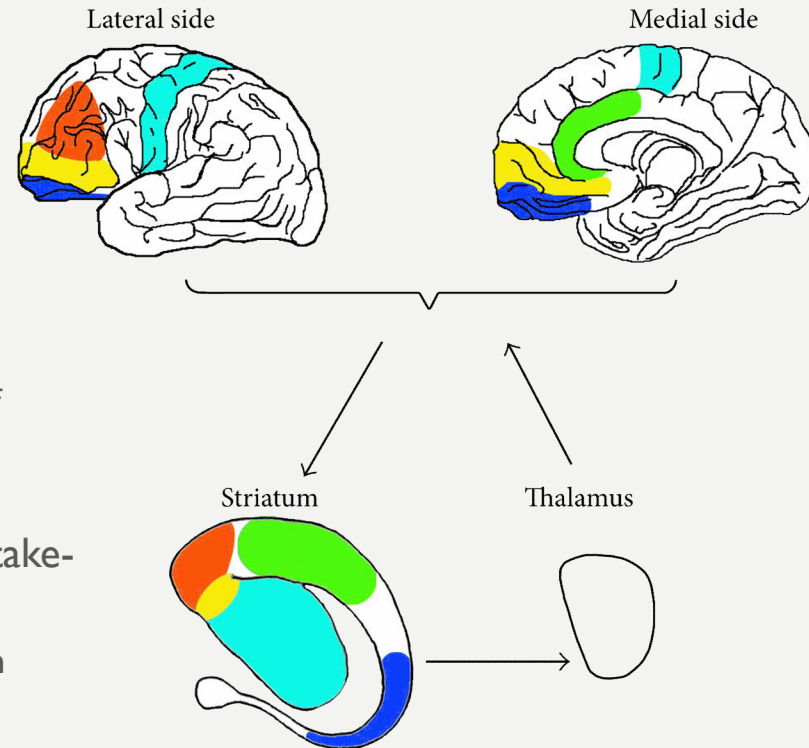


# BIOLOGY OF ADHD

- There is some
- Prefrontal lobes
- Dopamine, Norepinephrine
- Genetically related to autism

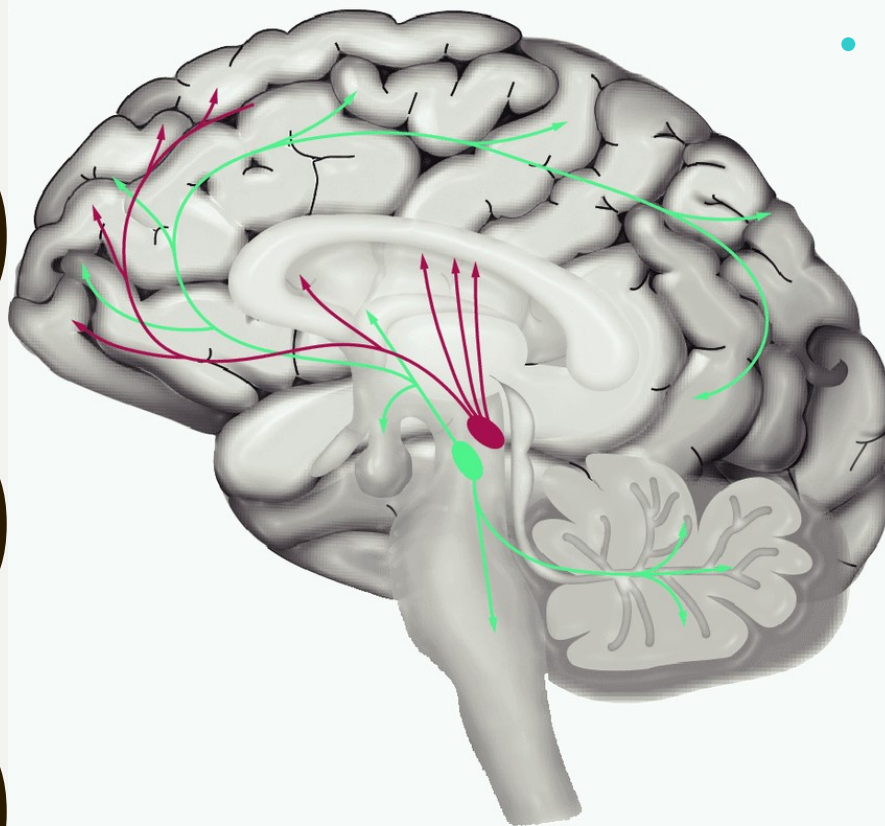
# BIOLOGY OF ADHD

- Neurocircuitry (all loop back through the thalamus)
- Task Prioritization & Organization/'Executive Function' (RED)
  - (left) DLPFC → Nucleus Accumbens/Head of Caudate
- Attentive/Detail-oriented vs. Distractible/Mistake-prone/Forgetful (GREEN)
  - Anterior Cingulate Cortex → Inferior Striatum
- Hyperactivity (TEAL)
  - Motor Cortex → Putamen/Lateral Lentiform Nucleus
- Impulsivity (NAVY)
  - Orbitofrontal cortex → Inferior Caudate



From Zhu et al, 2016 (BioMed Research International)  
"The Relationship between Neurocircuitry Dysfunctions and Attention Deficit Hyperactivity Disorder: A Review"

# NEUROTRANSMITTERS



Dopamine pathways are depicted in red. Norepinephrine pathways are depicted in green.

- **Dopamine**
  - Mesocortical circuit: attention, memory
  - Mesolimbic circuit: short-term reward
  - Nigrostriatal circuit: movement, sensory-seeking behaviors
- **Norepinephrine**
  - Produced centrally in the locus coeruleus (pons) & released virtually everywhere else in the CNS
  - Increases alertness, attention, memory formation and recall
  - Can also promote restlessness/anxiety (panic)
  - lowest during sleep, highest during fight-or-flight response.

# MEDICATIONS—WHEN?

- Optional
- Not getting anywhere with behavioral strategies
- Crisis time
- Losing self esteem/hope
- Falling behind academically
- Dangerous situations

# MEDICATIONS

- Stimulants: Short Acting, Long Acting  
4 main categories: Ritalin, Adderall, Vyvanse, Focalin. There are many variations within.
- FDA approved Nonstimulants: Intuniv, Strattera, Kapvay
- Non-FDA approved: Wellbutrin, Provigil/Nuvigil

# STIMULANTS-95%

- Work right away
- Work for the day—different times
- Major side effects: worse sleep, worse appetite, worse mood. Tics ?? Do NOT cause seizures
- Need to monitor BP, P, Height and Weight
- Rarely do cardiologists forbid.
- If taken as directed, not addictive
- Do not lead to addiction

# NONSTIMULANTS—5%

- Have to build up
- Should be taken every day
- Last all day 24/7
- Different side effects depending on particular med.
- Don't worsen tics

# STIMULANTS--CONCEPTS

- Differ in side effects and effectiveness
- One is not better than the other
- Main difference is how long they last (and what's covered by insurance)
- ***Even little differences in release make a difference.***

# STIMULANTS ARE NOT THE SAME AS “METH” ON THE STREET

- Caffeine is also a stimulant
- Methylphenidate based medications are actually not “amphetamine based,” rather a [benzylpiperidine](#) and [phenethylamine derivative](#) which also shares part of its basic structure with dopamine, norepinephrine.
- At therapeutic doses, ADHD stimulants do not sufficiently activate the reward system, or the [reward pathway](#) in particular, to the extent necessary to cause persistent increases in  $\Delta$ FosB [gene expression](#) in the D1-type medium spiny neurons of the nucleus accumbens; consequently, when taken as directed in doses that are commonly prescribed for the treatment of ADHD, methylphenidate use lacks the capacity to cause an [addiction](#).

# STIMULANTS-CATEGORIES

		Short
		Medium
METHYLPHENIDATE BASED	Methylphenidate (Ritalin)	Long
		Short
	Dexmethylphenidate (Focalin)	Long
		Short
AMPHETAMINE BASED	Amphetamine Salts (Adderall)	Long
		Very Long
		Short
		Medium
	Lisdexamphetamine (Vyvanse)	Long

# METHYLPHENIDATE (DURATION OF EFFECT)

- SHORT ( 4h )
  - Generic tablet
  - Brand: Methylin (Liquid or tablet)
- MEDIUM (6-8h)
  - Metadate CD 30% IR/70% ER
  - Ritalin SR=Metadate ER (Coated tabs, 20mg only, do not break)
- LONG (8-10h)
  - Ritalin LA 50/50
  - Concerta (22% IR)
  - Aptensio (37% IR)
  - Daytrana
  - Quillivant
  - Quillichew
  - Cotempla

And then, there's Jorney

# METHYLPHENIDATE—BY FORM

- Tablets: short acting (can be crushed)
- Sprinkle capsules: Metadate CD, Ritalin LA, Aptensio, Jornay (don't chew beads)
- “MUST BE SWALLOWED WHOLE” : Concerta, Ritalin SR
- Patch: Daytrana
- Liquid: Methylin (short) Quillivant (long)
- Chewable: Quillichew
- Meltaway: Cotempla

# FOCALIN

The DEX form of methylphenidate. *Some people who do well on Ritalin don't do well on Focalin and vice versa.*

- Short acting (4h)
- Focalin XR (8-10 h)
  - Capsule with beads inside.

# AMPHETAMINE SALTS

- Dextro vs Levo: Does dextro do better at Impulsiveness/hyper? Does Levo do better at inattention? May affect dopamine and norepinephrine differently
- Adderall: Generic: 75% Dextro: 25% Levo
  - Evekeo: 50/50 ratio of Dextro to Levo
- Adderall XR
  - Liquid: Dyanavel XR (75% Dextro: 25% Levo)
  - Meltaway: Adzenys (75%Dextro: 25% Levo)

# DEXAMPHETAMINES

The DEX form of amphetamine salts. *Some people who do well on Dex don't do well on Adderall and vice versa.*

- Short acting: Dexedrine, Zenzedi, Procentra liquid
- Medium acting: Dexedrine spansule
- Long acting: Vyvanse

# TREATMENT PRINCIPLES

- Start with a low dose of a stimulant. Easy to stop, overall most likely to be a “winner.”
- The higher the dose the better the effects but the more the side effects
- Try other stimulants; depending on response can change methylphenidate to amphetamine or vice versa, or just tinker.
- Then consider nonstimulants.

# NONSTIMULANTS

- Intuniv—helps with Impulsive, not so much attention
- Strattera---Best alternative for attention

Kapvay??

# TREAT THE COMORBIDITIES

- Address anxiety, depression
- Address sleep issues
- Tutoring
- Organizational help.
- Self esteem issues.

# “OTHER TREATMENTS”

- Neurofeedback—but \$\$.
- Games “Digital therapy” –EndeavorRx, Atentiv
- TNS: Monarch eTNS device

## **WHO I AM**

- Sarah Cheyette => Pediatric Neurologist at SUTTER HEALTH
- SarahCheyette.com
- Author:
  - Winning with ADHD
  - ADHD and the Focused Mind
  - ADHD and Me

*instant help solutions*

# winning with **adhd**

a **playbook** for **teens & young adults** with  
**attention deficit/hyperactivity disorder**



GRACE FRIEDMAN | SARAH CHEYETTE, MD  
FOREWORD BY STEPHEN P. HINSHAW, PhD

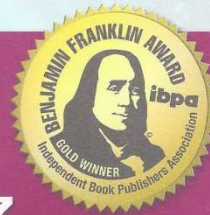
HOW TO USE THE SUCCESSFUL COACHING TECHNIQUES OF  
WORLD CLASS ATHLETES TO UNLOCK YOUR CHILD'S POTENTIAL

# ADHD & The Focused Mind

A GUIDE TO GIVING  
YOUR ADHD CHILD  
FOCUS, DISCIPLINE &  
SELF-CONFIDENCE

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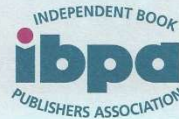
*Square One Publishers*

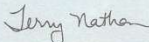
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