-day life

Diagnostic and Statistical Manual of Mental Disorders. 4th ed. Text Revision. 2000.

Domains of Impairment

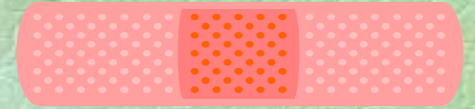


Academic Impairment



- Very well documented
 - Failure to perform academically is the single most common reason for referral of children and adolescents
- Children with ADHD
 - Perform poorly on achievement tests and failed grades/courses significantly more often than children without ADHD
 - Complete 3 fewer years of education than matched controls
 - Are more likely not to graduate from high school
- Academic impairment more profound when learning disabilities are present

Health and Injury



- Accidents, such as motor vehicle crashes, are the leading cause of death until 44 years of age in the US
- Without treatment, adolescents with ADHD have 4 times as many serious injuries and 3 times as many motor vehicle accidents than those without ADHD or those with ADHD who consistently take medication
- 9-year study of medical utilization shows that persons with ADHD have more than double the cost of care as compared to controls

Barkley et al. *Pediatrics* 1993;92:212.
Leibson et al. *JAMA* 2001;285:60.

Substance Abuse



- Many people with untreated ADHD try to self-medicate to improve functioning
- Smoking
 - ADHD adults smoke more and have more difficulty quitting
 - Children with ADHD start younger and smoke more
- Substance use disorders (SUDs)
 - Fear: stimulant therapy may lead to substance abuse
 - Fact: untreated ADHD is a significant risk factor for substance abuse in adolescence and adulthood
 - A longitudinal study found ADHD medication was associated with an 85% reduction in risk for SUD in ADHD youth
 - Stimulants are known to be associated with dependence and abuse in “at-risk” populations

Biederman et al. *Pediatrics* 1999;104:e20.
Pomerleau et al. *J Subst Abuse* 1995;7:373.
Milberger et al. *JAACAP* 1997;36:38.

Sexual Behavior

- Longitudinal follow-up at young adulthood of a cohort of children (ongoing Milwaukee follow-up study) with ADHD compared to controls
 - More pregnancies (38% vs. 4%)
 - More sexually transmitted diseases (17% vs. 4%)
 - More sexual partners (19 vs. 7)
 - Tested for HIV (54% vs. 21%)
 - Sexual intercourse at earlier age (15 vs. 16 years)

Criminality

- ADHD has high comorbidity with ODD and CD
 - Coupled with an impulsive, high-risk lifestyle— increases risk for legal problems
- Long-term study reports that persons with ADHD more likely to be
 - Arrested more than once (23% vs. 8%)
 - Jailed (9% vs. 1%)
 - Arrested (39% vs. 20%)
 - Convicted (28% vs. 11%)



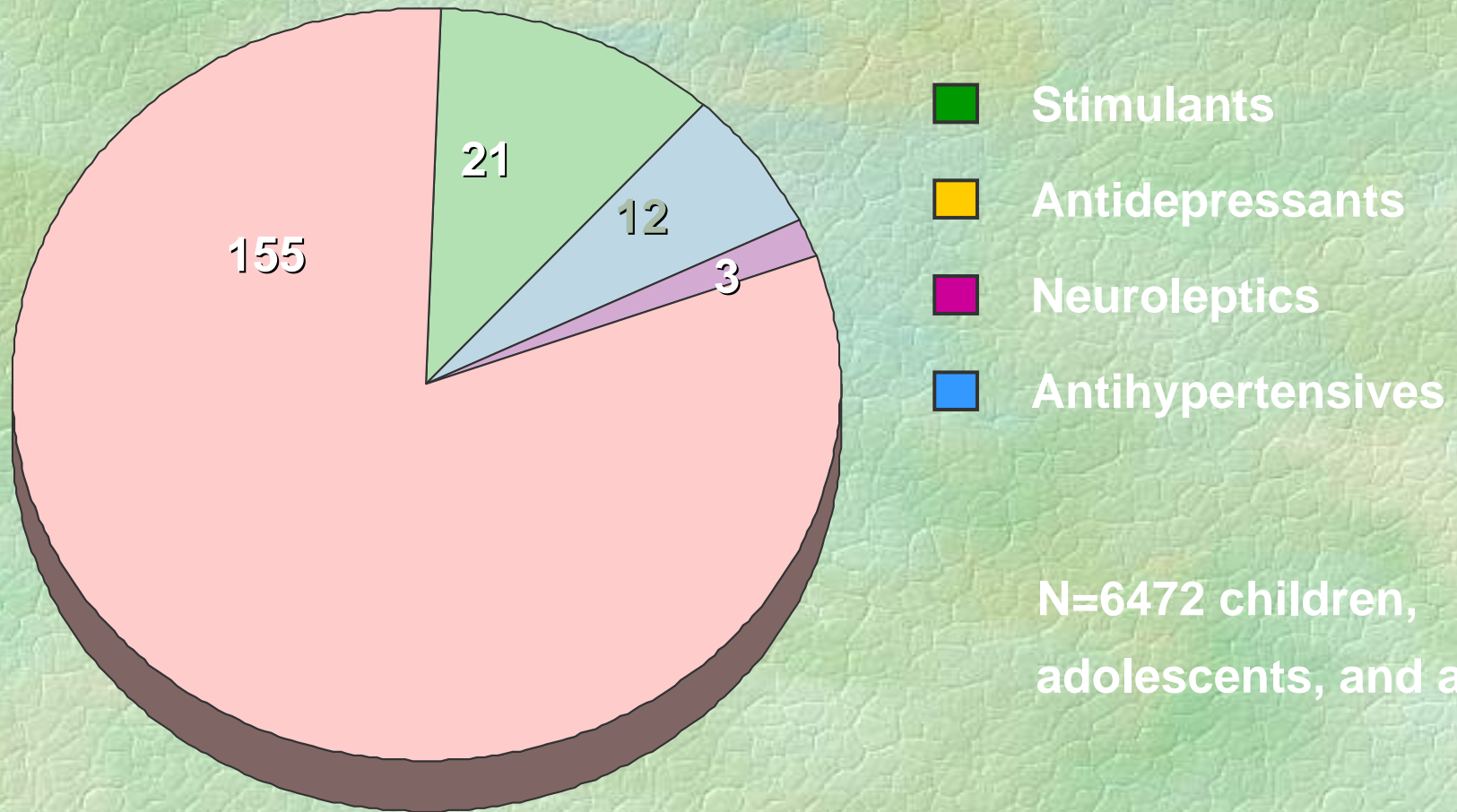
Self-Esteem and Social Functioning

- Adults
 - “Just don’t seem to get it”
 - Lack intuitive understanding
 - Tactless, blurt out things before thinking
- Social problems begin in childhood, persist into adolescence
 - Fewer friends, poorer social skills
 - Lower self-esteem assessment scores

Treating ADHD: What Works?

- Of the pharmacologic options available for ADHD, stimulant medications are the
 - First-line agents for treatment
 - Most commonly used
 - Most effective
 - Most studied

Controlled Studies of Medication in ADHD



N=6472 children,
adolescents, and adults.

Kohn Group

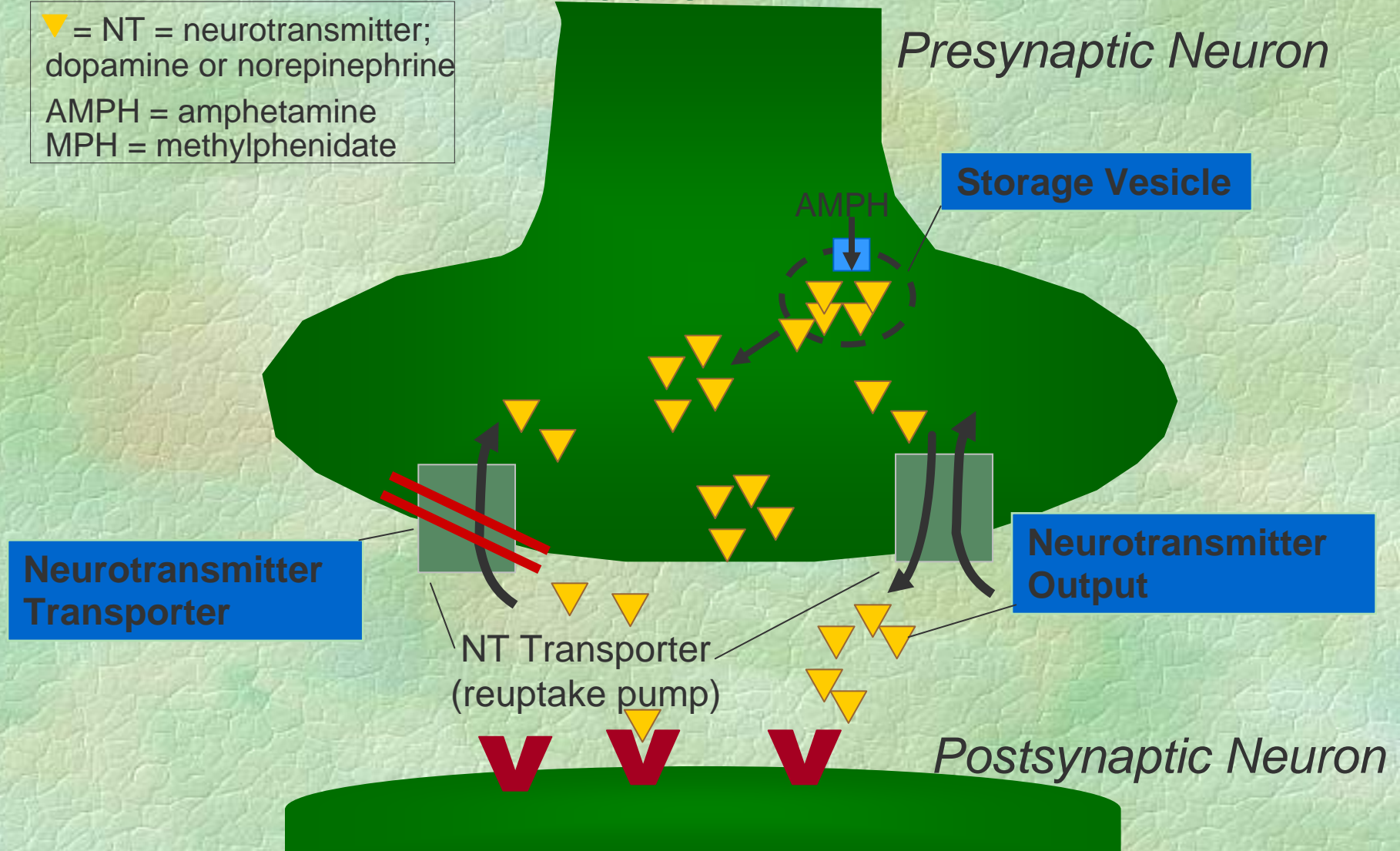
Spencer et al. *JAACAP* 1996;35:409.

Neurochemistry of ADHD

- Maximal effectiveness may be produced by those agents that act on both the DA and the NE neurotransmitter systems
- Stimulants potentiate the actions of both dopamine and norepinephrine in the synapse
- Both dopaminergic (DA) and noradrenergic (NE) systems are strongly implicated in the pathophysiology of ADHD

Stimulants' Proposed Mechanism of Action

▼ = NT = neurotransmitter; dopamine or norepinephrine
AMPH = amphetamine
MPH = methylphenidate

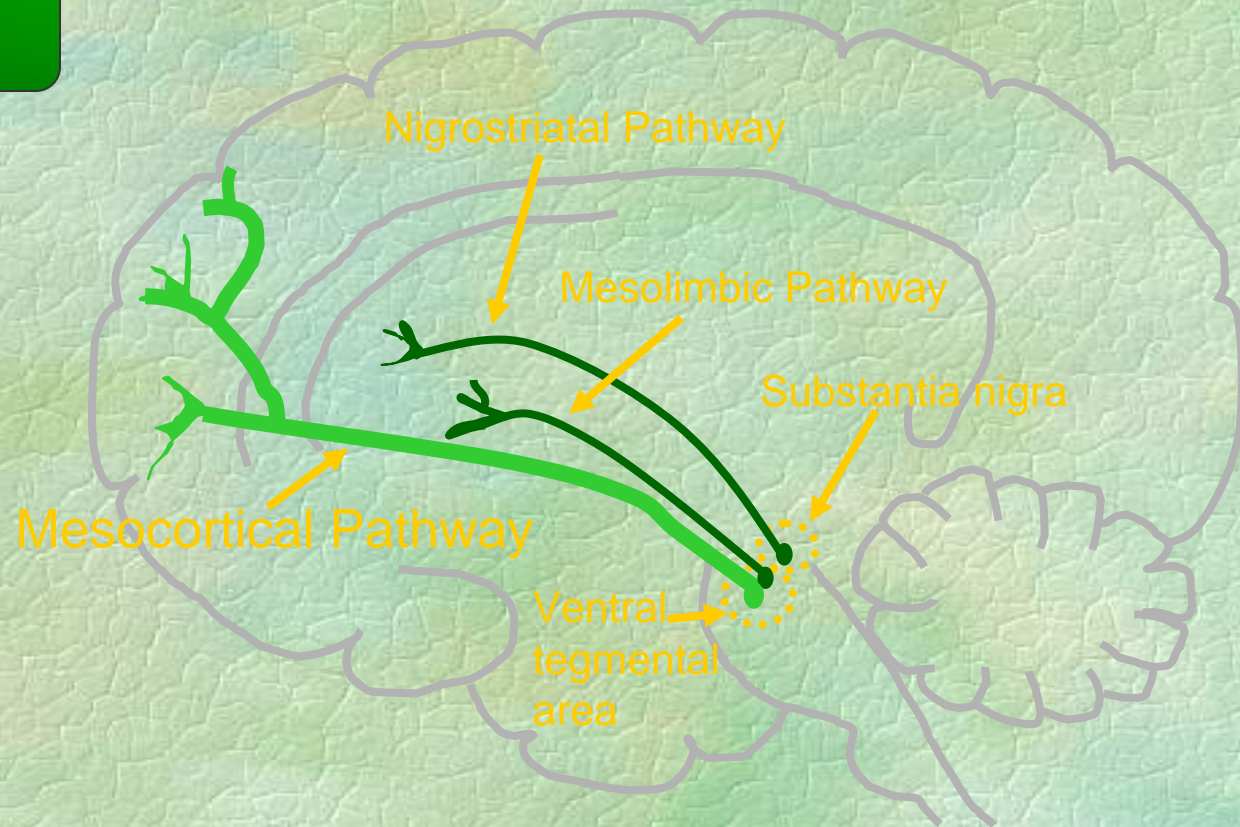


Adapted from Wilens & Spencer. *Child Adolesc Psych Clin N Am* 2000;9:573.

Dopamine Neurotransmission Relative to ADHD

Dopamine

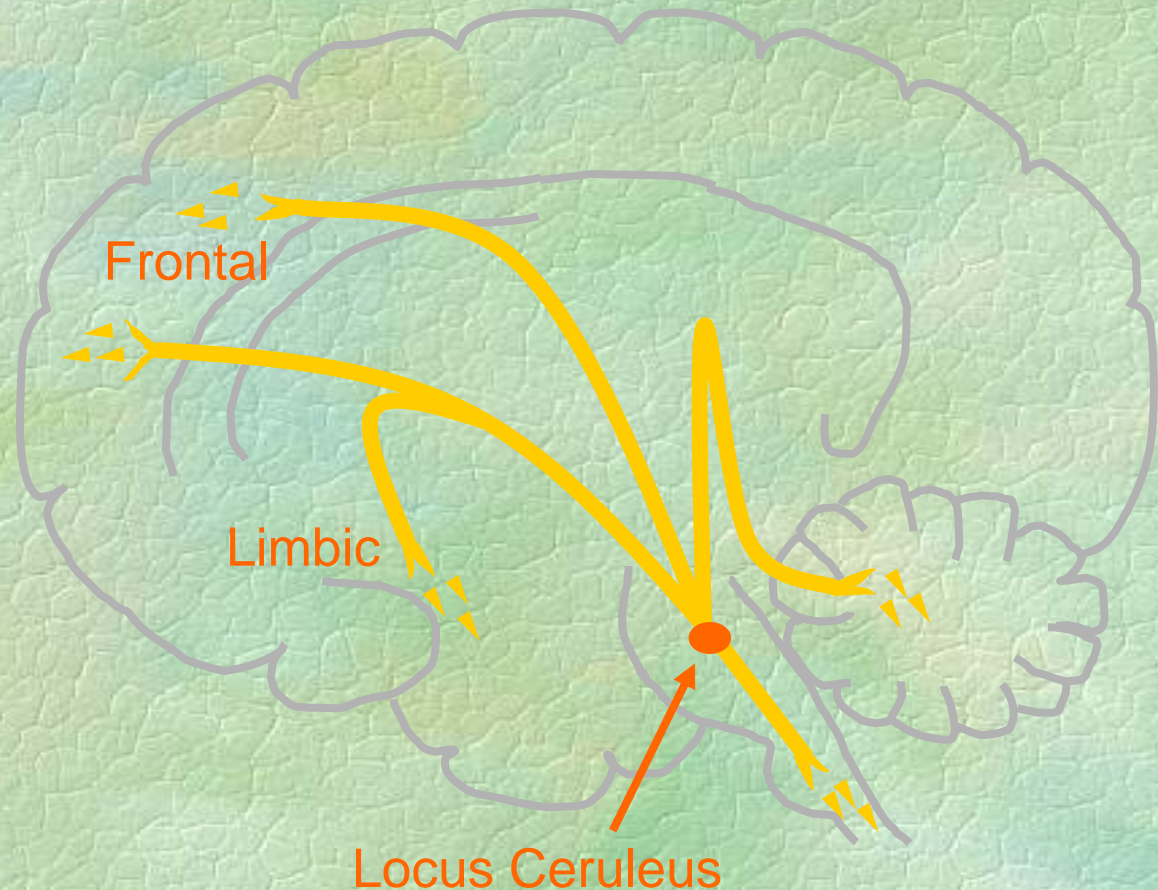
- **Improves attention**
- **Enhances signal**
 - **On-task behavior**
 - **On-task cognition**
 - **Focus**



Norepinephrine Neurotransmission Relative to ADHD

Norepinephrine

- Dampens noise
- Executive operations
- Increases inhibition



Questions?