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# ATTENTION DEFICIT/ HYPERACTIVITY DISORDER: CONCEPTUALIZATION FROM THE FIRST DESCRIPTIONS TO THE 5TH EDITION OF DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDER

## Abstract

**Introduction:**Attention deficit/hyperactivity disorder (ADHD) is the most common neurodevelopmental disorder that is found in approximately 5% of the school – age population worldwide [56]. From the first description of the ADHD like behaviors in 1775, [15] conceptualizations of the disorder have evolved greatly over time, reflecting the developments on different field of research.

**Objective:** The aim of this paper is to describe briefly the evolution of the concept of ADHD focusing on today conceptualization of the disorder from the perspective of the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5) [7].

**Method:** Review of scientific articles (written in English language) from MEDLINE, PSYCHINFO, for the period 1900 – 2018.

**Results:** Overall, the clinical descriptions have remained remarkably consistent in their essential features over the past century and longer. Research employing factor analysis has repeatedly identified two distinct yet substantially correlated behavioral dimensions underlying the various behavioral symptoms thought to characterize ADHD demonstrating stability over time [72]. Instability of subtypes of DSM-IV, along with shortcomings identified for developmentally

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appropriate presentation and symptom cut-off, age of diagnosis and demonstrated impairment fueled the refinement of diagnostic criteria for ADHD in DSM-5.

**Conclusion:** The DSM-5 diagnostic criteria represent the best consensus of experts in the field. Nevertheless, the criteria have not escaped controversy and are not without limitations. Research must focus at identifying more heterogeneous traits of the disorder.

**Key Words**: ADHD, diagnostic criteria, DSM, hyperactivity/impulsivity, inattention,

## FROM THE FIRST DESCRIPTIONS TO CLASSIFICATION SYSTEMS

ADHD has a long and somewhat controversial history [10, 68]. Although ADHD is not a new clinical phenomenon, however, it is a relatively new diagnostic label to describe individuals who display developmentally inappropriate levels of inattention, impulsivity, and/or hyperactivity.

Recently, the first description and publication of ADHD-like behaviors is credited to Melchior Adam Weikard, a prominent German physician. In 1775, Weikard, published the textbook " Der Philosophische Arzt". Weikard's text contained a brief chapter on attention disorders, possibly the first ever such description in medical literature [15]. He described many of the symptoms now associated with the inattentive dimension of ADHD in the Diagnostic and Statistical Manual of Mental Disorders.

On 1798, another physician, Sir Alexander Crichton, described a mental state much like the inattentive subtype of ADHD, in his book *An Inquiry into the Nature and Origin of Mental Derangement.* He wrote about "morbid alterations of attention" characterized by extreme mental restlessness and distraction. He described one feature of this condition as *"the incapacity of attending with a necessary degree of constancy to any one object,"* which certainly sounds familiar as one of the diagnostic indicators of ADHD. He also wrote of an extreme state of reactivity to stimuli such as barking dogs or other sudden noises, a restlessness that patients with the condition called *"the fidgets"* [27, 28]. Nevertheless, the first scientific papers about what we today know as ADHD were published in a series of three lectures (Still, 1902). In March 1902, Sir George Frederic Still (1868–1941), delivered a series of lectures under the name "Goulstonian Lectures, Some Abnormal Psychical Conditions in children" before the Royal College of Physicians of London on March 4th, 6th, and 11th, 1902. He described 23 children who had serious problems with sustained attention and self-regulation, who were often aggressive, defiant, and

resistant to discipline, excessively emotional or passionate, which showed little inhibitory volition, and could not learn from the consequences of their actions, though their intellect was normal [64].

Still's lectures set the foundation for further researches in the area of attentional difficulties. Although the inclusion of inattentive, hyperactive, and impulsive symptoms has been relatively constant across clinical and scientific descriptions of the disorder over time, conceptualizations have evolved considerably fueled by the findings of different fields of research and different terms are being used to describe the disorder, such as, "minimal brain damage, minimal brain dysfunction, hyperkinetic reaction of childhood, attention deficit disorder and the ADHD that we know today". Concomitantly, efforts have been made to universally agree upon a set of criteria for diagnosing ADHD. What is now called Attention-Deficit/Hyperactivity Disorder (ADHD) first appeared in the second edition of the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders in 1968 termed "Hyperkinetic Reaction of Childhood", [3].

It is important to note that in those early definitions, the syndrome that was studied included a broad set of problems, often including learning problems, motor and coordination problems, and even sleep problems. By the early 1960s, the syndrome in use had become too over inclusive to enable effective diagnosis, treatment, or research approaches [25]. Early descriptions of ADHD mostly were focusing on hyperactivity as the core feature of the disorder, although difficulties with sustained attention were also included. It was only until the laboratory studies from Virginia Douglas in the late 1960s and 1970s that the importance of deficits in sustained attention and impulse control in descriptions of the syndrome came into focus [29] and decisions were made to identify a core element of ADHD and to break off the learning and motor disorders into separate categories. Influenced largely by this research, deficits in sustained attention rather than overactivity came to be viewed as central to the disorder by the early 1980s and the disorder was renamed Attention Deficit Disorder (ADD) in DSM-III [4], while hyperactivity was a specifying feature of the ADD with or without hyperactivity. With the development of more refined research criteria and measuring instruments, the criteria for defining the disorder were modified in the DSM-IIIR [5] where ADD became ADHD and was classified with two other behavioral disorders under the category of disruptive behavior disorders. With the publication of the *DSM- IV* [6], the term ADHD was retained and to reduce the heterogeneity of the disorder three subtypes of attention-deficit/hyperactivity disorder (ADHD) based on numbers of symptoms of inattention (I) and hyperactivity-impulsivity (HI) were defined, although these

subtypes proved to be highly unstable over time [72]. Because of shortcomings of the DSM-IV diagnostic system, such as poor subtype stability [45, 72], developmentally insensitive criteria [18], and poor performance of the age-of onset criteria [11] a series of research modified diagnostic criteria for ADHD were included in the fifth edition of The Diagnostic and Statistical Manual of Mental Disorders, DSM-5 [7] clearly reflecting the efforts to more accurately and precisely diagnose the disorder. Nevertheless, debate still exists about the best classification system and subtyping of the disorder with authors calling for necessary revisions to improve ADHD as a diagnostic category [61]. In the following paragraphs we will discuss the DSM-5 category of ADHD under the perspective of it's diagnostic criteria.

## DEFINITION OF ADHD IN DSM-5

### Symptoms of ADHD

In the fifth edition of Diagnostic and Statistical of Mental Disorders, DSM-5 [7], differently from DSM-IV, where ADHD was included under the category of disruptive behavior disorders, ADHD is included on the category of neurodevelopment disorders reflecting its nature as a disorder of brain development. In fact, the overarching category of Disruptive Behavior Disorders, which included ADHD in DSM-IV, was misleading because there was no reliable evidence suggesting that the inattentive subtype represented a disruptive disorder. Instead, children with this subtype are often characterized as being hypoactive, shy, and withdrawn. The essential feature of attention-deficit/hyperactivity disorder (ADHD) is a persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development [7]. Available data overwhelmingly support the concurrent, predictive, and discriminant validity of the distinction between inattention and hyperactivity-impulsivity symptoms, and factor analysis of the items has demonstrated stability over time [44, 72]. Because of the stability of symptom dimensions, the same 18 diagnostic symptoms of ADHD in DSM-IV were retained in DSM-5 and were clustered in the same symptom domains that best describe the core deficits on ADHD specifically, inattention and hyperactivity/impulsivity. The symptoms of *inattention* include primary inattention (e.g., attention to details, sustained attention, distraction) as well as secondary inattention, or things that happen as the result of not paying attention. These include listening skills, task completion, organization, sustained mental effort, losing items, and forgetfulness. The symptoms of *hyperactivity and impulsivity* are combined into one category, as they have been found to represent a single dimension, can be difficult to

distinguish from one another, and typically co-occur. Symptoms include motor presentations (e.g., fidgets/squirms, leaves seat, runs/climbs or subjective feelings of restlessness, often "on-the-go") as well as verbal presentations (e.g., talks excessively, blurts out answers). Some symptoms can be expressed motorically and verbally, such as "difficulty waiting turn," "difficulty being quiet," and "interrupts/intrudes." However, because the presentation of ADHD changes with development, and because certain symptoms are impacted by changing demands (e.g., formal school entry), the application of a single list of symptoms to all ages has raised concern [24, 32], highlighting just how critical it is that symptoms be developmentally appropriate and empirically informed. In fact one study found changes in endorsement patterns over time for each of the 18 DSM-IV, with several symptoms, particularly those of inattention, were infrequently endorsed and of apparently limited diagnostic utility at ages 4-5; hyperactive/ impulsive symptoms were more frequently endorsed among young children with ADHD than were inattentive symptoms. However, by ages 6-7, inattention items were somewhat superior at discriminating ADHD from Non-ADHD children [39]. To address these issues, differently from DSM-IV, most symptoms are illustrated by examples of how each might be observed at different ages, offering developmentally appropriate presentations at different ages. Actually, the DSM-5 wording changes might influence the ADHD symptoms endorsement pattern by increasing symptom identification [62]. While for children and adolescents 16 years and younger the presence of at least six symptomatic criteria [44] from a category must be demonstrated, people 17 years and older require five or more symptoms. This is a change from the DSM-IVTR, which applied the same symptom count requirement across all ages. The decision to require fewer symptoms for older adolescents and adults than for children was reached after reviewing studies that found adults with an established history of childhood ADHD often present with fewer symptoms in adulthood although impairment persists [19, 20, 34, 67]. Matte et al. (2015), examined the reliability and validity of proposed DSM-V symptoms in a sample of adult ADHD individuals and found that fewer symptoms than the six-of-nine threshold required by DSM-IV provided the best cutoff point for identifying adults who are impaired [49]. Additionally, a study that examined the prevalence of adults meeting the revised DSM-5 symptoms cutoff for ADHD as compared to the previous DSM-IV symptoms cutoff, found a significant increase (65%) in the number of participants meeting the new cutoff as compared to the old DSM-IV symptoms cutoff, suggesting that using the new criteria may identify more adults with ADHD and fewer diagnoses will be missed [58]. However, some authors suggest that ADHD symptoms are best characterized along three

dimensions where hyperactivity and impulsivity are separate, demonstrating unique clinical presentations of inattention, hyperactivity, and impulsivity and might offer better predicting behavioral outcomes in children with ADHD [54].

## Subtypes or Presentations?

ADHD is a greatly heterogeneous disorder with respect to clinical presentation, comorbidity, impairments, possible causal models, outcome and worldwide prevalence [42, 63, 71, 23, 59, 56]. Although ADHD, along with all other conditions in the DSM-5, is considered as a diagnostic category, there is a strong consensus that it, as well as many other childhood disorders, is best understood in dimensional rather than categorical terms where ADHD is considered the extreme of a dimension or dimensions of behavior that vary along a continuum with the behavior of typical children [2, 61, 35, 43, 48]. In fact the view of psychopathologies as representing dimensions of behavior or even typologies of these dimensions arises from the perspective of developmental psychopathology [1], consequently, the presentations of ADHD are best understood as representing a disorder whose symptoms vary in severity along two distinct, although highly related spectra or dimensions of inattention-disorganization and hyperactivity-impulsivity [2, 53]. Because of this great heterogeneity efforts have been made to identify more homogeneous subtypes of ADHD to facilitate searches for causal factors, identify potential differences in long-term outcome, and, most important, aid in treatment planning (Barkley, 2006; Jensen et al., 1997; Willcutt et al., 2012). Studies that evaluated the stability of ADHD subtypes over time, concluded that developmental trajectories of symptoms is highly different with the symptoms of hyperactivity declining over time suggesting weak stability of Hyperactiviy Type (HT), with children shifting from HT to Combine Type (CT) [45, 47, 72]. In addition to the unpredictable shifts between subtypes exhibited by some individuals with ADHD, longitudinal studies suggest that a subset of individuals shift systematically from ADHD-C to ADHD-I across development [47]. As a reaction to the instability of the DSM-IV ADHD subtypes, these were replaced with presentation specifiers in the DSM-5, corresponding directly to the prior subtypes. Thus if a child "often" has at least six of the inattention symptoms, the *Predominantly Inattentive presentation* may be considered. Likewise, if he "often" has at least six of the hyperactivity and impulsivity symptoms, the *Predominantly Hyperactive/Impulsive presentation*, may be appropriate. If he is eligible for both of these categories, the C*ombined presentation* should be considered. People 17 years and older only require five symptoms from a category to meet symptomatic criteria for DSM-V ADHD.

## Persistence of the Symptoms

Beside the requirement of a specific number of the symptoms, "persistence" of them for at least six month is another requirement. In fact, the ADHD symptoms ebb and flow across days, weeks, and months, showing changes when schoolwork gets harder or easier, when tasks are routine or novel, and when an individual is stressed or relaxed. Symptoms of ADHD typically fluctuate across various settings and caregivers [14, 73]. Thus, some factors that determine the variation of symptoms have been delineated, for example the degree of environmental demands for restricted behavior. In free play or low demand setting, children with ADHD are less distinguishable from typical children [14]. These children appear more compliant and less disruptive with their fathers than with their mothers [66], and are rated as manifesting lower levels of symptoms by their fathers than by their mothers [31].

Children with ADHD perform better and display fewer behavioral problems in novel settings or tasks, but once they become familiar with the setting the level of deviant behavior increases [12, 73]. Some consider variability in performance across time and contexts to be the essence of ADHD [22]. In consistence with the above findings the DSM-V delineates that: "Typically, symptoms vary depending on context within a given setting. Signs of the disorder may be minimal or absent when the individual is receiving frequent rewards for appropriate behavior, is under close supervision, is in a novel setting, is engaged in especially interesting activities, has consistent external stimulation (e.g., via electronic screens), or is interacting in one-on-one situations (e.g., the clinician's office)", [7] thus recognizing that symptom expression can change in response to many factors, including environmental features.

## Age of onset

The DSM-V states clearly, "ADHD begins in childhood" [7] and requires evidence of several ADHD symptoms prior to 12 years of age. Although there is no defined age when the first symptoms of ADHD begin to show, research offers data that symptoms of ADHD start to display in a very little age [32, 65]. Many parents first observe excessive motor activity when the child is a toddler, but symptoms are difficult to distinguish from highly variable normative behaviors before age 4 years. Although issues such as the rapidly developmental changing between age 2 and 6 weakens the ADHD diagnosis among preschool children [46], the validity of a diagnosis of ADHD in pre-school children has increased over the years; these present with the same symptom structure,

similar neuropsychological deficits, associated impairment, co-morbidity and developmental risk [36]. ADHD is most often identified during elementary school years, when inattention becomes more prominent and impairing [7]. Additionally, retrospective accounts of age of onset tend to report a later age than current observation [16, 50, 69]. Prospective studies suggest that nearly all persons identified with ADHD over the lifespan could have been identified by age 12 to 14 on the basis of the symptoms they showed at that time [41]. On the other side results from a prospective birth cohort suggested that adults who are able to report symptom onset by age 12 also had symptoms by age 7, even if they are not able to report them. The data suggested that the prevalence estimate, correlates and risk factors of ADHD will not be affected if the new diagnostic scheme extends the age-of-onset criterion to age 12 [57]. Based on these findings, the DSM Committee proposed raising the age threshold from 7 to 12 years of age which would then allow older children to meet the diagnostic criteria for ADHD, even if symptoms did not first appear until approximately age 11. The strong support for the adoption of this revision was based on the premise that many more individuals could actually meet diagnostic criteria for ADHD. In the past, these individuals would have been denied diagnosis and presumably the necessary treatment to remediate their various behavioral, social, and learning problems [11, 41]. Research has found no clinically significant differences in outcome, treatment response, course, or severity for "early onset" versus "late onset" [34, 57]. Additionally, another study evaluating the impact of age extension in prevalence rates of ADHD in a nationally representative sample of U.S. found that the extension of the age-of-onset criterion from 7 to 12 years led to an increase in the prevalence rate of ADHD from 7.38% (*DSM-IV*) to 10.84% (*DSM-5*), supporting the validity of the *DSM-5* extension of the age-of-onset criterion in ADHD [70]. Nevertheless, studies aggregating prospective assessments and retrospective reports are needed to address the utility and validity of the new age-of-onset criterion [55].

## Pervasivity of Symptoms

In the DSM-IV-TR criteria for ADHD, to ensure the pervasiveness of the symptoms: "Some impairment from the symptoms must be present in two or more settings (e.g., at school [or work] and at home)". Authors argued that this means of determining pervasiveness might confound the source of information (parent vs. teacher) with the settings across which one is attempting to determine pervasiveness [51]. The DSM-5 requires that the symptoms are pervasive and that 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), so strengthening the cross-situational requirement.

## Impairment

The DSM-5 criteria for ADHD mention impairment in several places. Criterion A begins with a statement that the symptoms must interfere with functioning or development. Each category (i.e., inattentive, hyperactive/impulsive) requires that the symptoms must "negatively impact directly on social and academic/occupational activities" [7], (pp. 59–60). Criterion D states, "There is clear evidence that the symptoms interfere with, or reduce the quality of, social, academic, or occupational functioning" (p. 60). In other words, there is impairment if a symptom negatively impacts or limits a person's activities or development. Barkley and colleagues (2006) distinguished between symptoms and impairment by defining the former as "the behavioral expressions associated with the disorder" and the latter as "the consequences that ensue for the individual as a result of these behaviors" [17].

Several investigators [9, 21, 26] have found that a significant percentage of children that meet diagnostic criteria for psychiatric disorders do not display clinically significant impairment and conversely, other investigators [Angold et al., 1999] have found that some children with subthreshold symptomatology may be just as clinically impaired as those whose symptoms met full criteria for a diagnosis suggesting that they should be regarded as suffering from a psychiatric disorder. Childhood ADHD is associated most frequently with impairments in three primary areas: peer, family, and academic functioning. Additionally, the presence of an impairment criterion affects prevalence rates for disorders. Gordon and colleagues [37] found modest associations between symptoms and impairment, suggesting that not only are symptoms and impairment not identical, but also that it is entirely possible to have a level of functional impairment very different from that "expected" from one's clinical presentation. However measuring impairment is difficult. Some measuring instruments have proved to be useful at measuring impairment [21, 33, 40].

## Conclusion

Difficulties with attention, impulse control or motor activity are part of normal human development. Some behavior traits such as short attention span, poor inhibition or increased motor activity are normal behaviors in little children, and vary along a continuum, and also have different developmental

trajectories. When one evaluates for the presence of ADHD must aim at identifying the extremes of this continuum and must ascertain that the behaviors are inconsistent with the development level of the individual being assessed. On the other side, only the presence of six or more symptoms does not qualify someone for the ADHD diagnosis. Some other conditions must be met such as the presence of several symptoms before age 12 years and for more than six months, and impairment and functioning difficulties must be demonstrated in at least 2 areas of functioning.

## SUMMARY

ADHD is not e new condition. It is one of the disorders that have provoked a lot of debate and controversies with respect to its validity as a diagnosis. Despite modifications on the conceptualization of the disorder over time, the clinical descriptions have remained remarkably consistent in their essential features over the past century and longer. This constellation of behavior problems may constitute one of the most well-studied childhood disorders of our time. Many laypeople are still struggling to accept the notion that the disorder may be a biologically rooted developmental disability or the result of a subtle brain injury, when nothing seems physically wrong. The DSM-5 diagnostic criteria represent the best consensus of experts in the field, although still have important limitations and have not escaped controversy. In fact, altering an established nosology may alter "patient's access to health care and educational services, confuse the use of diagnosis on the courts and undermine the cumulative nature of scientific research into mental disorders."[52] .

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