

# Advances in the Diagnosis and Treatment of ADHD

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## Sources:

Barkley, R. A., Murphy, K. R., & Fischer, M. (2008) *ADHD in Adults: What the Science Says*. New York: Guilford

Barkley, R. A. (2006) *Attention deficit hyperactivity disorder: A handbook for diagnosis and treatment (3<sup>rd</sup> ed.)*. New York: Guilford.

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# What is ADHD?

## The Current Clinical View

A disorder of age-inappropriate behavior:

- **Inattention** (Executive Functioning ?)
  - At least 6 types of attention – not all are impaired in ADHD
    - Arousal, alertness, selective, divided, span of apprehension, & persistence
  - Poor persistence toward goals or tasks
  - Impaired resistance to responding to distractions
  - Deficient task re-engagement following disruptions
  - Impaired working memory (remembering so as to do)
- **Hyperactivity-Impulsivity** (Poor inhibition)
  - Impaired verbal and motor inhibition
  - Impulsive decision making; impatient or cannot wait
  - Greater disregard of future (delayed) consequences
  - Excessive task-irrelevant movement and verbal behavior
    - Fidgeting, squirming, running, climbing, touching
  - Restlessness decreases with age, becoming more internal, subjective by adulthood

# DSM-IV Diagnostic Criteria

## Inattention Symptoms

- ◆ fails to give close attention to details
- ◆ difficulty sustaining attention
- ◆ does not seem to listen
- ◆ does not follow through on instructions
- ◆ difficulty organizing tasks or activities
- ◆ avoids tasks requiring sustained mental effort
- ◆ loses things necessary for tasks
- ◆ easily distracted
- ◆ forgetful in daily activities

Symptoms must occur “Often” or more frequently

# Hyperactive-Impulsive Symptoms


- ◆ fidgets with hands or feet or squirms in seat
- ◆ leaves seat in classroom inappropriately
- ◆ runs about or climbs excessively
- ◆ has difficulty playing quietly
- ◆ is “on the go” or “driven by a motor”
- ◆ talks excessively
- ◆ blurts out answers before questions are completed
- ◆ has difficulty awaiting turn
- ◆ interrupts or intrudes on others

Symptoms must occur “Often” or more frequently

# Other DSM-IV Criteria

- Manifests 6+ symptoms of either inattention or hyperactive-impulsive behavior
- Symptoms are developmentally inappropriate
- Have existed for at least 6 months
- Occur across settings (2 or more)
- Result in impairment in major life activities
- Developed by age 7 years
- Are not best explained by another disorder, e.g. Severe MR, PDD, Psychosis
- 3 Types: Inattentive, Hyperactive, or Combined

# Issues for DSM-V

- Inattention list may be mislabeled
    - Broaden to include poor working memory (and possibly larger domain of executive functions)
  - Symptoms and wording are not appropriate past childhood
    - Need more items for adult stage of disorder
  - Symptom cutoffs (6 of 9) are also not appropriate past childhood
    - May have to adjust thresholds down to 4 of 9 if > age 17 and higher than 6 if < 4 yrs
  - Cutoffs are based mainly on boys (3:1)
    - May be lower for girls; for now use rating scales
- 

# More Issues for DSM-V

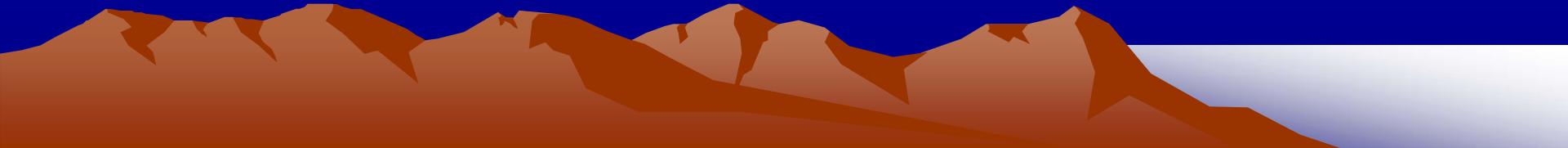
- Duration may be too short for preschoolers:
  - try 1 year or more
- Developmental deviance undefined
  - use 93 percentile (+1.5 SDs above normal mean)
- Requires cross-setting occurrence of symptoms that implies need for parent-teacher agreement
  - Instead, blend reports of both and use history of cross setting impairment
- No requirement for corroboration by others
  - Yet that is essential when evaluating teens and young adults up to late 20s-early 30s due to under-reporting of symptoms
- Impairment is undefined (use average person standard)
- Age of onset of 7 years lacks validity
  - use childhood onset – approximately 16 years

# Best New Symptoms for Adults

1. Is often easily distracted by extraneous stimuli (DSM-IV)
2. Often make decisions impulsively (EF)
3. Often has difficulty stopping my activities or behavior when I should do so (EF)
4. Often starts a project or task without reading or listening to directions carefully (EF)
5. Often shows poor follow through on promises or commitments I may make to others (EF)
6. Often has trouble doing things in their proper order or sequence (EF)
7. Often more likely to drive a motor vehicle much faster than others (Excessive speeding)(EF) [For non-drivers, substitute this item: "Often have difficulty engaging in leisure activities or doing fun things quietly."]
8. Often has difficulty sustaining attention in tasks or play activities (DSM – optional)
9. Often has difficulty organizing tasks and activities (DSM – optional)

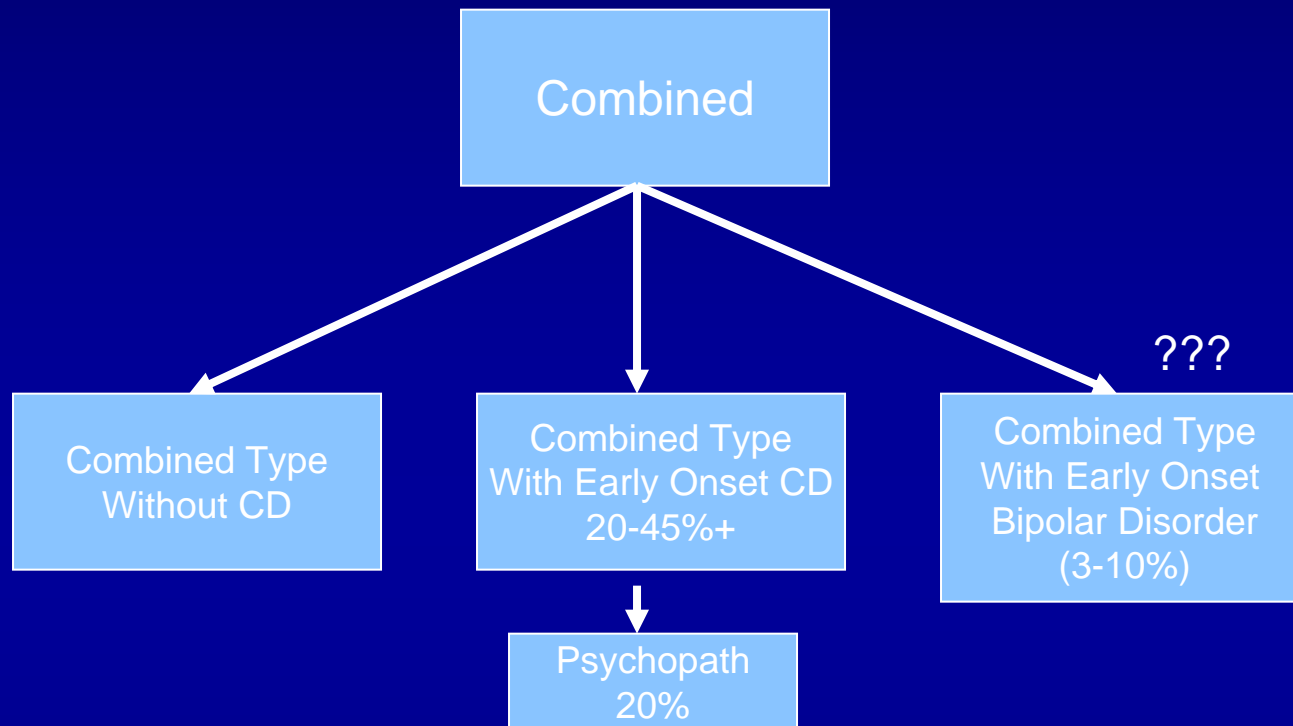
Cutoff would be either 4 of first 7 or 6 of all 9 items above  
Onset of symptoms producing impairment in childhood to  
adolescence ( $\leq 16$ )

Research to appear in Barkley, R., Murphy, K., & Fischer, M. (2008). *The Science of ADHD in Adults: Clinic Referred Adults vs. Children Grown Up*. New York: Guilford.

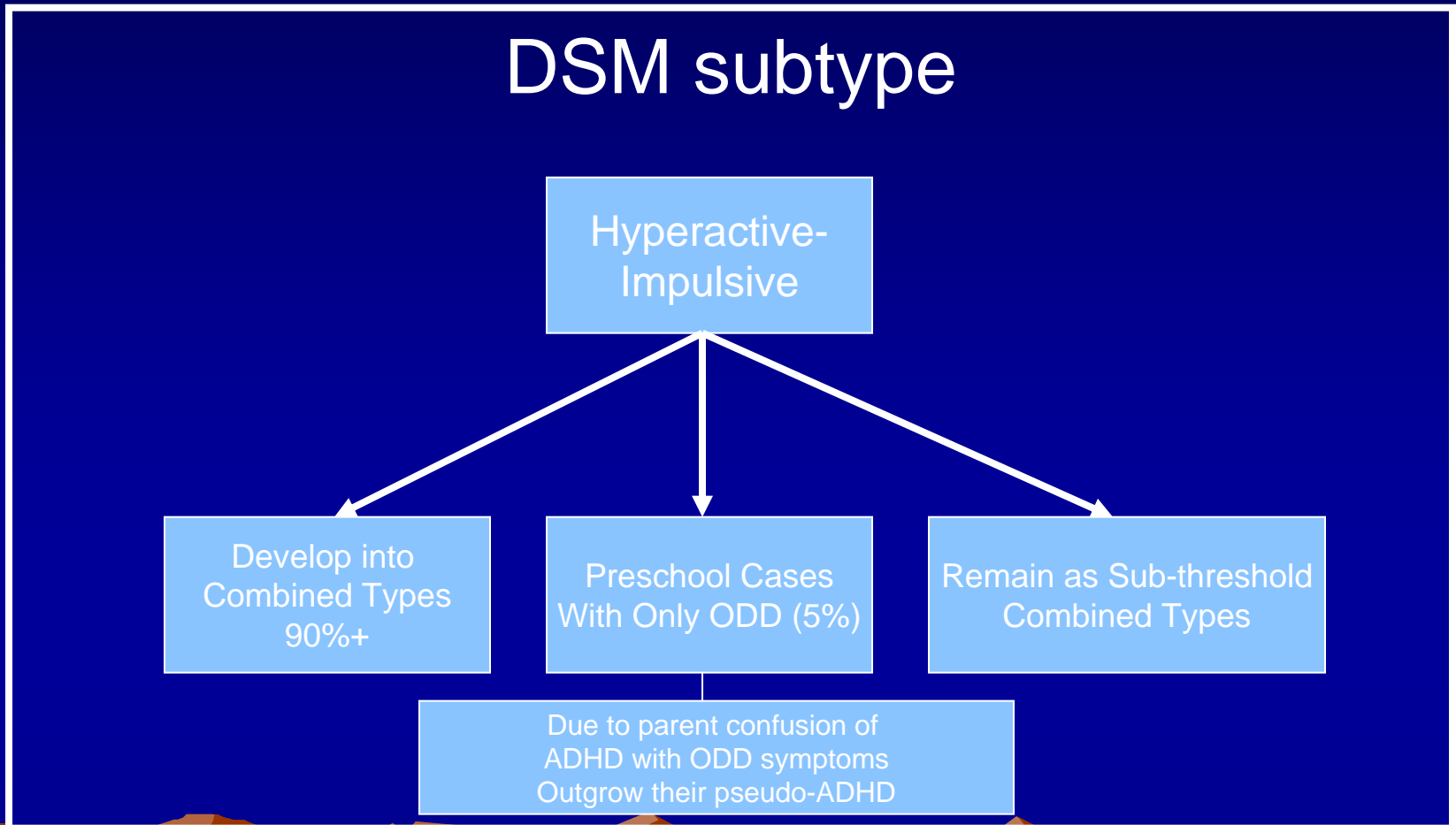


# DSM Subtypes vs. Research-Based Subtypes

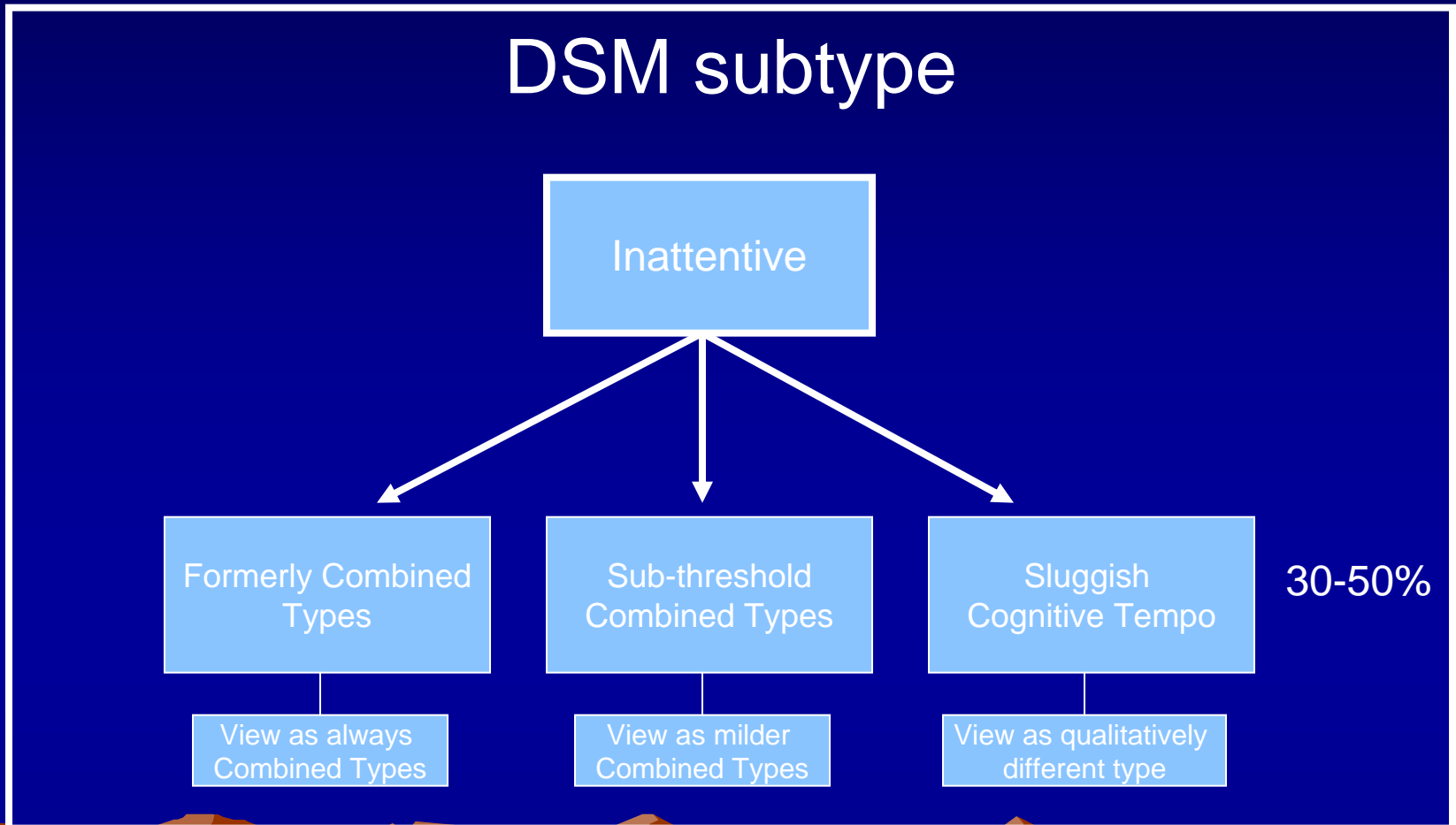
## DSM subtypes



# DSM Subtypes vs. Research-Based Subtypes



# DSM Subtypes vs. Research-Based Subtypes



# ADHD - Inattentive Type

- Presenting Symptoms not Typical in C-Type:
  - Daydreaming, Spacey, Stares
  - Hypoactive, Slow moving, Lethargic,
  - Motorically and cognitively sluggish
  - Easily Confused, Mentally “Foggy”
- Slow, Error Prone Response Style & Processing
  - Less able to use relevant environmental cues in task responding\*\*
- Poor Focused or Selective Attention
  - Slower reaction times, more omission errors\*\*
  - Unlike ADHD-C type, sluggish style is cross-situational\*\*
- Erratic Retrieval - Long-Term Memory (?)
- Socially Reticent or Withdrawn
- No motor inhibition problems or impulsiveness\*
  - If anything, they are overly inhibited\*\*
- Little evidence for executive function deficits\*

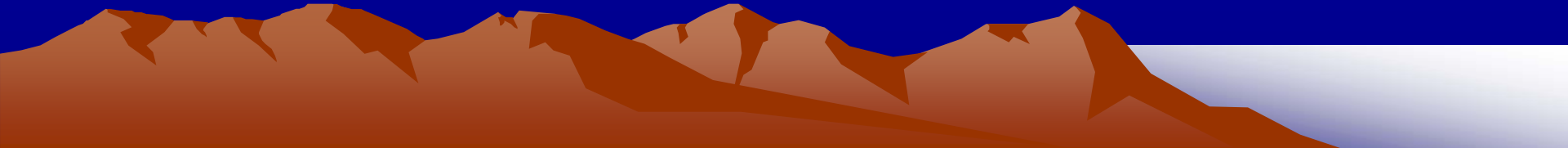
\*Solanto, M. V. et al. (2007). *Journal of Abnormal Child Psychology*, 35, 729-744.

\*Milich, R. et al. (2001). *Clinical Psychology: Science and Practice*, 8, 463-488.

\*\*Derefinko, K. J. et al. (2008). *Journal of Abnormal Child Psychology*, 36, 745-758.

# ADHD Inattentive Type with SCT

- Comorbidity: Rarely show Aggression or ODD/CD
- Lower levels of parenting stress
- Greater risk of anxiety symptoms
- Possibly greater risk for depression (?)
- Greater parental concerns regarding school failure
- Equally impaired in educational performance
  - But ADHD is a productivity disorder while SCT is an accuracy disorder
  - Greater frequency of math disorders in SCT (?)
- Greater family history of anxiety and LD (?)

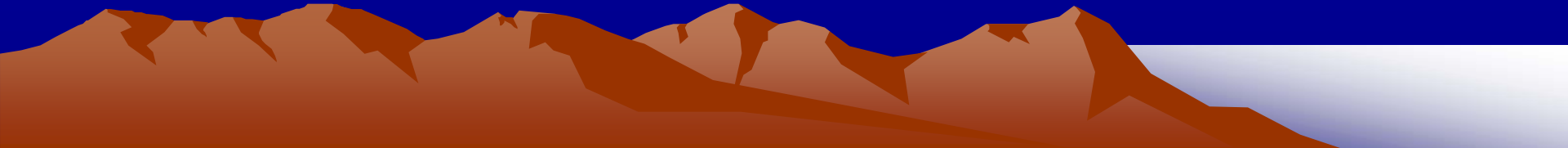


# Treatment Implications for SCT

- Less Likely to Have a Clinically Impressive Response to Stimulants (based on a few studies; need more research)
  - (Barkley Study finds 65% improve modestly in symptom ratings but only 20% showed a good clinical response)
- Better response to social skills training than ADHD cases
  - Up to 25% of ADHD cases become more aggressive in social skills groups due to peer deviancy training
  - Training works best for shy, withdrawn, anxious children
- Good (better?) response to joint home-school behavioral treatments
  - MTA study: anxious cases did the best in psychosocial treatment
  - Pfiffner (2007) study shows good response to home-school behavioral training and child training in social and organizational skills that is targeted at ADHD-I specific problems\*
- More responsive to cognitive therapy (??)
  - It doesn't work for children with ADHD but is this ADHD?
  - It does work for anxiety disorders and depression
- Consider Strattera (atomoxetine) as it may treat anxiety in ADHD cases – these cases are more likely to have anxiety as a comorbidity\*\*

• \*Pfiffner, L. et al. (2007). *Journal of the American Academy of Child and Adolescent Psychiatry*, 46, 1041-1050.

• \*\*Geller, D. et al. (2007). *Journal of the American Academy of Child and Adolescent Psychiatry*, 46, 1119-1127.



# Toward DSM-V Subtypes?

Combined Type  
(Specify severity)

Combined Type  
With CD

~~Combined Type  
With Bipolar  
Disorder?~~

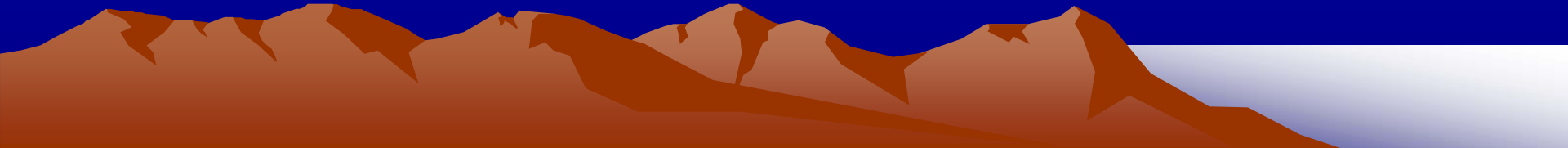
Sluggish Cognitive Tempo  
(Inattentive Only)

# A Theory of ADHD as a Disorder of Executive Functioning

- ADHD is a disorder of inhibition and self-regulation
- Self-regulation arises from the brain's executive system
- The EFs serve to organize behavior across time so as to direct it toward probable future events
- This system involves at least 5 functions that appear to be forms of self-directed private action
  - Inhibition (preventing the prepotent response) and interference control (resistance to distraction)
  - Nonverbal working memory (sensing to the self)
  - Verbal working memory (private self-speech)
  - Emotional and motivational self-regulation
  - Planning and problem-solving (private play to the self)

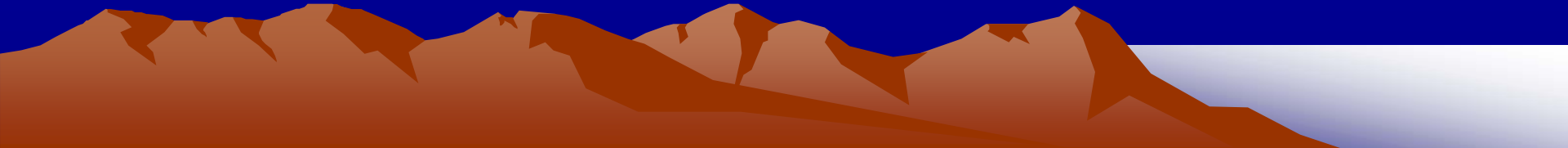
# Developmental Transitions in Behavioral Control from the EFs

- External → Mental (private)
- Others → Self
- Temporal now → Anticipated future
- Immediate → Delayed gratification



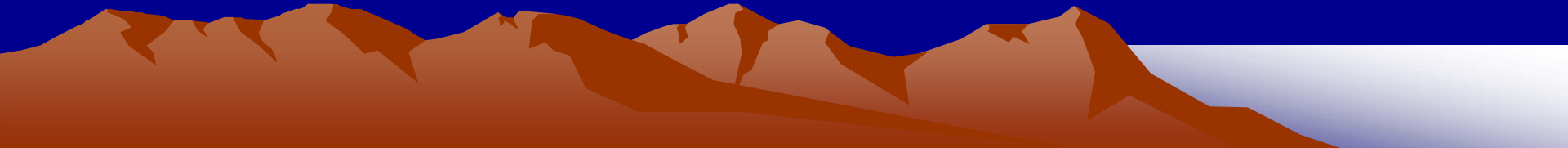
# Understanding ADHD

- ADHD Creates a “Time Blindness” or “Temporal Neglect Syndrome” (Myopia to the Future)
- Those with ADHD Live in the Moment
- Its a Disorder of:
  - Performance, not skill
  - Doing what you know, not knowing what to do
  - The when and where, not the how or what
  - Using your past at the “point of performance”  
The point of performance is the place and time in your natural settings where you should have used what you know but did not
- Its Not an Attention Deficit but an Intention Deficit Disorder (Inattention to mental events & the future)



# Implications for Treatment

- Teaching skills is inadequate
- All treatments are at the point-of-performance
- Medications may be essential for most (not all) cases – it is a form of neuro-genetic therapy
- While ADHD creates a diminished capacity, does this excuse accountability? (No!, the problem is time and delays -- not consequences)
- Behavioral treatment is essential but does not generalize or endure after removal
- The compassion and willingness of others to make accommodations are vital to success
- A chronic disability perspective is most useful

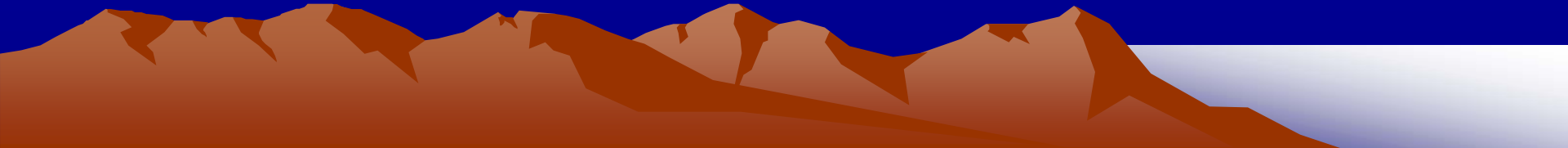


# Reverse Engineer the EFs

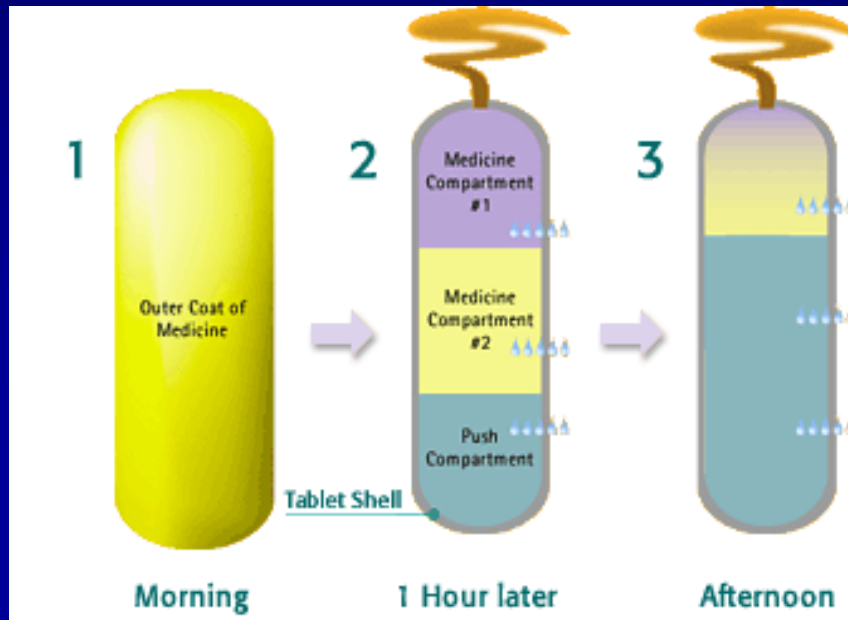
- Externalize important information
  - lists, posters, signs, other cues of critical reminders and post at the point of performance
- Externalize time periods related to tasks
  - use timers, clocks, counters, that signal time's passing
- Break up future tasks into many small steps
  - do 1 step each day; keep the E-R-Os close in time
- Externalize sources of motivation
  - Quick praise, token/point systems, tangible rewards
- Permit more external manipulation of task components
  - manualize the problem as much as you can

# Advances in Treatment: ADHD Medications

- Psychopharmacology
  - New stimulant delivery systems
    - Pills, pumps, pellets, and patches (e.g., Concerta, Medadate CD, Ritalin LA, Focalin XR and Adderall XR, Daytrana)
  - Non-abusable formulations (Vyvanse – novel prodrug amphetamine binding formula)
  - Better understanding of preschooler stimulant response
  - New noradrenergic medications
    - Strattera – highly selective NE reuptake inhibitor; first FDA approved non-stimulant for ADHD in children and adults;
    - Also Wellbutrin – not as selective an NE reuptake blocker
  - Decreasing use of tricyclic anti-depressants
  - Demonstrated efficacy of anti-hypertensives
    - (e.g., Catapres, Tenex)

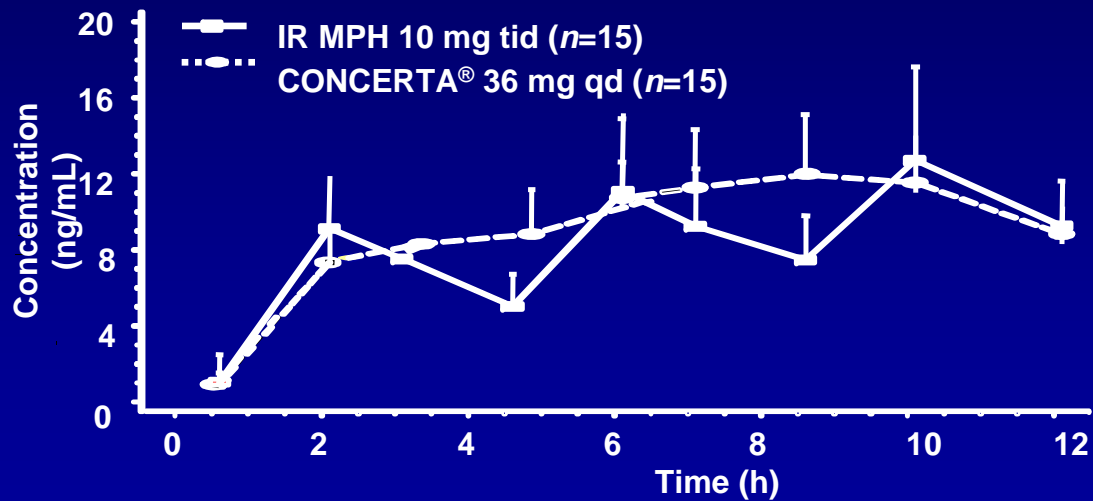


# Concerta: A New Delivery System



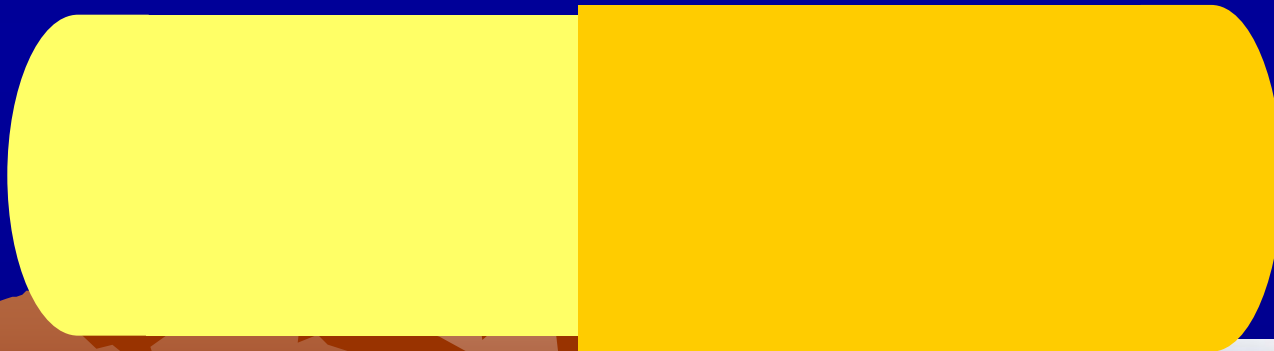
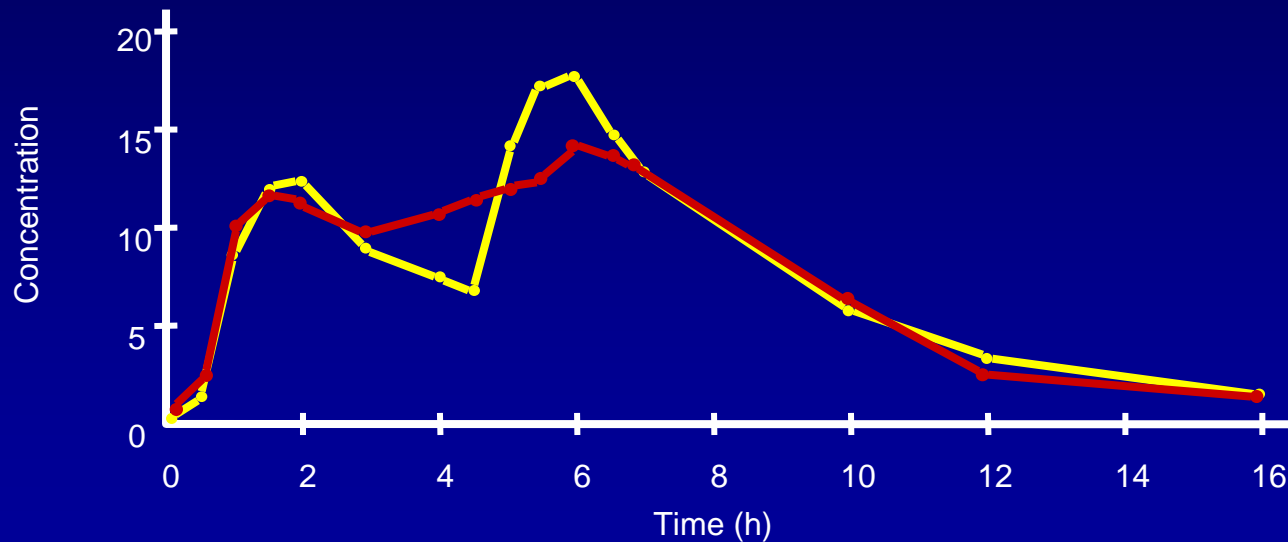
- Concerta uses OROS technology to create an osmotic pump
- Activated by water absorption in the stomach and intestinal track
- Pressure delivers a continuous flow of liquid methylphenidate
- Lasts 10-12+ hours
- Same effects and side effects as regular methylphenidate

# MPH OROS (Concerta<sup>®</sup>)



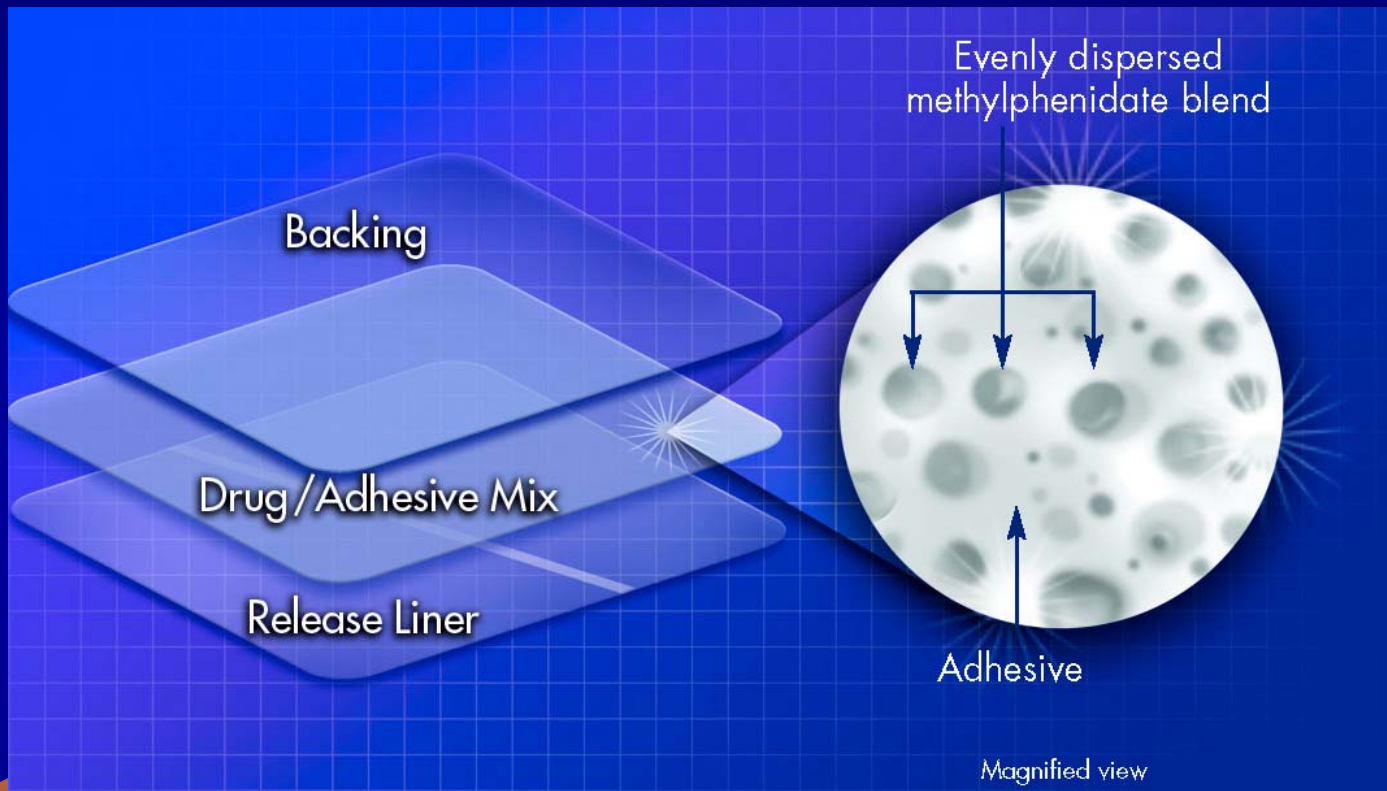
Outer Coat of Medicine  
(22% Immediate Release)

# Pulse Delivery System (Diffucaps, Microtrol, SODAS)



# Daytrana DOT Matrix™ Transdermal Technology

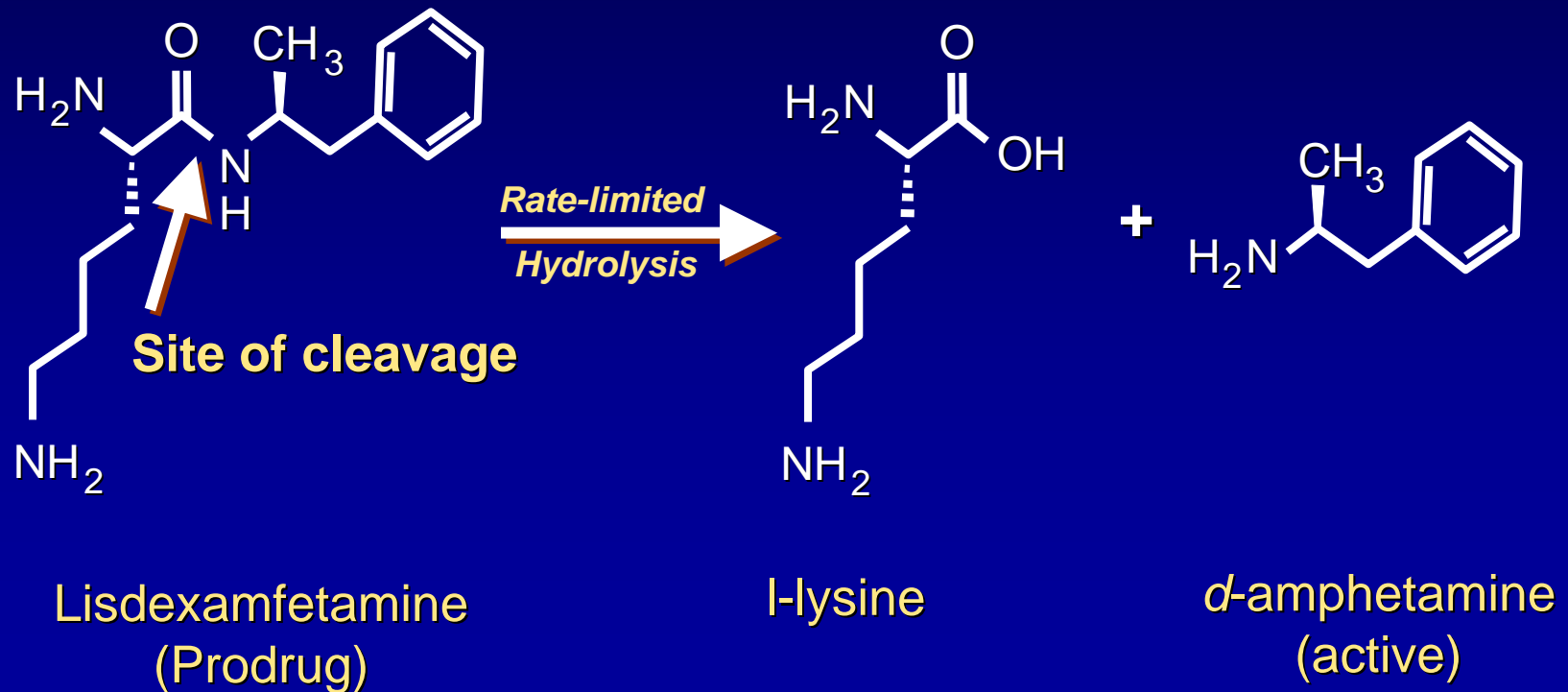
- Methylphenidate is mixed with adhesive



# What Is Vyvanse™?

- A long-acting, prodrug stimulant
- Once-daily medication indicated for the treatment of ADHD
  - The efficacy and tolerability of Vyvanse were evaluated in children aged 6 to 12 years
- Capsules available in multiple dosage strengths
  - 30 mg
  - 50 mg
  - 70 mg
- Can be taken with or without food
- Can be dissolved in water

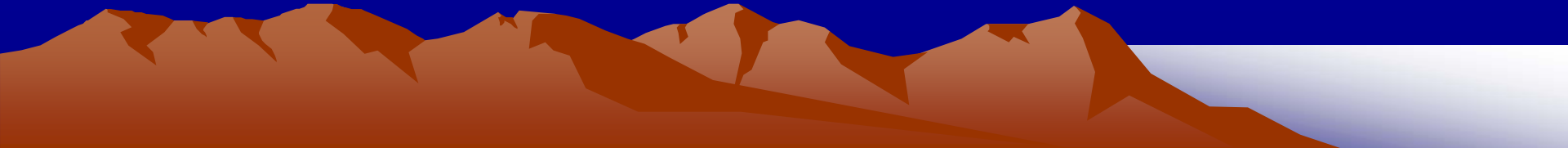
# Chemical Structure of Vyvanse™



- Vyvanse is a prodrug that is therapeutically inactive until it is converted to active d-amphetamine in the body

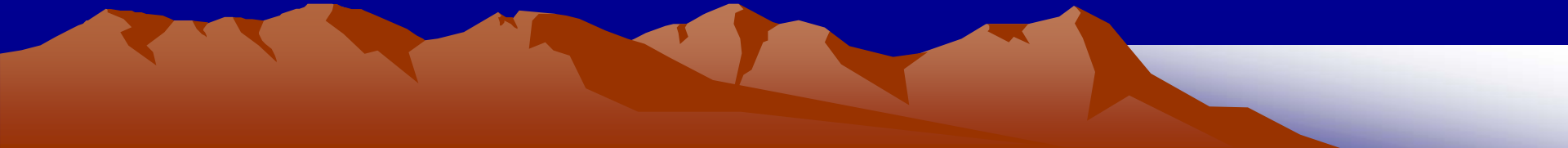
# Advances in Family Treatment

- Parent Education About ADHD
  - The first critical step in treatment
  - Adopt a “parents are shepherds” perspective
- Learning the value and limitations of parent training
  - Changes defiance and parent-child conflict, not ADHD
  - Works best in younger children
    - (<11 yrs., 65-75% respond)
  - Modestly useful for teens
    - (25-30% show reliable change)
- Incorporate teen in treatment and use Problem-Solving, Communication Training
  - (30%+ show reliable change)
  - Best to combine it with above PT to reduce drop outs



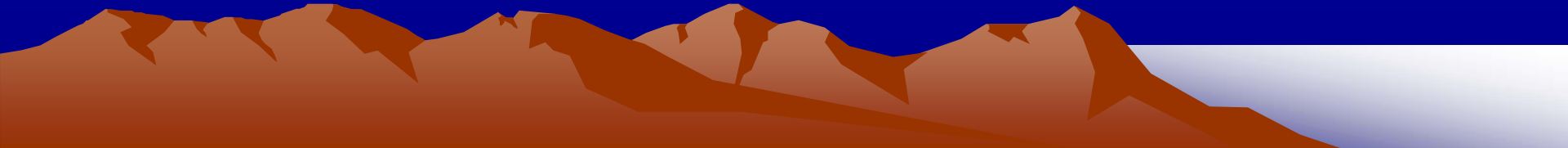
# More Treatment Advances

- Teacher Education About ADHD
- Classroom Behavior Management
  - Designing prosthetic classrooms
  - Very effective but no generalization or maintenance after withdrawal
- Special Education Services (IDEA, 504)
- Regular Physical Exercise
  - A coping or compensatory tool
- Residential Treatment (5-8%)
- Parent/Family Services (25+%)
- Parent/Client Support Groups (CHADD, ADDA, Independents)



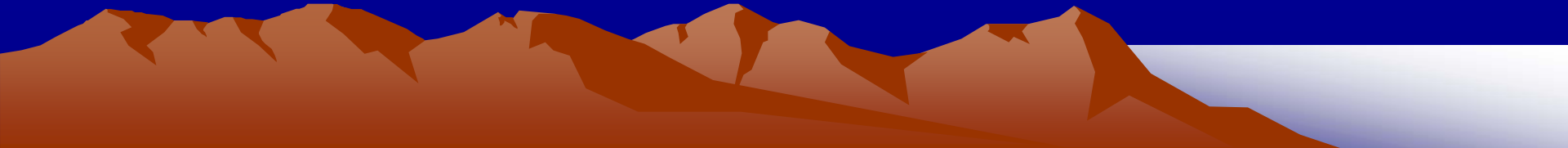
# Experimental Psychosocial Treatments

- Biofeedback (EEG) (Lubar, Univ. of Tennessee)
  - Numerous positive clinical studies but all suffer serious flaws in their methods
  - 2 randomized trials found no real benefits
- CogMed – cognitive training of working memory (Torkel Klingberg, Karolinska Institute, Stockholm)
- Time Management and Organization Training for ADHD Children (Howard Abikoff, NYU Medical School)
- Challenging Horizons Program – after school supplemental training for teens in social, recreational, and academic remediation (Brad Smith, Univ. of South Carolina)
- Cognitive Behavioral Training of Adults with ADHD (Steve Safren, Harvard Medical School; Russ Ramsay & Rothstein, Univ. of Pennsylvania Medical School)
- Parent Phone Coaching with Computer Assisted Checkups (Cunningham, McMaster University Medical School, Hamilton, Ontario, Canada)



# Unproven Therapies

- Elimination Diets – removal of sugar, additives, etc. (Weak evidence)
- Megavitamins, Anti-oxidants, Minerals (No compelling proof or have been disproved)
- Omega 3 Fatty Acids (Fish Oil) – one recent study with mixed results (effects at home on parent ratings, no effect at school on teacher ratings)
- Sensory Integration Training (disproved)
- Chiropractic Skull Manipulation (no proof)
- Play Therapy, Psycho-therapy (disproved)
- Self-Control (Cognitive) Therapies for Children (disproved)
- Social Skills Therapies for Children (in clinic)
  - Better for Inattentive (SCT) Type and Anxious Cases



# Conclusions

- ADHD is probably a disorder of self-regulation and executive functioning
  - ADHD is not a benign disorder
  - ADHD persists to adulthood in 65+% of cases
  - Many advances in treatment occurred in the past decade, especially in medications
  - ADHD can be successfully managed leading to improved life course and outcomes
- 