THE DIAGNOSIS OF ADHD IN ADULTS

Christopher J. Nicholls & Emily K. Ross
The childhood-onset clinical condition that carries the name Attention-Deficit/Hyperactivity Disorder (ADHD) is increasingly being recognized as persisting into adulthood. While there can be “acquired” deficits similar to ADHD, current research is focusing upon identifying the underlying neuroanatomic and cognitive abnormalities characteristic of the developmental condition.

This presentation focuses upon current conceptions of, and diagnostic approaches to, evaluating ADHD in adults, and will present information on the diagnosis from the perspective of the DSM-5, the ICD-11, and the NIMH’s Research Domain Criteria (RDoCs). Symptoms of ADHD in adults will be distinguished from those of childhood, and a battery of assessment strategies will be identified and discussed.
OBJECTIVES

1. Participants will be able to define and compare the presentation of ADHD symptoms in adults as distinct from those of childhood.

2. Participants will be able to select and apply a comprehensive assessment strategy for the diagnosis of ADHD in adults.

3. Participants will be able to list and discuss the neuroanatomic structures and circuitries implicated in current conceptions of ADHD.
PART ONE: WHAT YOU ALREADY KNEW
Assumptions of adult NP

• Dysfunction in the brain leads to specific impairments
• CNS insult leads to a loss of previously acquired abilities and behavior
• Specific NP tests reflect the impact of definitive brain disease
• Batteries of NP tests can localize/pinpoint areas of dysfunction
But, children are not little adults!
Pediatrics is an adolescent

• Despite the long history of medicine, the first hospital devoted to children opened in 1852 in London, England, followed in the USA at The Children’s Hospital of Philadelphia, in 1855 and The Hospital for Sick Children in Toronto in 1875.

• In 1900, 30.4% of all deaths occurred to children< 5 years of age, while in 1997 the incidence was 1.4%

• The American Academy of Pediatrics was not formed until 1930.
Pediatric Neurology is in middle school

• American child neurology resulted a merging of neurology and pediatrics in the late 19th century

• Early pediatric neurology focused upon metabolic and degenerative disorders of childhood - often as a result of birth injuries (cerebral palsy, epilepsy, ID)

• Early pediatric neurologists focused upon deinstitutionalization of children and the establishment of specific care units in hospitals for children with neurological diseases
Child Psychiatry is a toddler

• Leo Kanner created the first academic child psychiatry department in the world, in 1930, and wrote the first textbook on the subject in 1935.

• C&A Psychiatry was first recognized as a medical specialty in 1953, in the formation of the American Academy of Child Psychiatry.

• However it wasn’t until the work of Sir Michael Rutter and the “Isle of Wight” studies of childhood psychiatric epidemiology, that Child Psychiatry became a truly scientific field based upon extensive research.
Pediatric neuropsychology is an infant!

- Things like ADHD, learning disabilities, autism, etc., have only really been studied over the past 40 - 50 years
- ADHD in adulthood never existed because the kids we diagnosed with ADHD hadn’t grown up yet!
History of diagnoses: (from Barkley, 1990)

- George Still’s lecture on the “defect of moral control,” to the Royal College of Physicians (1902).
- The 1917-18 outbreak of an encephalitis epidemic in North America, and the concept of a “postencephalitic behavior disorder” that was clearly the result of CNS damage.
- 1930’s “organic driveness” and “restlessness syndrome” - recognizing the similarity between the symptoms of hyperactivity in children and the behavioral sequelae of frontal lobe lesions in primates.
- 1940’s popularity of considering all psychiatrically hospitalized children as having experienced some form of brain damage, whether or not there was evidence.
- 1950’s “hyperkinetic impulse disorder” thought to be due to a CNS deficit (poor filtering of stimulation) in the thalamus (Laufer et al., 1957).
- The first Diagnostic and Statistical Manual of the American Psychiatric Association (1952) spoke of “chronic brain disorders” but had no specific category for ADHD symptoms.
- 1950’s and 60’s - critical reviews questioned concept of a unitary syndrome of brain damage in children and led to a change in terms to “Minimal Brain Damage”
Publication of DSM-II (1968) first coined the term “Hyperkinetic Reaction of Childhood”
Keith Conners (1969) developed parent and teacher rating scales for the assessment of symptoms of hyperactivity, particularly during trials of stimulant medications - for 20 years these checklists were the “gold standard” for hyperactivity identification, but were criticized for confounding hyperactivity with aggression.
The 1970’s began to focus on the central role of deficits in attention and impulse control in accounting for functional impairment, more so than hyperactivity (Douglas, 1972)
Publication of DSM III (1980) included diagnosis of Attention-Deficit Disorder - with or without hyperactivity, and also created specific symptom lists, cutoff scores, guidelines for age of onset and exclusionary criteria.
The 1980’s also produced more advanced tools of assessment, including the Child Behavior Checklist (Achenbach & Edelbrock, 1983); the ADD Comprehensive Teacher Rating Scale (ACTeRS; Ullmann, Sleator, & Sprague, 1984), the Home and School Situations Questionnaires (Barkley, 1988) and the ADHD Rating Scale (DuPaul, 1991).
Gordon (1983) developed the first commercially available CPT, which was found to discriminate ADHD from Controls and was sensitive to medication effects.
Later in the 1980’s there were growing doubts about how important the role of attention was as one of the core deficits in ADHD.

A growing focus was made upon issues of motivational factors, reinforcement schedules and family interaction as causative, despite a growing awareness of genetics and heritability.

The focus upon family dynamics led treatment to emphasize parenting/family dysfunction, anger management training, social skills training, etc.

Consequently, DSM III-R (1987) returned to emphasis on hyperactivity and made the inattentive subtype “Undifferentiated Attention-Deficit Disorder” as a separate category. Attention-Deficit/Hyperactivity Disorder

- DSM-III-R classified ADHD with ODD and Conduct Disorder in a category known as “Disruptive Behavior Disorders”
- symptoms combined - needed 8/14 symptoms for diagnosis
- rated mild, moderate, severe
“Minimal brain dysfunction (MBD) has long been considered a disorder limited to childhood. A number of longitudinal and adoption studies suggest that MBD may persist into adult life where its existence is concealed by the application of a variety of diagnostic labels. In order to test the hypothesis that MBD does persist into adulthood, 15 putative MBD adults were identified on the basis of current MBD-like complaints, self-description of MBD characteristics in childhood, and a parental rating (on a standardized form) of “hyperactivity” in childhood. Eleven of the 15 subjects were given a double-blind trial of methylphenidate hydrochloride, and all 15 were given an open trial of pemoline, imipramine hydrochloride, or amitryptiline hydrochloride. Eight of the 11 showed a significant response to the double-blind trial of methylphenidate. Of the 15, eight showed a good response to stimulants or tricyclic antidepressants, two showed a moderately favorable response, and five were unresponsive to drug therapy.”

Wood, Reimherr, Wender, & Johnson, 1976
### THE WENDER-UTAH SCALE

As a child I was (or had):

<table>
<thead>
<tr>
<th></th>
<th>not at all/very slightly</th>
<th>mildly</th>
<th>moderately</th>
<th>quite a bit</th>
<th>very much</th>
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<tr>
<td>1. concentration problems</td>
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<td>2. anxious, worrying</td>
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<td>3. nervous, fidgety</td>
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<td>4. inattentive, daydreaming</td>
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<td>5. hot- or short-tempered, low boiling point</td>
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<td>6. temper outbursts, tantrums</td>
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<td>7. trouble with stick-to-it-tiveness, not following through, failing to finish things started</td>
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<td>8. stubborn, strong-willed</td>
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<td>9. etc.</td>
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<td>10. etc.</td>
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1993 - Ward, Wender, & Reimherr published an article containing the Wender Utah Rating Scale, which was used to retrospectively evaluate the presence of ADHD childhood symptoms in adults.

- Originally a 61 item scale completed by the patient, and a 10 item scale completed by a parent (preferably mother) of the patient.
- Later changed to a 25 item scale, with ratings 0 - 4. A cutoff score of 36 or higher correctly identified 96% of adults with ADHD and 96% of normals
- Scale was problematic due to small sample size, retrospective memory, required hyperactivity, and did not assess current symptoms
- Also had poor discrimination of ADHD from other psychiatric disorders.
- But it still opened the door to the diagnosis of ADHD in adults

(From Mapou, 2009)
DSM-IV (1994) FIRST INCLUDED SYMPTOMS FOR ADULTS (AS OPPOSED TO JUST CHILDREN)

Wender’s work was part of a growing recognition of the persistence of symptoms into adulthood
BUT THERE WERE OTHER BOOKS, TOO
IS IT EXECUTIVE FUNCTIONS?

ADHD = disinhibition

ADD = EF
DSM-IV AND 5

- DSM-IV (1994) and DSM-IV TR (2000) clarified subtypes of
  - Combined type
  - Predominantly Inattentive type (6/9 symptoms)
  - Predominantly Hyperactive-Impulsive type (6/9 symptoms)
  - Not otherwise specified (subsyndromal)
- DSM 5 (2013)
  - Retained the subtypes of
    - Combined presentation (314.01)
    - Predominantly inattentive presentation (314.00)
    - Predominantly hyperactive/impulsive presentation (314.01)
  - Returned to ratings of severity (But doesn’t give much guidance on how to rate)
    - Mild
    - Moderate
    - Severe
  - Changed “Not otherwise specified” subtype to “In partial remission” category if full criteria were previously met but not in the past 6 months, and symptoms still result in impairment in social, academic, or occupational functioning.
Inattention: Six or more of the following symptoms of inattention have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

- Often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities.
- Often has difficulty sustaining attention in tasks or play activities.
- Often does not seem to listen when spoken to directly.
- Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions).
- Often has difficulty organizing tasks and activities.

Inattention: Six or more symptoms of inattention for children up to age 16, or five or more for adolescents 17 and older and adults; symptoms of inattention have been present for at least 6 months, and they are inappropriate for developmental level:

- Often fails to give close attention to details or makes careless mistakes in schoolwork, at work, or with other activities (e.g., overlooks or misses details, work is inaccurate).
- Often has difficulty sustaining attention in tasks or play activities (e.g., has difficulty remaining focused during lectures, conversations, or lengthy reading).
- Often does not seem to listen when spoken to directly (e.g. mind seems elsewhere, even in the absence of any obvious distraction).
- Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (e.g., starts tasks but quickly loses focus and is easily sidetracked).
- Often has difficulty organizing tasks and activities (e.g., difficulty managing sequential tasks; difficulty keeping materials and belongings in order; messy, disorganized work; has poor time management; fails to meet deadlines).
Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework).

Often loses things necessary for tasks or activities (e.g. toys, school assignments, pencils, books, or tools).

Is often easily distracted by extraneous stimuli.

Is often forgetful in daily activities.

Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (e.g. schoolwork or homework; for older adolescents and adults, preparing reports, completing forms, reviewing lengthy papers).

Often loses things necessary for tasks and activities (e.g. school materials, pencils, books, tools, wallets, keys, paperwork, eyeglasses, mobile telephones).

Is often easily distracted by extraneous stimuli (for older adolescents and adults, may include unrelated thoughts).

Is often forgetful in daily activities (e.g. doing chores, running errands; for older adolescents and adults, returning calls, paying bills, keeping appointments).
Hyperactivity: Six or more of the following symptoms of hyperactivity-impulsivity have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

1. Often fidgets with hands or feet or squirms in seat.
2. Often leaves seat in classroom or in other situations in which remaining seated is expected.
3. Often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness).
4. Often has difficulty playing or engaging in leisure activities quietly.
5. Is often “on the go” or often acts as if “driven by a motor.”
6. Often talks excessively.

Impulsivity:

1. Often blurts out answers before questions have been completed.
2. Often has difficulty awaiting turn.
3. Often interrupts or intrudes on others (e.g., butts into conversations or games).

Hyperactivity and Impulsivity: Six or more symptoms of hyperactivity-impulsivity for children up to age 16, or five or more for adolescents 17 and older and adults: symptoms of hyperactivity-impulsivity have been present for at least 6 months to an extent that is disruptive and inappropriate for the person’s developmental level:

1. Often fidgets with or taps hands or feet or squirms in seat.
2. Often leaves seat in situations when remaining seated is expected (e.g., leaves his or her place in the classroom, in the office, or other workplace, or in other situations that require remaining in place).
3. Often runs about or climbs in situations where it is not appropriate (Note: in adolescents or adults may be limited to feeling restless).
4. Often unable to play or engage in leisure activities quietly.
5. Is often "on the go" acting as if "driven by a motor" (e.g., is unable to be or uncomfortable being still for extended time, as in restaurants, meetings; may be experienced by others as being restless or difficult to keep up with).
6. Often talks excessively.
7. Often blurts out an answer before a question has been completed (e.g., completes people’s sentences; cannot wait for turn in conversation).
8. Often has difficulty waiting his/her turn (e.g., while waiting in line).
9. Often interrupts or intrudes on others (e.g., butts into conversations, games, or activities; may start using other people’s things without asking or receiving permission; for adolescents and adults, may intrude into or take over what others are doing).
B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.

C. Some impairment from the symptoms is present in two or more settings (e.g., at school [or work] and at home).

D. There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.

E. The symptoms do not occur exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder and are not better accounted for by another mental disorder (e.g. Mood Disorder, Anxiety Disorder, Dissociative Disorder or a Personality Disorder).

B. Several inattentive or hyperactive-impulsive symptoms were present prior to 12 years.

C. Several inattentive or hyperactive-impulsive symptoms are present in two or more settings (e.g., at home, school, or work; with friends or relatives; in other activities).

D. There is clear evidence that the symptoms interfere with, or reduce the quality of, social, academic, or occupational functioning.

E. The symptoms do not occur exclusively during the course of schizophrenia or another psychotic disorder and are not better explained by another mental disorder (e.g. mood disorder, anxiety disorder, dissociative disorder, personality disorder, substance intoxication or withdrawal).
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<tr>
<td>314.0 Attention deficit disorder</td>
<td>F90 Hyperkinetic disorders</td>
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<td>□ F90.0 Disturbance of activity and attention</td>
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<tr>
<td>Adult</td>
<td>□ F90.1 Hyperkinetic conduct disorder</td>
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<td>Child</td>
<td>□ F90.8 Other hyperkinetic disorders</td>
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<td>314.00 Without mention of hyperactivity</td>
<td>□ F90.9 Hyperkinetic disorder, unspecified</td>
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<tr>
<td>Predominantly inattentive type</td>
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<td>314.01 With hyperactivity</td>
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<td>Combined type</td>
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<td>Overactivity NOS</td>
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<td>Predominantly hyperactive/impulsive type</td>
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<td>Simple disturbance of attention with overactivity</td>
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<td>314.1 Hyperkinesis with developmental delay</td>
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<td>Developmental disorder of hyperkinesis</td>
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<td>Use additional code to identify any associated neurological disorder</td>
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<td>314.2 Hyperkinetic conduct disorder</td>
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<td>Hyperkinetic conduct disorder without developmental delay</td>
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<td>Excludes: hyperkinesis with significant delays in specific skills (314.1)</td>
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<td>314.8 Other specified manifestations of hyperkinetic syndrome</td>
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<td>314.9 Unspecified hyperkinetic syndrome</td>
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<td>Hyperkinetic reaction of childhood or adolescence NOS</td>
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<td>Hyperkinetic syndrome NOS</td>
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“Differences in international opinion about the broadness of the concept of hyperkinetic disorder have been a well-known problem for many years...”

“Hyperkinetic conduct disorder (F90.1) is one of the few examples of a combination category remaining in ICD-10, Chapter V(F). The use of this diagnosis indicates that the criteria for both hyperkinetic disorder (F90.-) and conduct disorder (F91.-) are fulfilled. These few exceptions to the general rule were considered justified on the grounds of clinical convenience in view of the frequent coexistence of those disorders and the demonstrated later importance of the mixed syndrome. However, it is likely that The ICD-10 Classification of Mental and Behavioural Disorders: Diagnostic criteria for research (DCR-10) will recommend that, for research purposes, individual cases in these categories be described in terms of hyperactivity, emotional disturbance, and severity of conduct disorder (in addition to the combination category being used as an overall diagnosis).”

“Oppositional defiant disorder (F91.3) was not in ICD-9, but has been included in ICD-10 because of evidence of its predictive potential for later conduct problems. There is, however, a cautionary note recommending its use mainly for younger children. “

World Health Organization: The ICD-10 Classification of Mental and Behavioral Disorders - Clinical descriptions and diagnostic guidelines. Page 21.
Abstract: There are large differences between nations in the diagnosis and management of children with marked impulsiveness and inattention. The differences extend to the names and definitions of disorder and the extent to which medication should be used. This paper uses data from a large randomized clinical trial of pharmacological and psychosocial treatments, conducted in North America, to clarify its implications for other parts of the world. A diagnostic algorithm was applied to 579 children, diagnosed with ADHD-Combined Type in the MTA trial, to generate the ICD-10 diagnosis of ‘hyperkinetic disorder’ (HD); only a quarter met these more stringent criteria. HD was a moderator of treatment response. The superiority of medication to behavioral treatment was greater for children with HD. Children with ADHD but not HD also showed some improvement with medication. The results provide evidence for the validity of HD as a subgroup of those presenting ADHD; and suggest that treatment with stimulants is a high priority in children with HD. Results also suggest that some children with other forms of ADHD will respond better to medication than to psychosocial intervention, and therefore that European guidelines should extend their indications.
“The goal of this study was to compare the predictive validity of the two main diagnostic schemata for childhood hyperactivity – attention-deficit hyperactivity disorder (ADHD; Diagnostic and Statistical Manual – IV) and hyperkinetic disorder (HKD; International Classification of Diseases – 10th Edition).”

“Conclusions: Like earlier versions, ICD-10 and DSM-IV continue to delineate diagnostic entities with substantially different prevalence in clinic samples. However, HKD, ADHD-C, ADHD-IA and ADHD-HI groups overlap substantially in terms of important clinical characteristics, although HKD and ADHD-C may be somewhat more severe variants of the condition than ADHD-IA and ADHD-HI.”
WHAT ABOUT ICD-11 (2018)?
BELOW INFORMATION IS NOT FINAL; NOT APPROVED BY WHO

- Changes from hyperkinetic disorders back to attention deficit disorders
- Includes distinct codes based on the area of impairment (i.e. communication impact, children & youth impact, interpersonal relations impact, household activities impact, life management activities impact, school activities impact, mobility impact, social participation impact, understanding impact)
- Includes:
  - Attention deficit hyperactivity disorder
    - predominantly hyperactive-impulsive presentation
    - predominantly inattentive presentation
    - combined presentation
  - Attention deficit disorder without hyperactivity
- Excludes:
  - Anxiety disorders
  - Mood (affective) disorders
  - Pervasive developmental disorders
  - Schizophrenia

Attention deficit disorders are characterized by persistent, significant difficulty sustaining attention on tasks that do not provide a high level of stimulation or frequent reward that begins during childhood or adolescence and is inconsistent with the individual's developmental level. Symptoms must be present to a degree that significantly interferes with personal, family, social, educational, occupational or other important areas of functioning and be evident in more than one situation (e.g., home, school, clinic, work).

http://apps.who.int/classifications/icd11/browse/f/en#http%3a%2f%2fid.who.int%2ficd%2fentity%2f821852937
Attention deficit hyperactivity disorder

- Attention deficit hyperactivity disorder is a disorder that is characterized by a variable mixture of persistent inattention, hyperactivity and impulsivity of a degree that significantly deviates from what would be expected given the individual’s general developmental level, and that begins during childhood or adolescence.
  - Inattentiveness is the inability to keep one’s mind focussed on a task.
  - Hyperactivity manifests as excessive movements and difficulty to remain still. Impulsivity is a tendency for rushed action without reflecting.

- Predominantly hyperactive-impulsive presentation
  - A presentation of Attention deficit hyperactivity disorder in which hyperactive symptoms (e.g., excessive movement, restlessness and difficulty remaining still) or impulsive symptoms (rushed action without reflection, impatience, lack of planning) predominate. Inattentive symptoms may or may not be present.

- Predominantly inattentive presentation
  - A presentation of Attention deficit hyperactivity disorder in which inattentive symptoms (e.g., difficulty keeping one's mind focused on tasks that do not provide a high level of stimulation or frequent rewards) predominate, but hyperactive-impulsive symptoms are also present.

- Combined presentation
  - A presentation of Attention deficit hyperactivity disorder in which both hyperactive-impulsive and inattentive symptoms are present, with neither predominating.
Attention deficit disorder without hyperactivity

- Attention deficit disorder without hyperactivity is characterized by a persistent pattern of inattention,
  - with onset during the developmental period (typically before age 5),
  - that is outside the limits of normal variation expected for age and level of intellectual functioning and
  - significantly interferes with academic or occupational functioning.
- Inattention refers to
  - significant difficulty in sustaining attention to tasks that do not provide a high level of stimulation or frequent rewards,
  - difficulties with concentration, distractibility, failing to pay attention to details of tasks undertaken, and
  - problems with organization.
- The pattern of inattention is not accompanied by significant hyperactivity or impulsivity and is clearly observable in more than one setting.
PART TWO: WHAT WE CURRENTLY KNOW
WHY DO WE GET ADHD EVALUATION REFERRALS?

FIGURE 6
PCPs’ REASONS FOR COLLABORATING WITH OR DEFERING TO SPECIALISTS WHEN DIAGNOsing ADULT ADHD

- Inexperience/lack of confidence: 52%
- Difficult to diagnose and treat/no clear diagnostic: 22%
- Second opinion/confirm diagnosis: 20%
- Many treatment medications are controlled substances: 13%
- Other: 11%
- Time constraints: 4%

PCPs=primary care physicians.

- Provides a good outline of how to perform an assessment that is consistent with research guidelines.
- In personal communication, Rob tells me that for the most part he relies upon “history and interview” to make an ADHD diagnosis.
- This, however, is not sufficient for securing accommodations, disability determination or eligibility for services.
- And besides, everyone knows what ADHD is, right?
BUT WE PROBABLY SHOULD HAVE A MODEL...

Rob Mapou’s suggestion:

- **Comprehensive** approach recommended (not a focused approach) because of the many possible causes for the presenting problem(s).
  - Bright adults may be able to compensate well for their difficulties, but can still have specific cognitive problems that a comprehensive evaluation may reveal
- Components of a Comprehensive Evaluation of ADHD:
  - obtaining historical information and reviewing available records
    - developmental and academic history
      - can be obtained via a history questionnaire prior to intake
    - need clear evidence of ADHD in childhood
  - Assessment of past and current symptoms via semi-structured interview and behavioral rating scales
    - other report = important.
  - Neuropsychological testing
  - Measure of personality and emotional functioning
  - Behavioral observation throughout
  - Symptom validity measures
Cognitive Framework for Assessment:

- Global functioning → summary measures of the client’s functioning in the intellectual and academic realms
- Foundation skills → necessary for input (alertness, attention, sensory) and output (motor, EF, problem solving, reasoning)
  - frontal lobes, deeper subcortical structures, and connections from these areas to other parts of the brain
- Modality Specific Skills (language vs. visuospatial)
- Integrated Skills → learning and memory
  - problems with either of these areas typically related to other issues (that’s why it’s on the top of the hierarchy).
It would be nice to perform a comprehensive neuropsychological battery with everyone referred for an ADHD evaluation, but it would take 8+ hours and is impractical.

Many physicians feel comfortable diagnosing and prescribing medications based upon a brief interview and maybe a checklist or two.

Most of the referrals sent to The Nicholls Group are less about whether or not a person has ADHD, and more about questions of specific impairments:

- Bright college student with good grades who struggles with sustained focus in reading.
- Graduate students with no history of learning disability, but overwhelmed by volume of required work.
- Individuals looking for workplace accommodations due to slow speed of processing, poor working memory, disorganization, etc.
- Individuals whose partners “can’t take it any more.”
- Individuals who have been involved in treatment with a mental health provider for a different condition but “aren’t getting better.”

Most adults who are referred already have a pretty good idea of where the problems lie - they want to know how to solve them.
Susan McDaniel, APA President-Elect:
“We need to anticipate new financial models, ensuring psychologists are part of bundled and global payments.”

Tony Puente, candidate for 2016 APA President-Elect:
Health Care Trends:
- Unsustainable cost trends
- Increased Audits
- Electronic Health Records
- Health Care Homes
- etc.
TWO DIFFERENT MODELS OF ASSESSMENT

Comprehensive:
- Extensive history taking
- Records review
- Multiple questionnaire completion
- IQ testing
- Achievement testing
- Executive function testing
- Kitchen sink testing

Focused:
- Specific history taking
- Targeted records review
- Specific rating scales (pt. and informant)
- Targeted testing based upon history
SHOULD WE USE A STRUCTURED INTERVIEW?

Brown ADD Scales Diagnostic Form (1996 - Pearson)
- Clinical History Protocol for Evaluating Possible ADDs
- Scoring Summary of the Ready Score Answer Document
- Multirater Evaluation Form for the DSM-IV AD/HD Criteria
- Screener for Comorbid Disorders
- Examiner’s Worksheet for IQ Test Data
- Summary of Wechsler Test Scores Relevant to ADD Diagnosis
- Overall Summary of Diagnostic Data

Conners’ Adult ADHD Diagnostic Interview for DSM-IV (2001)
- Broad structured interview assessing
  - risk factors in the areas of perinatal history, temperament, development, environment
  - medical history
  - elementary/middle/high school academic history
  - psychiatric history
  - family history
  - post-secondary academic history
  - occupational history
  - social/interpersonal history
  - substance use/abuse
SELECTED RATING SCALES

- Self-Rating Symptom Checklist for ADHD Adults (Barkley - 1991, not normed)
- ADHD Rating Scale - IV (Murphy & Barkley, 1996)
- Brown Attention-Deficit Disorder Scales (1996)
- Kooij & Buitelaar ADHD Rating Scale (1997)
- (Achenbach) Young Adult Behavior Checklist for ages 18-30 (1997)
- Conners’ Adult ADHD Rating Scales (1999)
- Adult ADHD Self-Report Scale (WHO, 2005)
- Behavior Rating Inventory of Executive Functions - Adult Version (2005)
- Barkley Adult ADHD Rating Scale – IV (2011)
### Adult ADHD Self-Report Scale (ASRS-v1.1) Symptom Checklist

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<tr>
<th>Patient Name</th>
<th>Today's Date</th>
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<td>Please answer the questions below, rating yourself on each of the criteria shown using the scale on the right side of the page. As you answer each question, place an X in the box that best describes how you have felt and conducted yourself over the past 6 months. Please give this completed checklist to your healthcare professional to discuss during today's appointment.</td>
<td>Never</td>
</tr>
<tr>
<td>1. How often do you have trouble wrapping up the final details of a project, once the challenging parts have been done?</td>
<td></td>
</tr>
<tr>
<td>2. How often do you have difficulty getting things in order when you have to do a task that requires organization?</td>
<td></td>
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<tr>
<td>3. How often do you have problems remembering appointments or obligations?</td>
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</tr>
<tr>
<td>4. When you have a task that requires a lot of thought, how often do you avoid or delay getting started?</td>
<td></td>
</tr>
<tr>
<td>5. How often do you fidget or squirm with your hands or feet when you have to sit down for a long time?</td>
<td></td>
</tr>
<tr>
<td>6. How often do you feel overly active and compelled to do things, like you were driven by a motor?</td>
<td></td>
</tr>
<tr>
<td>Part A</td>
<td></td>
</tr>
<tr>
<td>7. How often do you make careless mistakes when you have to work on a boring or difficult project?</td>
<td></td>
</tr>
<tr>
<td>8. How often do you have difficulty keeping your attention when you are doing boring or repetitive work?</td>
<td></td>
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<tr>
<td>9. How often do you have difficulty concentrating on what people say to you, even when they are speaking to you directly?</td>
<td></td>
</tr>
<tr>
<td>10. How often do you misplace or have difficulty finding things at home or at work?</td>
<td></td>
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<tr>
<td>11. How often are you distracted by activity or noise around you?</td>
<td></td>
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<tr>
<td>12. How often do you leave your seat in meetings or other situations in which you are expected to remain seated?</td>
<td></td>
</tr>
<tr>
<td>13. How often do you feel restless or fidgety?</td>
<td></td>
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<tr>
<td>14. How often do you have difficulty unwinding and relaxing when you have time to yourself?</td>
<td></td>
</tr>
<tr>
<td>15. How often do you find yourself talking too much when you are in social situations?</td>
<td></td>
</tr>
<tr>
<td>16. When you're in a conversation, how often do you find yourself finishing the sentences of the people you are talking to, before they can finish them themselves?</td>
<td></td>
</tr>
<tr>
<td>17. How often do you have difficulty waiting your turn in situations when turn taking is required?</td>
<td></td>
</tr>
<tr>
<td>18. How often do you interrupt others when they are busy?</td>
<td></td>
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<tr>
<td>Part B</td>
<td></td>
</tr>
</tbody>
</table>
Barkley says we don’t need to give NP tests!

- Barkley (2012) is adamant that "the majority of individuals with ADHD are not impaired on neuropsychological EF tests, even if groups of ADHD cases differ in mean scores from control groups on many such tests." (p.12)
- Nevertheless, Barkley (2012) develops an entire philosophical theory of why executive function deficits are the key to impairment in society, focusing upon the "Self" in self-regulation
- Barkley suggests that we just use his Deficits in Executive Functions Scale
Fuermaier et al (2015) evaluated 55 adults with ADHD and 66 healthy participants with regard to cognitive functioning in several domains by employing subjective and objective measurement tools. Both revealed significant cognitive dysfunction in the ADHD adults, however a comparison of effect sizes showed larger dysfunction in the subjective assessment than the objective assessment, and one could not predict the other - so both are important in clinical practice and provide different information.
MY TAKE ON TESTING: CAN’T VS. DOESN’T VS. WON’T

- Can’t = identifiable weaknesses on focused/specific tasks that reflect poorly developed skills

- Doesn’t = competent performance in structured one-on-one testing but self- and other-report of impairment in daily functioning

- Won’t = some external factor that motivates a person to want to have a diagnosis (e.g. extra time on Bar exam, desire for medications, personality factors, etc.)
CAN’T - 19YO FOOTBALL PLAYER

- trouble with timed tests, runs out of time
- if provided tutoring, outlines and notes gets C’s
- trouble with math more than reading
- average high school grades
- ACT = 19 (41% nationally)
- no health concerns, one concussion in high school
- siblings ok, father didn’t complete high school
- ASRS, BASC, Brown wnl
- NIH Toolbox:
  - average scores on picture vocabulary, dimensional card sort, picture sequence memory
  - low average list sorting word memory and oral reading recognition
  - impaired score on flanker inhibitory control and attention
- word memory test and other embedded pvt scores wnl

- WAIS IV: FSIQ 82, VC 83, PR 90, WM71, PS 97
- WIAT III: Reading 85, Math 83, Writing 80 Oral 88
- TOWRE 7/7
- Nelson-Denny Rdg Comp 6%, Rate 8%
- Tower of London Move 72, Correct 72, Rule violation 106, Time violation 106, Initiation time 88, Execution time 100, total problem solving time 112
- WCST Total errors 90, Pers Resp 123, Pers Errors 123, Nonpers errors 78, Concept.Level responses 81, categories completed 0
- Trails A 37 +2 errors, B 51
- TOVA RTV 62/42/44, Comm 108/117/117, Om 58/<40/<40 API -4.02
History:

- 36 year old landscaper referred by social worker who has seen him for depression
- took antidepressants x 4 years but still has “missing connections”
- currently on Wellbutrin 300 and Prozac 20
- tried Adderall but made him irritable when it wore off
- alcohol abuse beginning at age 14, currently drinks once per week
- almost failed high school
- attended multiple community colleges as a music major, never completed final performance in order to get degree
- multiple odd jobs, father always “bailed me out” and gave him money
- Became married, started work as a landscape designer and contractor - successful but impulsive credit card spending leads to poor financial stability
- Marital troubles - has seen several therapists who felt “it was my fault.”
- Wife reports that he “can’t sit still” and constantly has to be moving
ADHD Self-Report Scale endorsed 4/6 screening items
- Brown ADD scale total score 93 (>55 = “highly probable” for ADHD dx)
- Barkley BDEFS Self-Report >90% on scales reflecting self-management to time, self-organization/problem solving, self-motivation. Total EF Score 93%, ADHD-EF index 88%
- Wife’s completion of BDEFS:
  - poor sense of time
  - wastes or mismanages time
  - trouble planning ahead for upcoming events
  - forgets things he was supposed to do
  - can’t seem to accomplish goals he sets for himself
  - trouble completing one activity before moving on to another
  - difficulty prioritizing, etc.

TOVA:

<table>
<thead>
<tr>
<th>Scale</th>
<th>First half</th>
<th>Second half</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT variability</td>
<td>88</td>
<td>95</td>
<td>94</td>
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<tr>
<td>Commission errors</td>
<td>95</td>
<td>98</td>
<td>97</td>
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<tr>
<td>Omission errors</td>
<td>100</td>
<td>40</td>
<td>40</td>
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<tr>
<td>Attention performance index</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>index = -2.95</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Symptom exaggeration index</td>
<td></td>
<td></td>
<td>wnl</td>
</tr>
</tbody>
</table>
37 yo baseball player referred for evaluation to be in compliance with his request for a Therapeutic Use Exemption (TUE) under Major League Baseball’s Joint Drug Prevention and Treatment Guidelines - he wants to take Adderall

- Prior history of ADHD diagnosis by physician and treatment with Adderall, which he found helpful
- Currently not using stimulants due to league random drug testing.
- Has to work extremely hard to stay focused and avoid distractions while pitching
- Distracted by fans, other players, the music, announcer etc.
- Hard time staying in the present, mind drifts to the point that others ask “where did you go?”

- Loses track in conversations “I’m sorry, my mind just wandered, could you repeat that?”
- Often feels restless, has to exercise hard and still cannot sit still to watch TV or a movie
- Constantly has to be doing something
- Wife reports he never finishes anything, jumps from one unfinished activity to another
- Struggled in elementary school, parents often called to school, lots of detentions
- “got in with the wrong crowd” in high school, experimentation with drugs
- Baseball “was my saving grace” and kept him motivated to get eligibility passing grades
- Attended four different colleges and did not graduate
BASEBALL PLAYER, CONT’D.

- TOMM: 45/50/50
- WMT: 100/100/100
- WAIS-IV: FSIQ 121, GAI 124, VC 116, PR 125, WM 131, PS 94. All subtests ≥11 except Symbol Search = 7
- TOVA: RTV <40, <40, <40; Comm 104/114/114, Omissions 100, <40, <40; severe distractibility at end of test, multiple omissions in a row
- DKEFS: TMT all >11, VF >11, DF >15, Color-Word Int all >9, 20 Questions initial abstraction = 8 but rest>11, word context 12, Tower 13 with 0 rule violations, Proverbs 12
- CVLT-II, Trial 1=+1, Trial 5=+1. Trial 1-5=71T, Short delay free = +1.5, SD cued = +1, LDFree = +1.5, LD cued = 1, Semantic clustering +3, Serial clustering -1.5, Forced choice recognition 95
- Nelson-Denny wnl reading comprehension with no big gain with extended time, but reading rate 3rd percentile

- BDEFS - self-report long form
  - Self-management to time = 94%
  - Self-organization/prob. solving = 95%
  - Self-restraint = 93%
  - Self-motivation = 84%
  - Self-regulation of emotions = 95%
  - Total EF Summary Score = 94%
  - ADHD/EF Index = 96%

- BRIEF (self/wife percentiles)
  - Inhibit = 98/99
  - Shift = 99/99
  - Emotional control = 94/96
  - Initiate = 85/73
  - Working memory = 98/99
  - Plan/Organize = 87/83
  - Task Monitoring = 97/77
  - Organization of materials = 93/98

- SA45 - sensitive, anxious, acutely aware of reactions of others, tense, keyed-up
Disability applicant who fails both embedded and standalone effort tests.

Patient who shows up stoned and admits to daily marijuana use.

Angry and entitled employee who has to have a diagnosis or “That &#$@*** boss is going to fire me.”
WHAT? SYMPTOM EXAGGERATION???

- Sullivan et al. (2007) - “...Rates of apparent symptom exaggeration comparable to those found in medicolegal settings (e.g. personal injury cases), particularly in the context of ADHD were found.”

- Suhr et al (2008) - “...Results showed a 31% failure rate on the WMT. Those who failed the WMT showed clinical levels of self-reported ADHD symptoms and impaired neuropsychological performance.”

- Musso & Gouvier (2012) “...Most self-report questionnaires were not sensitive to malingering...Failure of three or more symptom validity tests proved most useful at detecting malingered ADHD...there is a substantial need for measures designed specifically for detecting malingered ADHD...”
ADHD ASSESSMENT CAN VARY IN SCOPE

The scope depends upon your referral questions, what will be done with the information, who wants it, and how much time, money, and depth is going to be required.

- Simple interview.
- Interview plus checklists.
- Include records review and collateral info.
- Include measures of global functioning.
- Include measures of specific cognitive functions.
Could presenting symptoms be a reflection of an alternative medical diagnosis?
- sleep disorders - restless leg syndrome, delayed sleep phase disorder, OSA
- drug abuse - amphetamines, marijuana, alcohol, designer drugs, etc.
- epilepsy, particularly absence seizures
- learning disabilities, with 40% overlap between inattentiveness and dyslexia
- IADD
- metabolic disorders, thyroid dysfunction etc.

Could presenting symptoms be a reflection of the side effects of medications prescribed for other conditions?
- Topamax for migraines
- Other AEDs
- disinhibition secondary to tricyclic and serotonin reuptake inhibitors
Ms. XXX has been a Center-back for (college)’s women’s soccer team since her Freshman year. In addition to playing for (college), she has also played competitive club soccer for 10 years, and is also involved in the Women’s Premier Soccer League. Ms. XXX reports that over the last two years she has received nine concussions. Of those, she experienced nausea and vomiting in most of them, and minimal and brief memory loss during at least two of the concussions. After two back-to-back concussions in June-July of 2014, Ms. XXX was seen by a neurologist at YYY Hospital in (city, state). To the best of her recollection, there were no significant results from that visit, although she was encouraged to consider alternative athletic and academic options for the future. Since that time, she sustained three more concussions, the last of which was in November 2014. Ms. XXX said that she feels that each time she sustains a concussion it takes her longer to recover, and has begun to feel “mentally slower” than she used to.
PART THREE: WHAT’S NEW?
ADHD IS DEAD! LONG LIVE ADHD!

GUEST EDITORIAL

Requiem for a Diagnosis: Attention-Deficit Hyperactivity Disorder

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This editorial discusses the diagnosis of ADHD from behavioral and neuropsychological viewpoints. The DSM and clinical neuropsychology offer two completely different nomenclatures while brain-behavior relationships do not easily “map” on to the symptom picture of ADHD. Neuropsychological evaluation offers specificity in identifying and treating individual ADHD presentations, avoiding the heterogeneity inherent in the DSM diagnosis of ADHD.

Key words: ADHD, attention-deficit hyperactivity disorder, diagnostic systems, executive functioning

Attention-deficit hyperactivity disorder (ADHD) is a behaviorally defined diagnosis. The Diagnostic and Statistical Manual of Mental Disorders (DSM; American Psychiatric Association, 2000) lists 18 possible behavioral symptoms for diagnosing this condition. Nine observations concern criteria for inattention, 6 symptoms concern hyperactivity, and 3 observations pertain to impulsivity. This observational methodology allows for classifying three subtypes of ADHD (combined type, predominantly inattentive type, and predominantly hyperactive-impulsive type). However, children who present with a diagnosis of ADHD, regardless of behaviorally defined subtype, remain a highly heterogeneous population. In addition, the symptoms of ADHD are not unique to that diagnosis and can be seen in a variety of can demonstrate deficits in several elements of executive control, particularly when considering executive functioning (EF) includes aspects of both cognitive and viscerally functions (Starkstein & Kremen, 2001). In fact, symptoms in various DSM categories can overlap to such a degree that differential diagnosis becomes extremely problematic and comorbidity is more rule than exception. In one investigation, children presenting for clinical evaluation met full DSM-Fourth Edition criteria for one to five diagnoses (Yuryuta-Tobias, Rabinowitz, & Nezirioglou, 2003). Nevertheless, proponents of the DSM system advocate that all that is necessary to make a differential diagnosis of ADHD is a set of observational rating scales (Burkley, 2006). Many defenders of this behaviorally defined system criticize, marginalize, and
THE VERTICALLY INTEGRATED BRAIN
“Neuropsychology’s nomenclature is descriptive. The main diagnostic goal of neuropsychological evaluation is to identify and characterize brain-behavior relationships. This represents an inherently different process than generating a diagnosis on the basis of behaviorally defined criteria. DSM reference-based criteria for applying particular neuropsychological test findings do not exist...
The DSM perspective is a categorical approach to behavioral diagnosis. A theory to explain why the symptoms of ADHD occur has been absent. More recent work has determined that ADHD is more complex than anyone had thought on the basis of an 80% inherited and 20% acquired model of causation. Also, only 20% of ADHD occurs in isolation - usually there is “something else,” and at least 50% have a comorbid disorder. Use of the DSM potentially therefore sets up a diagnostic “trap.” The use of checklists containing the 18 DSM symptoms that is typically used to make a diagnosis adds additional sources of error, in that the ability to “pay attention” is often task dependent, and ADHD presentation changes over time - young children look differently from adolescents and adults. Also, many ADHD behaviors are not limited solely to ADHD but can occur in other disorders. The “one cause one disorder” model doesn’t fit.
ADHD IS A FRONTAL LOBE DISORDER, RIGHT?

Initial studies of other frontal lobe disorders led to the conclusion that ADHD is a frontal lobe disorder, however other studies of cerebral perfusion implicate not only frontal lobes but frontal-striatal systems, with hypoperfusion of the basal ganglia potentially being the factor responsible for ADHD symptoms. The emergence of a “dual pathway” model emerged from studies of the brain’s motivation and reward circuitry systems.
Historically, neuropsychology was based upon testing individuals with known neurological lesions, and then determining “where” in the brain the lesion occurred, and what kind of lesion it was.

- We spoke of “Frontal” disorders and “Parietal” disorders.

But maybe this isn’t accurate? For example, the WCST was originally thought to be a frontal measure of executive functions, however Monchi et al (2001) identified that the WCST activates the dorsolateral prefrontal cortex, the inferior parietal lobule, the inferior temporal cortex, the head of the caudate nucleus, and the cerebellum.
Well it might be a little more complicated....

(Cheng et al. 2012)
Koziol et al recommend replacing current models of ADHD with the RDoC concept of considering disorders on continua associated with emerging knowledge of brain networks.

At a basic level the “vertical” organization of the brain involves two parallel channels or reciprocal connection profiles.

- Cerebro-cerebellar circuitry (Schmahmann & Pandya, 1997)
For example, there are different kinds of impulsivity.

There are different causes:
- may be secondary to insufficient inhibition when presented with any stimulus
- may be because of a lack of inhibition when presented with multiple stimuli
- may be because of a lack of anticipatory control
- may be because of an inability to inhibit reward systems when presented with rewarding stimuli

NP test paradigms measure different types of impulse control in different ways:
- E.G. “Stroop-like” tasks require “inhibition” over prepotent responses by requiring a person to inhibit an over-learned, automatic response - i.e. a previous “association” has been learned
- CPT “inhibition” measures anticipatory control and recruits a different neural network
- the “delay aversion” type of inhibition involves, for example, asking a person if they would rather have $3 now or $5 tomorrow?
More recently the discovery of large-scale “distributed” brain networks is changing how we think and is replacing a localizationist point of view. The networks include:

1. frontoparietal network
2. dorsal attentional network
3. ventral attentional network
4. visual network
5. limbic network
6. sensorimotor network
7. default network
Yeo et al (2011) found remarkable reliability of these networks over 1000 healthy adult subjects.

Buckner et al (2011) report that the cerebellum connects with each of these seven distributed networks.

Catani et al (2012) used diffusion tensor tractography to map an entire atlas of white matter connections including cortical-subcortical networks that affect a wide range of behavioral domains - see www.natbrainlab.com
projection network showing internal capsule and corticospinal tracts

perisylvian network
YEO ET AL. (2011)

- Purple (Visual)
- Blue (Somatomotor)
- Green (Dorsal Attention)
- Violet (Ventral Attention)
- Cream (Limbic)
- Orange (Frontoparietal)
- Red (Default)
consists of dorsolateral prefrontal cortex, anterior cingulate cortex, anterior prefrontal cortex, lateral cerebellum, anterior insula, caudate nucleus, and the inferior parietal lobe.

involved in effortful cognitive tasks that require rules to be kept in mind to guide behavior.

it is therefore a cognitive control, executive function, working memory type of network, that underpins goal-directed behavior, particularly in novel problem-solving situations

aspects of this circuitry have been strongly implicated in ADHD and motor inhibition
THE DORSAL ATTENTION NETWORK

- intraparietal sulcus and frontal eye fields
- primarily involved in shifting the focus of attention and controlling spatial attention.
- important in environments that are constantly changing
- mediates top-down, goal-directed, executive control processes
THE VENTRAL ATTENTION NETWORK

- includes the temporoparietal junction, the supramarginal gyrus, the frontal operculum, and the anterior insula
- closely related to circuits termed the “salience network” or the “cingulo-opercular network” by Castellanos & Proal (2012)
- “what” an object is and what it is used for, playing an important role in behavioral praxis or potential action
- reward value determines what we attend toward
THE VISUAL NETWORK

- consists of occipital lobe, the lateral temporal region and the superior parietal lobule
- critical to ventral and dorsal stream
- in combination to above plays important role in sustaining visual attention and in suppressing attention to extraneous, irrelevant stimuli
THE DEFAULT NETWORK

- physiological baseline of brain activity
- there is a great deal of brain activity even when at rest
- anchored in the anterior medial prefrontal cortex and the posterior cingulate cortex
- additional components include the dorsomedial prefrontal system and the medial temporal lobe system
- activity is high until active, goal-directed cognitive processing is required, at which time it becomes less active
- in ADHD the default network regions do not seem to be suppressed
- associated with lapses in attention, leading to some suggesting that ADHD is a default network disorder
THE SENSORY NETWORK

- consists of primary motor cortex, the primary and secondary sensory cortices, the supplementary motor cortex, the ventral premotor cortex, the putamen, the thalamus, and the cerebellum.
- involved in certain motor abnormalities, and when present in ADHD, predict positive response to stimulant medication.
The RDoC framework consists of a matrix where the rows represent specified functional constructs (concepts representing a specified functional dimension of behavior) characterized in aggregate by the genes, molecules, circuits, etc. used to measure it. Constructs are in turn grouped into higher-level domains of functioning, reflecting contemporary knowledge about major systems of emotion, cognition, motivation, and social behavior. Currently, there are five Domains in the RDoC matrix.

- Negative valence systems
- Positive valence systems
- Cognitive systems
- Systems for social processes
- Arousal and regulatory systems
NEGATIVE VALENCE SYSTEMS

- Acute threat ("fear")
- Potential threat ("anxiety")
- Sustained threat
- Loss
- Frustrative nonreward
Approach motivation
- Reward valuation
- Effort valuation/willingness to work
- Expectancy/reward prediction error
- Action selection/preference-based decision making
- Initial responsiveness to reward
- Sustained responsiveness to reward
- Reward learning
- Habit
COGNITIVE SYSTEMS

- Attention
- Perception
  - Visual perception
  - Auditory perception
  - Olfactory somatosensory multimodal perception
- Declarative memory
- Language behavior
- Cognitive (effortful) control
  - Goal selection
  - Updating
  - Representation and maintenance
- Working memory
  - Active maintenance
  - Flexible updating
  - Limited capacity
  - Interference control
- Response selection
- Inhibition or suppression
- Performance monitoring
SYSTEMS FOR SOCIAL PROCESSES

- Affiliation and attachment
  - Attachment formation and maintenance
- Social communication
  - Reception of facial communication
  - Production of facial communication
  - Reception of non-facial communication
  - Production of non-facial communication

- Perception and understanding of self
  - Agency
  - Self-Knowledge
- Perception and understanding of others
  - Animacy perception
  - Action perception
  - Understanding mental states
AROUSAL AND REGULATORY SYSTEMS

- Arousal
- Circadian Rhythms
- Sleep and wakefulness
For each of the above domains/constructs and subconstructs, RDoC purports to evaluate multiple units of analysis:

- Genes
- Molecules
- Cells
- Circuits
- Physiology
- Behavior
- Self-Reports
- Paradigms
### Domain: Negative Valence Systems
- **Construct: Acute threat**
  - (*fear*)

---

#### Units of Analysis

<table>
<thead>
<tr>
<th>Genes</th>
<th>Molecules</th>
<th>Cells</th>
<th>Circuits</th>
<th>Physiology</th>
<th>Behavior</th>
<th>Self-Reports</th>
<th>Paradigms</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDNF, 5HT/5HTRs, CRF, FK85, GABAARs, Glutamate system, NMDARs, Opioid system, COMT, Cannabinoid system, Dopamine, DAT, Cam kinase, MAP kinase, PI-3 kinase, PKA, PKC, Acetylcholine, Norepinephrine, Strathmin, Pkap, TRBC5</td>
<td>NMDAR, Glutamate, Dopamine, Serotonin, BDNF, GABA, Cortisol/ Corticosterone, Endogenous cannabinoids, orexin, NPY, CRF family, FGF2, Oxytocin, Vasopressin, CCK, Neuropeptide S, Neurosteroids</td>
<td>Neurons, Glia, Pyramidal cells, GABAergic cells</td>
<td>Central Nucleus, BasAmyg, LatAmyg, vPAG, dPAG, v-hippocampus (post), d-hippocampus (ant), latPFC/insula, vmPFC (il), dmPFC (pi), OFC, Hypothalamus, dorsal ACC, rostral/vent ACC, ICMs, Medial Amyg, PAG, RPVM, Pons, autonomic nervous system, insular cortex, LC</td>
<td>Fear Potentiated Startle, Context Startle, Skin Conductance, Heart Rate, EMG, BP, Eye Tracking, Response accuracy, facial EMG, Respiration, pupillometry</td>
<td>Freezing, Response time, Avoidance, Response inhibition, Open field, Social approach, Analgesia, approach (early development), Risk assessment, Facial expressions</td>
<td>Fear survey schedule, BAI, STAI, SUDS, Fear Questionnaire, Trait Fear Inventory, Ellam Ethogram, Structured Diagnostic and Assessment scales, Albany Panic &amp; Phobia</td>
<td>Fear conditioning, viewing aversive pictures or films, emotional imagery</td>
</tr>
</tbody>
</table>

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HCP = Human Connectome Project - in 2010
NIH awarded grants to two consortia:
- “WU-Minn” consisting of Washington University, University of Minnesota, and Oxford University.
  These programs were provided with 3.0 Tesla “high definition” magnetic resonance imagers.
- Both programs have been gathering data on relatively healthy individuals, excluding severe psychiatric, neurological, endocrine or cardiovascular disease.
National Geographic features the Human Connectome Project

01-21-2014

New research from members of our HCP team suggests that brain circuitry is organized more like Manhattan’s street grid than London’s chaotic tangle of random roadways. Read the full article in the February 2014 issue of National Geographic.
This is all pretty new, but perhaps an improved level of understanding of the networks involved could prompt the development of assessment strategies and methodologies that could be used to objectify the issues.
The cross-linkage between Research Domain Criteria project and the Human Connectome Project may suggest new methodologies of assessment.
Table 1
Cross-linkage between Research Domains Criteria Project (RDoC) and Human Connectome Project (HCP) measures

<table>
<thead>
<tr>
<th>RDoC domains</th>
<th>RDoC constructs</th>
<th>HCP fMRI tasks overlapping with RDoC</th>
<th>Additional HCP measures related to RDoC constructs</th>
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<tbody>
<tr>
<td>Cognitive systems</td>
<td>Attention</td>
<td>Posner task variant</td>
<td>NT List Sorting&lt;sup&gt;a&lt;/sup&gt;</td>
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<tr>
<td></td>
<td>Working memory</td>
<td>N-back task</td>
<td>NT Dimensional Change Card Sort</td>
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<td>Cognitive (effortful) control</td>
<td>Category specific representation task</td>
<td>NT Flanker Task</td>
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<td>Declarative memory</td>
<td>Relations between features vs. matching</td>
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<td>Language behavior</td>
<td>Episodic retrieval task</td>
<td>Penn Word Memory Test</td>
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<tr>
<td></td>
<td>Perception</td>
<td>Sentence presentation; story presentation tasks</td>
<td>NT Picture Sequence Memory</td>
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<td>Retinotopic mapping</td>
<td>NT Picture Vocabulary</td>
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<td>NT Oral Reading Recognition</td>
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<td>Visual measures</td>
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<td>Variable Short Penn Line Orientation Test</td>
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<td>NT Words in Noise (Audition)</td>
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<td>NT Odor Identification Task (Olfaction)</td>
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<td></td>
<td>NT Taste Intensity Test (Taste)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>NT Pain Intensity and Interference Surveys</td>
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</tbody>
</table>
Clearly neuropsychology is on the verge of a paradigm shift.

The next decade should greatly increase our knowledge of ADHD and other things.

Stay tuned for the updates from AZNS!

Thanks for your attention.
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THANK YOU!