





# Adderall and How It Affects The Body

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# Introduction

- Synthesized in 1887 by a Romanian chemist, Lazăr Edeleanu
- First used as new asthma medication, but had little effect
- Its stimulant properties made it popular for weight loss, depression, as energized “pep pills” for soldiers in the world war, and performance enhancing medication by athletes
- Now commonly used as treatment for narcolepsy and **ADHD**



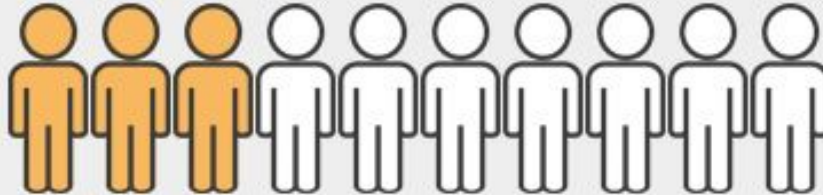
# Stimulant Abuse

At The University of Kentucky



30%

Students that reported abusing an ADHD stimulant drug like Adderall at some point as a possible "study enhancer."





# COLLEGE ADDERALL USE



24

percent of University students use Adderall

81

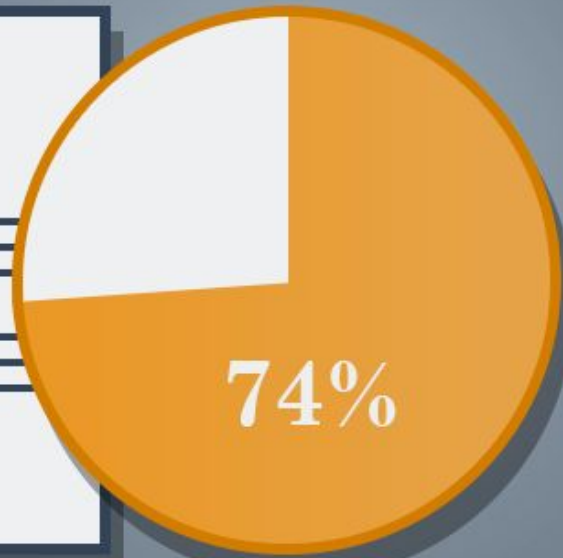
as much as 81 percent of college students think that Adderall usage is only slightly dangerous, despite the fact that the consequences of the illicit use of the drug sit right next to those of cocaine, meth, and morphine

90

Approximately 90 percent of students who use Adderall use it for the purpose of studying, but do not realize the potentially negative effects it has

# *Obtaining Adderall*

Percentage of students that got their Adderall from friends who had prescriptions



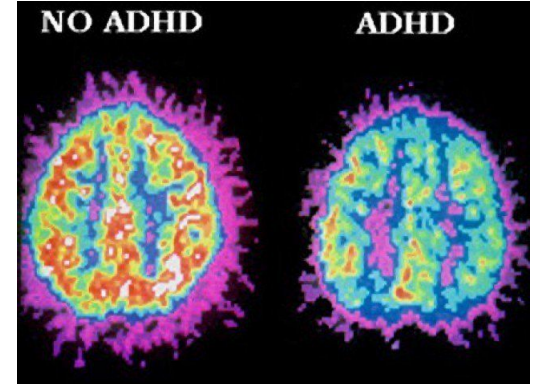
Journal of American College Health

(American Addiction Centers, 2019)



# The ADHD Brain

- Parts of the ADHD brain mature at a slower pace and do not reach the same level of maturity.
- Decreased neural connectivity between frontal cortex and visual processing area (Mazaheri et al., 2010).
- Inability to regulate homeostatic dopamine system, including:
  - Not able to produce enough dopamine.
  - Not enough dopamine receptors.
  - Inefficiently using the dopamine present in the brain.
- ADHD is not diagnosed with a PET or fMRI scan, rather with a clinical interview to determine how an individual's brain functions in different situations.



# Treatment

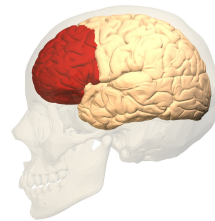
- Stimulant medications are used to promote increased levels of dopamine in the brain (Campo et al., 2011).
- One such stimulant is Adderall → with vast research supporting its ability to improve attention and focus, and reduce impulsive behaviour.
- Between 70-85% of children see improvements with the use of Adderall (Kolar et al., 2008).



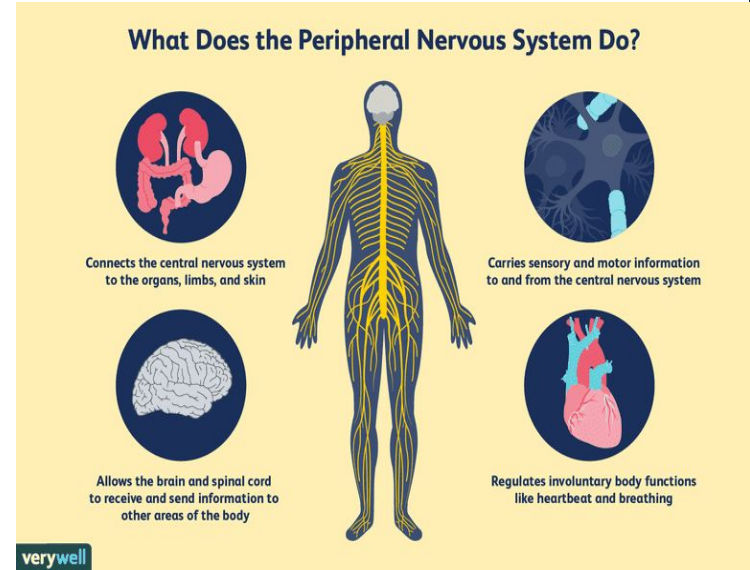


# Adderall Mechanism

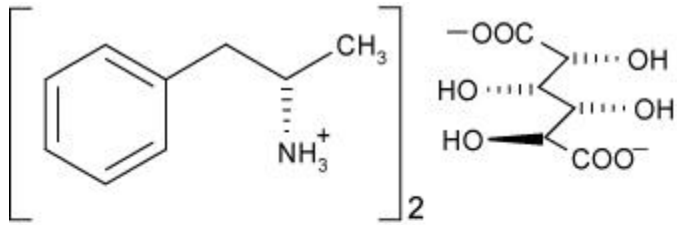
- Oral administration → absorbed by gastrointestinal tract
- Composed of amphetamines → can cross the blood-brain barrier
- Dextroamphetamine salts (75%) + levoamphetamine salts (25%)
- Dextroamphetamine → targets the **prefrontal cortex** of the brain and **increases** levels of **dopamine**
- Levoamphetamine → targets the **peripheral nervous system** and **increases** levels of **norepinephrine**



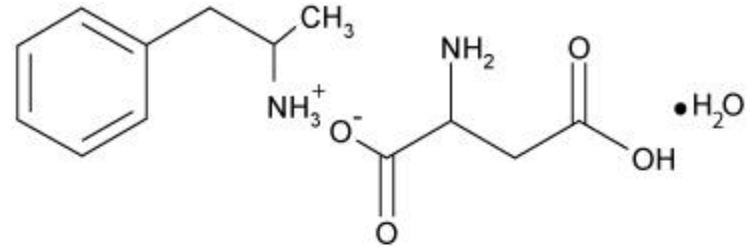
(The Science of Psychotherapy, 2017)



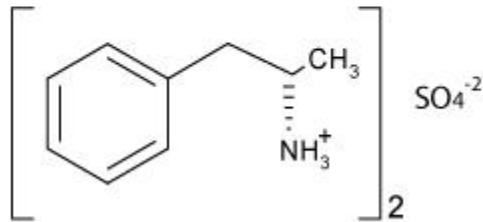
(Cherry, 2020)



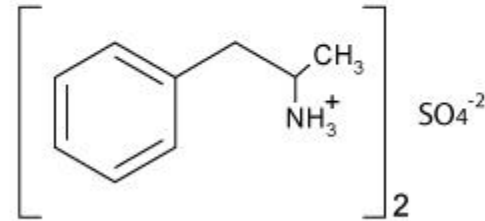
$(C_9H_{14}N)_2 \cdot C_6H_8O_8$   
 Molecular weight: 480.56  
 Dextroamphetamine Saccharate



$C_9H_{14}N \cdot C_4H_6NO_4 \cdot H_2O$   
 Molecular weight: 286.33  
 Amphetamine Aspartate Monohydrate



$(C_9H_{14}N)_2 \cdot SO_4$   
 Molecular weight: 368.50  
 Dextroamphetamine Sulfate

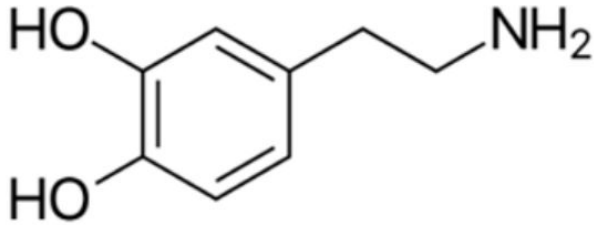


$(C_9H_{14}N)_2 \cdot SO_4$   
 Molecular weight: 368.50  
 Amphetamine Sulfate

# Neurotransmitters Involved

## Dopamine

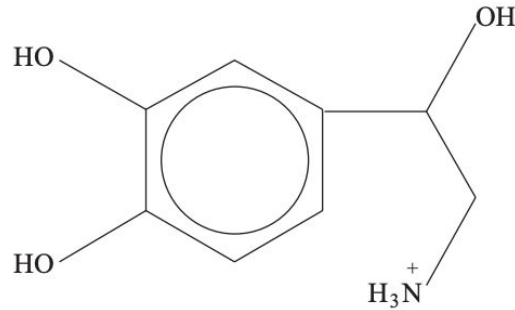
Increases motor function and motivation



(Aslanoglu & Öge, 2005)

## Norepinephrine

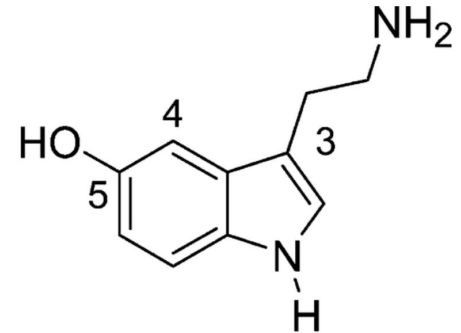
Increases blood pressure and heart rate, also early memory consolidation



(Ojimekwe, 2019)

## Serotonin

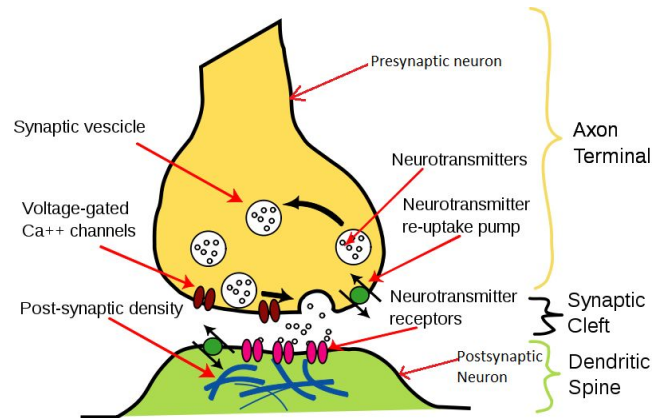
Promotes mood and maintains circadian rhythm



(Nichols & Nichols, 2008)

# Key Actions of Adderall

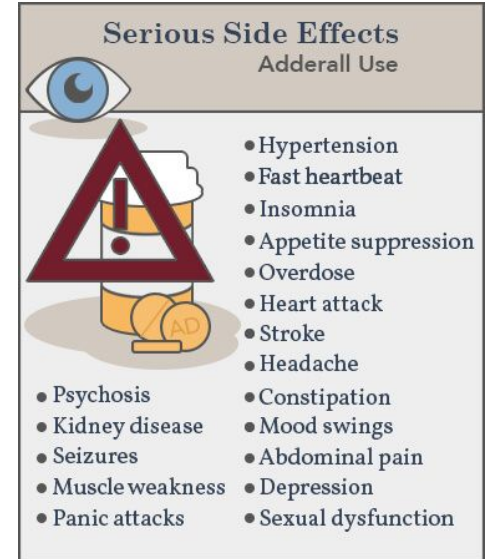
- **Prevent uptake** of neurotransmitters (dopamine, norepinephrine, and serotonin) into the **presynaptic neuron**
- **Release** neurotransmitters into the **synaptic space** → **increased** levels of neurotransmitters in the body
- **Minimize symptoms** of ADHD such as **hyperactivity, impulsivity, and a lack of concentration**



(Socratic, 2017)

# Side Effects of Adderall

- Adderall for children with ADHD have minimal short and long term effects
- Short term effects of Adderall abuse include increased heart rate, irritability, insomnia, and blurred vision
- Long term and excessive use of Adderall may result in hallucinations, psychotic episodes, cardiac arrest
- Causes intense mood swings and prolonged use increases the severity of withdrawal symptoms
- Withdrawal symptoms include violent mood swings, extreme fatigue, and uncontrollable cravings
- Adderall abusers are 20 times more likely to use cocaine or heroin (Volkow, 2005)



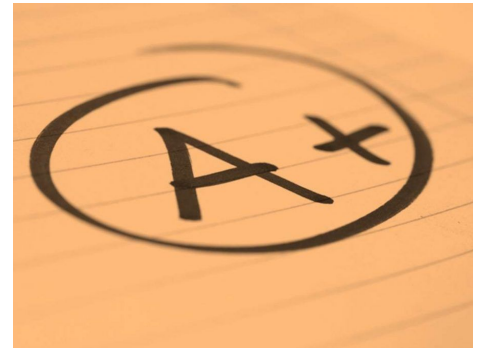
(American Addiction Centers, 2020)

# Case Study - Background

- High-achieving, ambitious students may take Adderall, out of curiosity or desire to perform better at school.
- The medication started to appear from close acquaintances distributing the medication to black markets.
- The twenty-first century was soon coined the term “Adderall generation”.



(Schwartz, 2016)



# Case Study - Casey Schwartz

Casey Schwartz: First experience with Adderall (Sophomore) of Brown University.

- Realized she was able to become the indistractable, achieving student through Adderall.
- Began to crave Adderall, believing she could not function or perform daily activities without it.
- Hard to keep track of how many pills she had already taken.



Casey Schwartz, a staff writer  
at New York Times

“Adderall wiped away the question of  
willpower.” (Schwartz, 2012)

# Her good journey stops here

- One day, experienced difficulty breathing → admitted to the ER due to substance induced panic attack
- “It is very hard to go off it because it leads individuals to think that they will no longer be able to produce the great works they used to with Adderall without it.” - Martha Farah, a cognitive neuroscientist at the University of Pennsylvania





# Treatment of Adderall Abuse



- When a person with an Adderall addiction wants to get off the drug, they must be slowly weaned off of it, in order to reduce the severity of withdrawal symptoms.
- Two main approaches are medication-assisted treatment (MAT) and psychotherapy
- MAT involves tapering off of Adderall
- That is followed by psychotherapy for abstinence maintenance



# Multiple-Choice Questions

1) Which of the following neurotransmitters are involved in the mechanism of Adderall?

- a) Norepinephrine
- b) Dopamine
- c) Serotonin
- d) All of the above ##
- e) A and B only

2) Which part of the brain do dextroamphetamine salts target?

- a) Parietal lobe
- b) Occipital lobe
- c) Prefrontal cortex ##
- d) Cerebellum
- e) Hypothalamus

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# Images

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