Chapter 27
Neuropsychological Assessment of Adult Attention Deficit/Hyperactivity Disorder

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Introduction

Attention-deficit/hyperactivity disorder (AD/HD) is a developmental brain disorder that is marked by persistent inattention and/or hyperactivity/impulsivity that interferes with daily functioning. It is normal for everyone to have some distractibility and impulsivity, but for children and adults with this disorder, these symptoms are more pervasive and interfere with their ability to function at school, home, and work. Children and adults with this disorder can be forgetful in their daily activities, have difficulty concentrating or sustaining their attention on a task, struggle to sit still for longer periods of time, feel constantly restless or as if driven by a motor, or talk nonstop. A full description of the scope of these symptoms is outlined in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) [1]. AD/HD is a heterogeneous disorder with three subtypes: predominantly inattentive, predominantly hyperactive/impulsive, and combined subtype. The prevalence of AD/HD in childhood in the United States is estimated at 5% [1], and prospective longitudinal studies have demonstrated that AD/HD persists into adulthood with an estimated prevalence of approximately 3.3–5.3% [2], though estimates vary widely depending on the variables and methods used [3–6]. Although the exact cause of AD/HD is unknown, vast epidemiological, neuroscience, cognitive, genetic, and psychiatric research has described various aspects of the disorder [1, 2, 7, 8]. Despite this, the diagnosis of AD/HD remains tricky due to the high comorbidity and/or overlap of symptoms with other psychiatric, developmental,

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and medical disorders [9]. The following case highlights a typical case presented in a primary care clinic in which a neuropsychological evaluation was requested to assist with diagnostic clarity.

Referral

Patient: 21-year-old female
Education: high school degree
Occupation: bartender at a restaurant

Reason for Referral

Ana was struggling with inattention, disorganization, and forgetfulness in the context of ongoing anxiety and depression. She recently withdrew from her first semester at a community college because she felt overwhelmed by her course load and her grades were slipping. Ana's psychological distress appeared to be related to and exacerbated by her ongoing cognitive complaints. Neuropsychological testing was deemed helpful for diagnostic clarity, identification of cognitive strengths and weaknesses, and offering diagnostic clarification around current emotional and cognitive functioning.

Case Presentation
Ana described chronic problems with disorganization, procrastination, forgetfulness, and following through with tasks dating back to childhood in Argentina and persisting as an adult. She explained that she misplaces her parking stub at work almost every day and added that she tends to run back and forth from her house to her car in the morning to collect important items she inadvertently leaves behind. Overall, she is independent with activities of daily living and most instrumental activities of daily living but not without a great deal of effort. She described using multiple compensatory strategies to assist her with attention and organization in daily life. She maintains a desk calendar with sticky note reminders for her doctor appointments and financial obligations so that she is able to pay bills on time. However, she routinely forgets to take her medication as prescribed and estimated that she misses a dose three times per week on average. With household chores, she reported that she is "scatterbrained" but gets them done weekly as a way to help her mother around the house.

Ana's medical history was significant for asthma, which was diagnosed approximately 6 months ago after she experienced respiratory distress, for which she was being prescribed albuterol. She reported prior nightly marijuana use but stated she discontinued after she was diagnosed with asthma. She estimated 9–10 h of sleep per night but noted she feels better when she gets 11–12 h. Her family history is

negative for AD/HD or learning disorders, though admittedly her family has never sought prior treatment.

In terms of psychiatric history, Ana reported a history of anxiety and episodic depression and had been witness to domestic violence between her parents as a child. She explained she always had a tendency to worry but that her anxiety and depressive symptoms peaked in high school. She described a second episode of depression 2 years prior in the context of academic and work demands. At that time, she quit her job and neglected her self-care, spent days in bed, and isolated from others. She had a first panic attack at that time and had approximately five panic attacks since then with the most recent occurring the week prior to her testing appointment. Her panic symptoms were characterized by increased heart rate, sweating, shaking, chest pain, dizziness, and tingling. These symptoms reportedly peaked within 6–7 minutes of onset. She recently began psychotherapy for anxiety and panic episodes. She was being treated with fluoxetine, 20 mg, which was prescribed 1 year prior only with modest benefit. She was previously tried on two different SSRIs (citalopram and sertraline) but with no benefit.

MD Perspective

Key Point
There is a high rate of overlap among AD/HD and mood disorders. The National Comorbidity Survey estimated that more than 80% of those who meet the DSM-4 criteria for AD/HD also met criteria for a mood disorder such as bipolar disorder or major depressive disorder [8].

As a primary care physician, it can be challenging to make a diagnosis of AD/HD, particularly in adulthood. AD/HD generally presents with symptoms of inattention and/or trouble with concentration. These symptoms, however, are common in other psychiatric disorders such as mood disorders. Therefore, making the right diagnosis can be complicated as there is so much overlap in symptomatology between AD/HD and mood disorders.

Ana presented initially with complaints of anxiety and had been a witness of domestic violence. It was unclear if the trouble with focus and concentration she was experiencing in school was related to a primary diagnosis of anxiety/depression or if she in fact had AD/HD or both.

In terms of medical history, she had a history of asthma, which sometimes can increase feelings of anxiety if asthma is poorly controlled. Her asthma was generally well controlled with albuterol and probably not a significant factor in her symptoms, but medical conditions should always be considered when evaluating a

psychiatric disorder. In addition, she was a marijuana user, which also affects concentration, attention, and mood [10–12], and it was important to determine how much of a contributor her drug use was to the clinical picture.

Key Point
Research suggests that AD/HD is associated with elevated substance use disorders [13–15]. Childhood AD/HD has been related to an increased odds of lifetime marijuana use, and one meta-analysis indicated that children with AD/HD were nearly three times more likely to have reported ever having used marijuana than children without AD/HD [16].

Ana reported some difficulty in school in childhood but had not been diagnosed with AD/HD in childhood. There remains some debate about how often AD/HD persists in adulthood. One meta-analysis estimates that about 50% of individuals with AD/HD in childhood have AD/HD that persists into adulthood [17, 18], but findings vary widely. Therefore, a diagnosis of AD/HD in childhood alone (or a suspicion of this as with Ana) is not enough to make this diagnosis in adulthood. Moreover, learning disorders may also co-occur with AD/HD, and these may present as problems with attention and concentration [1, 19]. Thus, evaluation for learning disorders becomes an important piece of the assessment.

When presented with these potential AD/HD cases, it is critical to make the right diagnosis/diagnoses so that the proper treatment (nonpharmacological or pharmacological) can be prescribed to the patient. This is of particular importance in the diagnosis of AD/HD as there are many important treatment considerations that must be taken into account. While there are various treatments, AD/HD is commonly treated with amphetamines, which are medications that can be abused. Approximately 3–10% of college-age students abuse amphetamines as they improve cognitive function even in those without any psychiatric disorder [20]. Not only do amphetamines carry a risk of abuse, but there is also some evidence in animal studies that they may cause neurotoxicity [20]. These medications can also exacerbate symptoms of anxiety, insomnia, and mania in patients with these conditions [20]. For these reasons, prescribing amphetamines cannot be taken lightly, and it is important to have a comprehensive understanding of the clinical picture before prescribing such medications.

In cases like Ana's, when there are multiple complicating factors, neuropsychological testing and assessment is critically important to decipher the relative contribution of the multiple psychiatric, developmental, and medical conditions to the clinical picture of possible AD/HD. Neuropsychological testing helps to tease out if the problems with concentration and attention are primarily related to an anxiety or mood disorder, a learning disorder, a substance use disorder, AD/HD, or a combination of these. Not only is neuropsychological evaluation a crucial part of the diagnostic process, it also provides guidance to patients for nonpharmacological interventions

to manage the symptoms. These interventions can be as important, if not more, as pharmacological interventions and have the benefit of less risk. The assessment of the neuropsychologist aids in determining any accommodations in the school setting that can promote student success. Neuropsychological testing provides valuable information to help guide patients and providers on the most appropriate treatments/interventions to maximize the AD/HD patient's ability to function at the highest level possible.

Key Point
An important element of a neuropsychological evaluation is the guidance provided to patients and their families for nonpharmacological interventions (behavioral management, cognitive remediation, academic accommodations) to manage the symptoms. These interventions can be as important, if not more important, as pharmacological interventions and have the benefit of less risk.

Referring to Neuropsychology

Despite a clear-cut history of attention difficulties since childhood, Ana also expressed learning difficulties as well as depression and anxiety beginning in childhood. Neuropsychological assessment was indicated to differentiate among AD/HD, a learning disorder, and depression and anxiety. It was also requested to help develop a treatment plan for Ana to improve her level of functioning at school and home.

The Role of Neuropsychology

Questions to be addressed by a neuropsychological assessment are as follows: Does this patient meet the criteria for AD/HD? What are her cognitive abilities? Are there any other comorbid psychiatric disorders or learning disorders?

Key Point
AD/HD and learning disorders can co-occur in a significant minority of children with each disorder, and comorbidity has been estimated to be 45% [19]. Individuals with specific learning disorder may appear inattentive due to frustration, low interest, or limited abilities [1]. According to the DSM-5, learning disorders reflect specific deficits with learning academic skills, while AD/HD poses a challenge in realizing academic abilities.

Neuropsychological Testing

Neuropsychological Perspective of Adult AD/HD

AD/HD is diagnostically challenging, particularly in adults. Because AD/HD is a neurodevelopmental disorder that first presents in childhood with symptom onset before age 12 [1], diagnosis in adulthood requires a thorough developmental history that integrates childhood and adult symptom profiles. A significant challenge in diagnosing adult AD/HD involves obtaining accurate accounts of AD/HD symptoms throughout the life span. Self-report of childhood symptoms in adulthood may be unreliable as a function of time [21]. Additionally, collateral information documenting childhood symptoms (e.g., school records, informant reports) may not be as readily available or accessible for adults [21].

Key Point
Because AD/HD is currently classified as a childhood-onset disorder, a thorough developmental history is essential for diagnostic clarification. Through interview and testing, patients are asked to describe their behaviors during childhood across contexts (at home, school, etc.) and fill out questionnaires describing current and historical symptoms, and when possible collateral information is gathered from caregivers and school transcripts.

Questions that may aid inquiry of childhood symptoms:

- What kind of student were you in elementary school?
- How did your kindergarten or first grade teachers describe you?
- Did you ever repeat a grade?
- Were you ever in a specialized classroom or did you work with a teacher's aid?
- Did you get sent to the principal's office? How often and for what?

Another challenge with diagnosis is the high level of comorbid psychiatric disorders with AD/HD. Approximately 50% of children and adults with AD/HD have a co-occurring psychiatric disorder [8, 22]. Nearly one-quarter of children have a co-occurring behavior disorder (e.g., conduct disorder or oppositional defiant disorder), and in adults, they commonly have co-occurring depression (38.3%), anxiety (47.1%), substance use disorders (15.2%), and impulse control disorders (19.6%; [8]). These psychiatric disorders can also cause attention and executive impairment. Medical conditions such as asthma, allergies, anemia, hypoglycemia, thyroid disorders, toxic exposure, vitamin deficiencies, and hearing or visual impairments can also disrupt attention [23]. Importantly, sleep disorders are also common among individuals with AD/HD [24] and well known to impair cognition, particularly attention, learning, and memory.

Key Point
Research has also shown evidence of a bidirectional relationship between AD/HD and sleep disturbances [25]. Sleep problems were part of the initial diagnostic criteria for AD/HD in DSM-3 [26]. The most common sleep disorder associated with AD/HD is initial insomnia or difficulty falling asleep [27]. For individuals with AD/HD, sleep problems may be intensified by anxiety and depression [28]. Introducing sleep hygiene strategies can be critical to improving concentration and treating AD/HD.

Thus, these co-occurring disorders can mask, mimic, or exacerbate AD/HD symptoms, thereby increasing the complexity of diagnosis and specialized knowledge of provider training. Therefore, it is not surprising that even though cognitive difficulties associated with AD/HD are often first reported in primary care settings [29], many adult primary care providers (48%) are uncomfortable diagnosing adult AD/HD [30, 31]. Consequently, they are more likely to defer to a specialist to assess AD/HD when compared to other disorders [32].

The Psychiatric Interview

A thorough history and establishment of presence of clinically significant AD/HD symptoms is the primary method of diagnosis, although neuropsychological testing can be used to support the diagnosis, rule in or out other causes, and develop a treatment plan that includes individualized cognitive remediation and/or indications for academic accommodations. Therefore, a detailed clinical interview was conducted with Ana, and school records were obtained for collateral input.

During the clinical interview, Ana acknowledged behavioral difficulties beginning in elementary school in Argentina. She recalled behavioral problems that resulted in her getting in trouble at school and at home (e.g., having constant problems completing her homework and disobedience). She was required to attend summer school in third and fourth grade and needed a tutor for homework help. Her difficulties persisted after she immigrated to the United States with her family in the fifth grade (10 years old). She was initially in ESL classes and then mainstreamed in middle school. She noted that learning English was easy. She reportedly earned Bs and Cs through middle school but would frequently stay after school for extra support. In high school, her grades were variable (As to Ds), though she mostly earned Bs and Cs. She reported that she began skipping classes and did not complete her assignments, in part because of disorganization and procrastination. Her teachers encouraged her to meet minimum requirements so that she could graduate. She graduated high school on time with a low GPA. Ana linked significant declines in her academic performance with the onset of anxiety and depression; this timeline

was corroborated by a review of her academic transcripts from high school. However, her struggles in more theory-oriented, writing classes raised the question of a possible undetected learning disorder, especially in the context of second-language learning. After taking off 1 year after high school, she enrolled at a local community college where she struggled academically and emotionally and withdrew during her second semester. At home, she was having difficulty keeping up with her chores and appointments.

Adult AD/HD is marked by ongoing symptoms of inattention, impulsivity, and/or hyperactivity, which significantly impair functioning across multiple settings, such as at home, school, or work; with friends or relatives; or in other activities. These symptoms may be exacerbated by external demands [30]. Therefore, it was critical to evaluate current functional impairment across domains in Ana's life. Based on presenting concerns, it was apparent that she was experiencing significant functional impairment at school and in her home life (e.g., medication noncompliance, difficulty keeping appointments). Notably, Ana denied major functional impairment at work though she trained herself to use multiple compensatory strategies (e.g., writing down all orders) in her job as a bartender. As a child, she struggled academically, notably even in Argentina, before immigrating and prior to onset of depression and anxiety. Taken together, this symptom history and review of her transcripts and the AD/HD questionnaires completed (see below) were consistent with AD/HD, combined type. The neuropsychological testing was further helpful in delineating the types of cognitive difficulties, performance validity, and assessing for a learning disorder.

Approach and Selection of Neuropsychological Test Battery

Neuropsychological tests are modestly reliable in diagnosing adults with AD/HD, though the absence of impairment on testing does not rule out behavioral impairment in daily functioning [33]. This is due, in part, to the significant symptom variability in adults with AD/HD [24]. However, adults with AD/HD have demonstrated difficulties on neuropsychological tests of activation (e.g., organization, prioritization, task initiation), attention (e.g., focused, sustained, and/or divided attention), alertness (e.g., regulating alertness, sustaining effort, processing speed), memory (e.g., working memory, recall), and/or action (e.g., monitoring and regulating self-action) [30].

While AD/HD has been consistently characterized by impaired executive functioning (planning, inhibitory control, organization), cognitive deficits are found on both executive and nonexecutive tasks, including verbal fluency, inhibition, set shifting, response consistency, word reading, and color naming [34]. In fact, at least some degree of impairment has been evidenced across all cognitive domains [35] when comparing adults with and without AD/HD. Though effect sizes vary by test, some of the most robust findings signal the utility of measuring complex and

sustained attention, verbal memory, and abstract verbal problem-solving that involves working memory [36].

In Ana's case, issues of bilingualism were also of consideration, especially in evaluating a learning disability. Patients who have English as a second language and/or are from a different culture have been shown to underperform on cognitive tests that are normed on English-speaking Americans [37]. Although there is significant research in the areas of acquisition of second language and impact of bilingual education on learning, there is scant research on how to evaluate the presence of a learning disability in a patient with English as a second language [33]. This is related to the fact that proficiency in a second language varies greatly as a function of age of acquisition and degree and years of exposure to the second language, to name a few variables. In Ana's case, she began to learn English at the age of 10 and completed more years of education in English than Spanish, making her a fluent conversational bilingual. She remarked that she considered English to be her current dominant language. Testing was therefore conducted in English. Academic testing in English was conducted to determine her level of proficiency in English and assist with a diagnosis of a learning disorder. It should be noted that because of the sequential nature of second-language learning (Ana learned Spanish first and then English), some performance variability of academic testing and neuropsychological testing was expected (Note: a thorough review of the effects of second language on neuropsychological testing is beyond the scope of this chapter; see [33, 38]).

As mentioned above, potential for secondary gain (e.g., academic accommodations, stimulant abuse) can result in symptom exaggeration or even fabrication. Sullivan et al. [39] found that 47% of college students evaluated for AD/HD did not pass performance validity tests (i.e., Word Memory Test), which are designed to detect a patient's level of effort and performance consistency. In another study, individuals feigning or exaggerating symptoms of AD/HD completed self-report questionnaires and neurocognitive testing in a manner that was difficult to distinguish from patients with AD/HD [40]. Self-report questionnaires are especially easy to feign; Jachimowicz and Geiselman [41] showed that 75–90% of college students successfully feigned AD/HD symptoms when directed to do so. As a result, performance validity tests are routinely administered in neuropsychological evaluations to ensure consistent effort throughout testing.

In order to assess Ana's current cognitive and emotional functioning, tests were selected:

- *Intelligence and premorbid functioning*: Wechsler Adult Intelligence Scale—Fourth Edition (WAIS-IV), Test of Premorbid Functioning from Advanced Clinical Solutions
- *Attention*: Digit Span from WAIS-IV; Conners' Continuous Performance Test—Third Edition
- *Executive functioning*: Trail Making Test, Verbal Fluency, and Color-Word Interference Test from the Delis-Kaplan Executive Functioning System

- *Memory*: California Verbal Memory Test—Second Edition; Logical Memory subtest from the Wechsler Memory Scale—Fourth Edition; Brief Visuospatial Memory Test—Revised
- *Visual-spatial abilities*: Rey-Osterrieth complex figure test
- *Performance validity*: Test of Memory Malingering, Advanced Clinical Solutions—Word Choice; Reliable Digit Span: Rey 15-Item
- *Academic achievement*: select subtests of Woodcock-Johnson Fourth Edition Tests of Achievement; Nelson-Denny Reading Test
- *Behavioral functioning*: Behavior Rating Inventory of Executive Function; *Barkley Adult ADHD Rating Scale-IV*
- *Mood functioning*: Beck Depression Inventory—Second Edition; Adult Manifest Anxiety Scale, Adult Version; Panic and Agoraphobia Scale; Panic Attack Questionnaire

Neuropsychological Domains and Test Findings (See Table 27.1)

Performance validity: Ana showed sufficient task engagement and performance consistency on neuropsychological testing for the results to be a valid representation of her current cognitive functioning.

Table 27.1 Neuropsychological test results

	Standard/scaled score	Percentile
Wechsler Adult Intelligence Scale—Fourth Edition		
Verbal Comprehension Index	80	9
Perceptual Reasoning Index	98	45
Working Memory Index	105	63
Processing Speed Index	94	34
Vocabulary	6	9
Similarities	5	5
Information	8	25
Block design	8	25
Matrix reason	11	63
Visual puzzles	10	50
Digit span	12	75
Arithmetic	10	50
Coding	10	50
Symbol search	8	25
Advanced Clinical Solutions		
Test of Premorbid Functioning	96	39
Conners' Continuous Performance Test Third Edition		
d'	48	42
Omissions	58	79

(continued)

Table 27.1 (continued)

	Standard/scaled score	Percentile
Commissions	37	10
Perseverations	59	82
Hit RT	90	>99
Hit RT SD error	75	99
Variability	60	84
Hit RT Block Chg	42	21
Hit RT ISI Chg	85	>99
Delis-Kaplan Executive Function System: Trail Making Test		
Visual scanning	9	37
Number sequencing	9	37
Letter sequencing	13	84
Number-letter sequencing	12	75
Number-letter sequencing errors	12	75
Delis-Kaplan Executive Function System: Verbal Fluency		
Letters	9	37
Category	11	63
Switching accuracy	16	98
Set-loss errors	13	84
Repetitions	8	25
Delis-Kaplan Executive Function System: Color-Word Interference		
Colors	7	16
Words	9	37
Inhibition	11	63
Switching	12	75
Inhibition errors	12	75
Switching errors	12	75
California Verbal Learning Test—Second Edition		
List A total (trials 1–5)	68	96
List A short-delay free recall	1	84
List A short-delay cued recall	1	84
List A long-delay free recall	1.5	93
List A long-delay cued recall	1	84
Wechsler Memory Scale—Fourth Edition		
Logical memory immediate recall	11	63
Logical memory delayed recall	10	50
Brief Visuospatial Memory Test—Revised		
Total recall (trials 1–3)	67	96
Delayed recall	59	82
Cued recall	–	>16
Rey-Osterrieth complex figure test		
Copy	–	11–16

(continued)

Table 27.1 (continued)

	Standard/scaled score	Percentile
Woodcock-Johnson Tests of Achievement—Fourth Edition		
Letter-word identification	97	42
Applied problems	116	85
Spelling	95	37
Passage comprehension	93	32
Calculation	99	47
Writing samples	109	73
Word attack	99	47
Oral reading	92	31
Sentence reading fluency	108	69
Math facts fluency	106	66
Sentence writing fluency	99	47
Nelson-Denny Reading Test		
Comprehension	206	49
Reading rate	188	28
Behavior Rating Inventory of Executive Function (BRIEF)		
Inhibition	80	>99
Shifting	73	99
Emotional control	78	>99
Self-monitoring	80	>99
Initiation	79	>99
Working memory	86	>99
Planning/organizing	89	>99
Task monitoring	72	99
Adult Manifest Anxiety Scale		
Worry	60	84
Physiological worry	71	98
Test	77	>99
Social concern/stress	62	88
Total anxiety	71	98
Raw		
Beck Depression Inventory	23	Significant
Barkley Adult ADHD Rating Scale		
Childhood inattention	5	Significant
Childhood hyperactivity	8	Significant
Current inattention	8	Significant
Current hyperactivity	9	Significant
Test of Memory Malingering		
Initial presentation	50	Pass
Second presentation	50	Pass
Advanced Clinical Solutions		
Word choice	50	Base rate: >25%

Premorbid Functioning and IQ. Ana performed within the average range on a measure of word reading, which is used to estimate baseline cognitive abilities. There is a strong association between word reading and IQ, and this relationship is relatively stable and uninfluenced by brain pathology [42].

Consistent with premorbid estimates, Ana obtained an overall IQ score in the low average to average range. For specific index scores, she earned average scores on indices of perceptual reasoning, processing speed, and working memory. She performed in the low average range on the Verbal Comprehension Index. Within this domain of verbal intelligence, she performed in the average to borderline range on subtests. Though she demonstrated average abilities with regard to crystallized information or school-based knowledge (information), she struggled more on a measure of verbal reasoning (similarities was borderline), and her vocabulary knowledge was low average. Even though she was fluently bilingual, Ana did not acquire English until she was approximately 10 years old, which likely affected her vocabulary knowledge. Overall, Ana's pattern of intellectual performances was intact across domains. She did not demonstrate significant deficits in areas of processing speed or basic attention that are sometimes observed in individuals with attention disorders.

Academic Achievement. Across measures of academic skills, Ana performed consistently in the average range compared to her grade-related American peers on tests of spelling, writing, reading, and mathematics. Significant disparity among academic skills is expected in individuals with learning difficulties as well as observed impairment in target areas. Given her performance on these tests, there was no evidence of a learning disorder. Moreover, these academic scores reflected well-developed skills in reading and writing in English, even with her later-onset bilingual status.

Attention and Executive Functioning. Ana's basic auditory attention (repeating numbers) and complex working memory (repeating numbers in backward order) were in the high average and superior range, respectively. In contrast, Ana's performance on measures of sustained visual attention was impaired, signaling difficulties with inattentiveness and vigilance. Further, self-report forms indicated concerns for both inattention and hyperactivity. Ana's performances on various executive functioning measures ranged from average to superior and did not suggest significant problems with mental flexibility, impulsivity, or inhibitory control. In contrast, Ana endorsed significant levels of executive dysfunction on a self-report measure (see Behavioral functioning section).

While Ana performed largely within the expected range across measures of attention and executive functioning, an isolated area of weakness was noted when tasks challenged her ability to sustain and focus her attentional resources. Qualitatively, Ana's observed impulsivity and distractibility during testing were consistent with the type of challenges often associated with AD/HD.

Memory and Learning. No deficits were noted across measures of verbal and visual memory. Ana's learning and retention of unstructured verbal information

(word list), structured verbal information (stories), and visual information (figures) were consistently strong with performances ranging from average to superior.

Visual Spatial Functioning: Ana's performance was low average when copying a complex geometric figure. Notably, she struggled to copy this figure in an organized and efficient fashion, suggestive of poor visual organization abilities.

Behavioral Functioning: On an executive function scale, Ana reported very significant challenges with all aspects of executive functioning. Specifically, she reported difficulty with initiation of tasks, working memory, planning and organization, task monitoring (e.g., making errors on tasks), and self-monitoring of behaviors. On an AD/HD self-report scale, she endorsed symptoms of both inattention and hyperactivity that met criteria for AD/HD both in childhood and in the past 6 months that met criteria for AD/HD combined type, reinforcing the diagnosis from the interview.

Mood Functioning: Ana rated her symptoms on anxiety and depression on broad-based rating scales. The results of self-report measures revealed clinically significant levels of anxiety and depression, including indecisiveness, agitation, irritability, disrupted sleep, pervasive worrying, test anxiety, as well as somatic and cognitive symptoms. These findings are consistent with Ana's clinical interview description: ongoing anxiety, depression symptoms, and the recent emergence of panic attacks. On the Panic Attack Questionnaire, she reported five panic attacks in the past year, with the last one being the prior week, lasting 6–7 minutes. Both anxiety and depression commonly co-occur with AD/HD. The pattern and severity of her reported symptoms were consistent with generalized anxiety disorder, panic disorder, and major depressive disorder (moderate, recurrent).

Diagnoses

F90.0 Attention-deficit/hyperactivity disorder (AD/HD), combined presentation
F33.1 Major depressive disorder, recurrent, moderate
F41.1 Generalized anxiety disorder
F41.0 Panic disorder

Collaborative Discussion

AD/HD in adults is a significantly impairing disorder that affects virtually every sphere of daily functioning (i.e., education, occupation, relationships, financial management) [2, 43]. One study at the University of Massachusetts showed that the areas most affected by AD/HD were education (worse in the hyperactive subtype), followed by home responsibilities and occupational functioning, and then, to a

lesser extent, relationships and social activities [2]. Adults with AD/HD have elevated risk for tobacco and drug use, antisocial behavior, and sleep problems [44]. Adults with hyperactive subtype especially are at higher risk for injury, have higher rates of nonsurgical hospitalizations and poisonings, and have lower rates of consistent exercising. Research has also revealed that these individuals have a greater risk of coronary heart disease [2, 45]. Therefore, neuropsychologists target not only acute symptoms of attention but also larger psychosocial disturbances. The following recommendations were made to Ana by the neuropsychologist (and primary care physician for some of the recommendations) in a feedback session.

1. *Psychopharmacological Treatment for AD/HD*: Psychostimulant medication is the most effective pharmacologic treatment for adults with AD/HD with response rates ranging from 25% to 78% [46, 47]. The factors predicting the wide response rate include stimulant dosage levels, presence of co-occurring mood disorders, and the various methods of measuring response rates.

   In the current case, Ana had suffered recent panic attacks, so even though prescription of a stimulant medication was recommended, the potential for increased panic attacks needed to be taken into consideration. The primary care physician directed Ana continue to take fluoxetine, 20 mg, for depression and panic in addition to the psychostimulant.
2. *Psychotherapy*: Given Ana's ongoing symptoms of anxiety and depression, she was encouraged to continue in psychotherapy to treat these conditions. Psychotherapy would help her feel better emotionally, but as her mood and anxiety improved, her attention was predicted to improve as well [48].
3. *Sleep Hygiene*: It was recommended that Ana follow up with prescription for continuous positive airway pressure. Sleep helps replenish memory and maintain optimal cognitive functioning, as well as enhancing overall well-being [49]. Therefore, it was important for Ana to develop reliable sleep hygiene as a self-care habit. She was educated on sleep hygiene at neuropsychology feedback (provided with a sleep hygiene handout as well) and was encouraged to make behavioral changes to improve the quality and duration of her sleep.
4. *Substance Use*: Ana was encouraged to continue to abstain from marijuana use. Ongoing use can negatively impact attention, processing speed, as well as anxiety and depressive symptoms [10–12, 50].
5. *Exercise*: Research shows that regular aerobic exercise helps improve attention by activating the part of the brain that controls focus, concentration, organization, and planning [51, 52]. Ana was encouraged to engage in aerobic exercise.
6. *Self-Care*: Maintaining physical and cognitive health through consistent self-care including a well-balanced diet, adequate regular sleep where possible, and regular physical activity (if not medically contraindicated) was strongly recommended. These behaviors are also well known to reduce mood and attention symptoms [49, 53, 54]. Ana was advised to focus on the holistic nature of treatment, emphasizing her self-care and lowering stress.

7. *AD/HD Coaching*: Ana was recommended to work with an AD/HD coach to develop specific compensatory strategies for her school or workplace and home life.

Academic

1. *Academic Accommodations*

   Accommodations, especially testing accommodations, have become increasingly prevalent, in part from an effort to provide persons with disabilities the ability to demonstrate their skills and compete fairly with nondisabled persons. However, there is not always a consistent metric of application of accommodations provided to individuals with disabilities, and greater research-based practice is needed to determine which accommodations are helpful and improve functional/academic outcomes [55]. Accommodations can be recommended for both work and educational settings. Academic accommodations, specifically, can be classified into several domains [56]: (1) setting accommodations which includes taking a test in a separate location from other students, (2) presentation accommodations for test instructions or test questions using a different communication medium (e.g., audio versus written), (3) scheduling accommodations such as taking a test at a different time of the day, (4) timing accommodations such as being provided with addition time or additional break, and (5) response accommodations such as responding to test items using alternative means (e.g., a scribe) (Table 27.1).

   There is not much formal research outcome efficacy of test accommodations for AD/HD, though evaluators typically make recommendations based on the patient's/student's cognitive symptom profile. Based upon Ana's diagnosis of AD/HD, her symptom and cognitive profile, the following academic accommodations were recommended:

   (a) Taking extra breaks during in-class exams and tests as well as standardized tests
   (b) Testing in a separate classroom, which offers a distraction-free environment
   (c) Permission to stand in the back of academic lectures or classes as needed to minimize fidgetiness
   (d) Permission to take notes standing up during academic lectures or classes as needed

2. *Study/Homework Strategies*

   Ana was also provided with cognitive strategies to assist with studying and homework based on her neurocognitive profile:

   (a) She was instructed to take frequent, short breaks while studying. Breaks typically need only be 1 or 2 minutes in duration. Noting when attention begins to diminish will help determine the optimal time for a break.

(b) Break down assignments into smaller steps or chunks.
(c) Schedule regular, consistent homework/study time into your day with firm start and end times.
(d) Use active, engaging study strategies such as note-taking or highlighting main points while reading, using electronic media (audio books, books on iPad), joining a study group, or explaining concepts to peers.

Chapter Review Questions

1. True/False: Because many individuals present for the first time with complaints of inattention and disorganization in adulthood, the DSM-5 recognizes AD/HD may have an adult onset.
2. True/False: There are three subtypes of AD/HD.
3. True/False: AD/HD causes sleep disturbance.
4. True/False: AD/HD is associated with elevated rates of substance abuse including marijuana use.
5. Which is the primary method of diagnosing AD/HD symptoms in adults?
   A. Neuropsychological testing.
   B. Review of academic transcripts.
   C. Clinical interview.
   D. Self-report measures.
6. Which of the following treatments are recommended for individuals diagnosed with AD/HD?
   A. Stimulant medications.
   B. Physical exercise.
   C. Sleep hygiene.
   D. All of the above.

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