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Subtypes of Attention-Deficit/Hyperactivity Disorder (ADHD): Distinct or Related Disorders Across Measurement Levels?

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Abstract The aim of this literature review is to assess the current state of knowledge regarding differences and similarities between the inattentive (IA) and combined (C) subtypes of Attention-Deficit/Hyperactivity Disorder (ADHD) in order to detail challenges concerning further conceptualization, diagnostics, and treatment. The literature on ADHD-IA and ADHD-C was reviewed and contrasted across genetic, neuroanatomical, neurophysiological/neurochemical, neuro(psycho)logical, and clinical psychiatric measurement levels. It was found that the more fundamental the measurement level, the less unambiguous evidence is found for subtype differences. Only on the clinical psychiatric diagnostic level, do more or less clear-cut differences in cognitive, social, academic, and behavioural functioning emerge. In conclusion, fundamental research that compares ADHD-IA and ADHD-C is relatively rare. At this point, only irrefutable phenomenological evidence of subtype differences seems to be available, even in attention problems which are presumed to be identical. The question as to whether both subtypes should be considered as two independent disorders was not adequately resolved.

Keywords ADHD · Subtypes · Inattention · Measurement levels · Review

When a child of primary school age is admitted to healthcare with symptoms of inattention, hyperactivity, and/or impulsivity, Attention-Deficit/Hyperactivity Disorder (ADHD) will be considered by professionals either as a primary diagnosis or as a differential diagnosis. Three to five percent of all primary school children are diagnosed with ADHD [1]. According to the symptomatic phenomenology, children with ADHD are diagnosed into the

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predominantly inattentive type (ADHD-IA), the predominantly hyperactive/impulsive type (ADHD-HI), or the combined type (ADHD-C). There is evidence that apart from differences in phenomenology, these subtypes are distinguishable on several other parameters. These findings have made several researchers openly question whether ADHD-IA and ADHD-C are distinct and unrelated disorders that should be considered separately [2–6]. In this literature review, we will focus on the ADHD subtypes by raising the question of whether these subtypes also reveal fundamental differences in the (aetiological) core characteristics of the disorder in addition to the differential symptomatology. We aim to sharpen and update the debate by examining historical data, sociodemographic information, developmental context and research findings on ADHD subtypes arranged on genetic, neuroanatomical, neurophysiological/neurochemical, neuro(psycho)logical, and clinical psychiatric measurement levels.

History of ADHD and its Subtypes

What follows is a short historical survey of ADHD. This historical overview of the changing terminology of what is now called ADHD is essential for a number of reasons. First of all, it provides a clear description of how the emphasis on the core deficit of this disorder shifted from hyperactivity to attention problems. Secondly, it shows how the introduction of the subtypes has resulted in a heated scientific debate revolving around the existence of separate disorders rather than related subtypes.

The early names for this condition reflect the changing presumptions of its organic aetiology. Apart from some case reports in the 19th century, the first scientific attempt to label ADHD-like symptoms resulted in the term Postencephalitic Behaviour Disorder [7]. In the next decade, brainstem damage was believed to cause this condition, hence the name Organic Driveness [8]. Strauss and his colleagues [9, 10] pointed at a developmental delay caused by brain damage, resulting in the terms Brain-Injured Child Syndrome and Minimal Brain Damage Syndrome. Since many behaviour-disordered children failed to show organic damage, Clements and Peters [11] reasoned that although brain processes were involved in the occurrence of ADHD symptoms, this condition was primarily caused by a defective functioning of specific structures. This line of thought resulted in the term Minimal Brain Dysfunction.

After a period of aetiologically based descriptions of the symptoms of inattention, hyperactivity, and impulsivity, a shift occurred toward more symptom-based descriptions. The (short-lived) use of the terms Restlessness Syndrome [12], Hyperkinetic Impulse Disorder [13], Hyperkinetic Behaviour Syndrome [14] and Hyperactive Child Syndrome [15] indicates that hyperactivity, and to a lesser extent, impulsivity were perceived as the core problems of this condition. The introduction of child psychiatric disorders in the Diagnostic and Statistical Manual of Mental Disorders, Second Edition [16] was the radical start of describing the disorder in the way we currently know it. Table 1 provides an overview of the evolution of the DSM typology and criteria of ADHD. Quite remarkably, a completely new conceptualization with multidimensional approach made its way into the DSM-III [17]. A dysfunction in attention processes was thus perceived as the core deficit of ADHD whereas hyperactivity became a nonessential, concomitant symptom. Rather surprisingly, the next edition of the DSM, the DSM-III-R [18], returned to a one-dimensional conceptualization of ADHD; this seemed a step back since validity studies supported the multidimensional approach that was proposed in DSM-III [17] and later reintroduced in the DSM-IV [19, 20]. The publication of

Table 1 Nomenclature and diagnostic criteria of ADHD across DSM editions

DSM edition	Typology and subtyping	Evolution of criteria
DSM-II [18]	Hyperkinetic reaction of childhood (or adolescence)	Symptoms of hyperactivity and inattention Exclusionary conditions
DSM-III [19]	Attention Deficit Disorder • ADD with hyperactivity (ADD/H) • ADD without hyperactivity (ADD/noH) + ADD residual type (ADD/RT)	Symptoms of impulsivity Specific symptoms and symptom cut-off score Duration of symptoms Age of onset
DSM-III-R [20]	Attention-Deficit Hyperactivity Disorder (ADHD) + Undifferentiated Attention Deficit Disorder (UADD)	Developmental deviance
DSM-IV [21] DSM-IV-TR [1]	Attention-Deficit/Hyperactivity Disorder • ADHD predominantly inattentive type (ADHD/IA) • ADHD predominantly hyperactive/impulsive type (ADHD/HI) • ADHD combined type (ADHD/C) + ADHD in partial remission + ADHD not otherwise specified	Cross-situational pervasiveness Functional impairment

the current DSM-IV-TR [1] revealed no new conceptualization of, or criteria for, ADHD as compared to DSM-IV [19].

A next step in the evolution of subtyping concerned the further classification of items assessing attention problems. A factor-analytic study by Lahey and colleagues [21] revealed that clinician ratings of ADHD-diagnosed children yielded a three-factor solution comprised of a hyperactivity–impulsivity factor, an inattention–disorganization factor, and a sluggish (cognitive) tempo factor (SCT). Children with ADHD-IA seemed to score high on the latter factor since they are reported to be sluggish, slow, and hypoactive, and to daydream frequently. McBurnett, Pfiffner, and Frick [22] added the two SCT items that were already considered for inclusion in the DSM-IV by the DSM-IV Field Trials for Attention and Disruptive Behaviour Disorders [23, 24]: "daydreams a lot" and "often is sluggish or drowsy". Because of the poor negative predictive power for ADHD-IA, these items were eventually excluded from the DSM-IV selection. McBurnett et al. [21] found that the division of the inattention cluster in a DSM-IV inattention item pool minus forgetfulness and in SCT plus forgetfulness was only appropriate when children failed to score (clinically) on the DSM-IV items of hyperactivity/impulsivity, meaning when a homogeneous inattentive group was present. Moreover, only children with ADHD-IA loaded on the SCT factor, which clearly indicates that attention problems within the different ADHD subtypes cannot be considered completely identical. Recently, Carlson and Mann [25] reached similar conclusions. These results moved several researchers to openly question whether ADHD-IA and ADHD-C are distinct and unrelated disorders that should be considered separately [2–6]. Indeed, as outlined below, remarkable differences remain between ADHD-IA and ADHD-C in their comorbidities and their behavioural, emotional, social, academic, and cognitive functioning.

Prevalence Rates

Drawing from an ADHD group admitted to a specialized clinic, the DSM-IV field trials reported a higher rate of ADHD-C compared to ADHD-IA, 55% and 27%, respectively [26] whereas in population-based studies ADHD-IA has consistently been found to be the most prevalent of the three ADHD subtypes [27, 28]. Two remarks are to be made while considering these prevalence rates. First of all, the results reveal a different admission trajectory and referral strategy to healthcare assistance. According to Carlson and Mann [29] the average referral age for children with ADHD-IA is 10.4, compared to 9.1 for children with ADHD-C. The study by Lahey and colleagues [26] confirmed this subtype difference in referral age of approximately 1 year. An explanation for this latter finding could be the difficult detection of attention problems until children make their way into a structured school setting: at preschool age it is primarily the symptoms of hyperactivity and impulsivity that attract attention. Secondly, there is consensus that there is only a low rate of children with ADHD-HI [30, 31]. Therefore, this review will focus on ADHD-IA and ADHD-C.

Besides the subtype difference in the prevalence rates, a subtype-specific gender ratio emerges. In the group of children with ADHD-C, the prevalence of boys is up to four times higher than that of girls (3.2–4.1:1). In the case of ADHD-IA, the preponderance of boys is much less striking (2.1–2.5:1) [2].

A final sociodemographic parameter to consider is socioeconomic status. Hardly any evidence is available for cross-cultural variation or differences in socioeconomic status between the ADHD subtypes [27], notwithstanding Milich and colleagues' [2] report that more children with ADHD-IA could be found in a higher socioeconomic class.

Developmental Course

Symptoms of hyperactivity and impulsivity often become apparent before the age of five [32]. As stated above, the DSM-IV-TR symptoms for inattention may be more prevalent during childhood age and even in adolescence and adulthood whereas the criteria for hyperactive–impulsive behaviour are much more applicable for young children [33, 34]. Alternatively, advancing age could be associated with fewer symptoms with a significant degree of impairment [35]. Although it can be hypothesized that this developmental course will be reflected in corresponding changes in subtype prevalence, long-term follow-up studies of children with ADHD-IA are not yet available.

In their review on ADHD in adults, Faraone and colleagues [36] point out that there is ample evidence for diagnostic continuity of ADHD throughout the life span, regardless of the ADHD subtype. It is estimated that up to 50% of children with ADHD continue to manifest symptoms in adulthood [37–39]. Willoughby [40] concludes from his review of developmental data on ADHD that, as a group, children and adolescents with ADHD continue to differ from normal controls in terms of inattention, hyperactivity, and impulsivity. However, in adulthood one clear difference from childhood emerges: the preponderance of diagnoses in adult males is less expressed or even absent when compared to the prevalence in females [36]. Biederman and colleagues [41] report that adults with ADHD have an increased chance for developing major depression, oppositional disorder, drug dependence, agoraphobia, and social phobia compared to normal controls. Hyperactivity/impulsivity was found to be a greater predictor of negative outcomes (e.g., aggression, conduct disorder) compared to inattention [42, 43]. Unfortunately, the developmental course of ADHD on a subtype level remains rather speculative. Obviously, (expensive) large-scale epidemiological studies taking into account subtype membership and comorbid conditions could lead to a more profound understanding of the disorder.

ADHD Subtypes Across the Measurement Levels

Extensive research into ADHD in the past decades has led to extensive but often obscure and contradictory knowledge. In order to structure the research findings concerning ADHD subtypes, we will use five measurement levels. It is important to note that the number of participants in many of the studies mentioned below is rather limited and generalized conclusions should not be expected. Moreover, many research results that will be discussed still refer to the nomenclature from previous DSM editions. As far as the generalizability to the current DSM-IV subtypes is concerned, Milich and colleagues [2] conclude that DSM-III subtypes can be transferred to the current division quite accurately but that the one-dimensional DSM-III-R approach to ADHD should be generalized with extreme caution.

First Level: Genetic Measurement Level

The heritability of ADHD is estimated to be 70–90% [43, 44]. Research strongly suggests the importance of genetic factors in the aetiology of the disorder, although environmental influences can still play a major role. ADHD liability is influenced by a number of gene variants which are also present in the normal population. In the case of ADHD, these genes combine to exceed a specific threshold that causes the disorder [45]. Generally, a genome-wide linkage scan appoints two regions that very likely harbor risk genes for ADHD: 16p13 and 17p11 [46]. More specifically, in molecular genetic studies, many of the researched candidate genes

are involved in the dopaminergic pathway. In their review, Yeh, Morley, and Hall [47] conclude that the genes for the dopamine receptor D4 (DRD4) and D5 (DRD5) and the dopamine transporter (DAT1) have only a modest influence on the development of ADHD. When subtypes are taken into account, a confusing and contradictory image emerges: the 7-repeat allele of the DRD4 gene is linked to both ADHD-IA [48] and ADHD-C [49]. However, the 2-repeat allele has been exclusively linked to ADHD-IA [50]. Recent research indicates that the association between the 148-bp allele from the DRD5 gene and ADHD is confined to the subtypes ADHD-IA and ADHD-C whereas no association with ADHD-HI could be detected [51].

Second Level: Neuroanatomical Measurement Level

MRI studies in ADHD groups revealed smaller sizes in the corpus callosum [52–54], the right frontal lobes [54–56], basal ganglia structures [55, 57–59] and total brain volumes, especially of the cerebellum [60, 61]. These findings point to a cerebellar–prefrontal–striatal dysfunction in ADHD. Single photon emission computer tomography (SPECT) and positron emission tomography (PET) studies also show a hypoperfusion in the frontal lobes and the caudate nuclei [62, 63]. It should be noted that evidence indicating a differential neuroanatomical basis of the different ADHD subtypes is almost nonexistent.

Third Level: Neurophysiological/Neurochemical Measurement Level

Generally, ADHD groups show abnormalities on the neurophysiological level abnormalities in the right frontal region [64] and in the right parietal region [65] when event-related potentials (ERP) recordings are used. When subtypes are taken into account, electroencephalogram (EEG) and ERP studies find only quantitative as opposed to qualitative differences between the two subgroups with ADHD-IA showing intermediate measures between those of controls and ADHD-C [66–68]. Hence, the bulk of EEG studies support the hypothesis of both subtypes being related disorders with varying degree of deviation from normal development. However, based on differences in frontal activity, Clarke, Barry, McCarthy, and Selikowitz [67] suggested that ADHD-C is associated with frontal lobe dysfunction, whereas ADHD-IA has other forms of central nervous system dysfunction. This would imply that different neuroanatomical systems are involved in the two subtypes of ADHD.

Although serotonergic as well as noradrenergic systems have been implicated in ADHD [69], neurochemical research very strongly stresses the dopaminergic system. The dopamine transporter (DAT1) regulates the concentration of dopamine in the synaptic cleft. A SPECT study reveals that in adult patients with ADHD, DAT1 levels are approximately 70% higher than in controls [70]. Moreover, Krause and Krause [71] found that DAT1 increases in ADHD were not limited to ADHD-HI but that they also played a major role in ADHD-IA. Psychostimulants cause a blockade of the DAT1 on the one hand, and on the other hand a higher release of dopamine from vesicular stores which increases the dopamine function [72].

Fourth Level: Neuro(Psycho)logical Measurement Level

Reports of studies on subtype differences on this well-studied measurement level will be divided into research focusing on executive functions and the effect of executive functions on attention processes.

Executive Functions (EFs)

EFs are defined as mental control processes that enable self-control and are necessary to maintain an appropriate problem-solving set in order to attain a future goal [73, 74]. Pennington and Ozonoff [73] consider response inhibition, visual working memory, planning, cognitive flexibility, and verbal fluency as the five major domains of executive functioning. Using Change Tasks and Go/No-Go Tasks, the core problem of ADHD seemed to be an inhibition deficit [73, 75] which causes secondary deficiencies in other EFs. When subtypes are taken into account, contradictory findings emerge again. Nevertheless, the inhibition deficit seems to be uniquely linked to ADHD-C [75–78]. Although the ADHD-C group has also been reported to show more problems in planning, set shifting, and verbal fluency compared to ADHD-IA [77, 79], subtype differences in the five major domains of executive functioning seemed difficult to replicate in subsequent studies [78, 80].

Executive Functions and Attention Processes

Although attention processes are often under the control of the EFs, we will now describe research findings on selective, sustained, and divided attention since they encompass cognitive problems that to a large extent characterize ADHD.

Selective attention is tested by presenting visuospatial orienting tasks to children. In their review Huang-Pollock and Nigg [81] conclude from the many conflicting research findings that ADHD in children is not characterized by a significant orienting dysfunction. The authors report only one study that examined the ADHD-IA subtype, thus taking into account the ADHD heterogeneity. This study failed to find subtype differences in orienting.

Sustained attention can be assessed using a Continuous Performance Task (CPT). Although previous research often failed to find significant differences in performance between ADHD-IA and ADHD-C [82, 83], a study by Collings [84] revealed more subtle findings: the performance of an ADHD-C group deteriorated much faster than that of an ADHD-IA and a control group, leading to the conclusion that only the former group displays a sustained attention deficit.

Finally, divided attention as measured by the Stroop Task reveals a general ADHD deficit when compared to normally developing controls, but fails to differentiate between subtypes [78]. However, a group of adolescents with ADHD-IA seemed to respond much more slowly on the Stroop Task than adolescents with other ADHD subtype diagnoses [85].

Fifth Level: Clinical (Psychiatric) Diagnosis and Comorbidities

This measurement level is most intensively studied in relation to the differentiation between the ADHD subtypes. On this level, we will make a further classification according to the diagnostic instruments that provide detailed information about ADHD-IA and ADHD-C. It is also on this fifth level that respective comorbidities emerge.

Parent and Teacher Reports

Questionnaires completed by parents and teachers as well as diagnostic interviews administered with parents make clear that the ADHD-C group shows more externalizing problems than the ADHD-IA group [28, 78, 86]. A study by the group of Faraone [27] confirmed this finding: within the ADHD-C group, 24.3% of all children received a comorbid diagnosis of conduct disorder (CD) and 68.1% of oppositional defiant disorder (ODD), whereas in

the ADHD-IA group these percentages fall back to 8.7% and 44.0%, respectively. In relation to internalizing problems, the literature is much less unambiguous. Increased rates of internalizing disorders have been found in both subtypes [87]. Although evidence exists that children with ADHD-IA receive higher scores on withdrawn and somatizing behaviour, the two subtypes do not differ concerning anxious and depressive behaviour [88].

Observation Studies

In order to obtain a more objective measure of ADHD behaviour in a specific setting and during a well-defined time period, behaviour observations with coding schedules are appropriate. In a laboratory environment, Barkley and colleagues [82] observed children while they performed a CPT task. They concluded that the ADHD-C group showed more ADHD-consistent and off-task behaviour compared to an ADHD-IA group, and that behavioural observations during a CPT task may be as or even more discriminating between both subtypes than the CPT performance itself. A similar conclusion can be drawn from observations with coding schedules in a more natural, school setting [89]. Here too, observation studies only permit us to determine the presence or absence of hyperactive behaviour but fail to trace differences in attention problems, for example in terms of SCT.

Sociometrics

When children are asked to name their most- and least-liked classmates, it becomes clear that both children with ADHD-IA and ADHD-C are less accepted than their peers [90]. Nevertheless, the ADHD-IA group shows more passive and withdrawn behaviour and thus receives fewer positive nominations, whereas the ADHD-C group is rejected more actively because of their impulsive and aggressive behaviour [91–93]. However, research reveals that children with ADHD encounter problems in their social relationships not just because of their impulsive and aggressive behaviour, but also because of pragmatic language problems that are often associated with this condition and that sometimes make it difficult to differentiate ADHD from high-functioning autism [94–97].

Intelligence and Achievement Tests

Several studies have reported that children with ADHD obtain significantly lower scores than their age-matched peers on measures of intellectual functioning [27, 98–100]. Moreover, children from both subtypes are characterized by poorer performances than their nondisordered peers on tests that measure academic skills [27, 82]. Between them, subtype differences are minimal [29], although children with ADHD-IA perform more poorly on mathematics achievement tests [101–103].

Barkley and colleagues [82] found that children from both groups were equally held back in school, but that children with ADHD-IA were confronted with more learning problems. This finding was also supported by other research groups [102, 103]. However, Faraone and colleagues [27] refuted the finding that ADHD-IA is more strongly associated with learning problems in terms of reading and mathematics disabilities. They found an elevated rate of language/stuttering disorders in children with ADHD-C compared to children with ADHD-IA.

In summary, both subtypes are associated with poor academic skills, with little difference between them. An increased risk for comorbid learning disabilities was demonstrated, particularly for the inattentive subtype group.

Table 2 Cognitive, social, academic, and behavioural functioning in ADHD-IA and ADHD-C

Dimension	ADHD-IA	ADHD-C
Cognitive		
Sustained attention	?	Quick decline in performance over time
Selective attention	–	–
Divided attention	Slow response speed	–
Sluggish Cognitive Tempo	Hypoactive, lethargic, day dreams frequently	–
Social	Social impairment, passive, withdrawn, low popularity	Social impairment, aggressive, active rejection by peers and low popularity
Academic	Underachievement, increased prevalence of co-morbid learning disabilities	Underachievement
Behavioural		
Internalizing	Withdrawn and somaticizing behaviour, slightly increased prevalence of comorbid Anxiety Disorder and Major Depressive Disorder	Slightly increased prevalence of comorbid Anxiety Disorder and Major Depressive Disorder
Externalizing	Slight increase in externalizing behaviour and comorbid ODD	Aggressive and delinquent behaviour, highly increased prevalence of comorbid ODD and CD

Discussion

Reviewing literature across different measurement levels enables us to structure the scientific findings concerning the ADHD subtypes and to draw some conclusions. The phenomenology of ADHD-IA and ADHD-C displays a number of similarities as well as some specific symptoms and impairments. Table 2 compares both subtypes on cognitive, social, academic, and behavioural functioning. The clinical, and to some extent, neuropsychological profiles of both subtypes are relatively well documented and can often create an unambiguous and exclusive description of each ADHD group. Although it can be debated whether sluggish cognitive tempo items should also be included as diagnostic items, we can conclude from psychological/psychiatric research findings that the DSM-IV-TR [1] reflects a legitimate and adequate subtypology. The question now emerges whether there is also additional and convincing evidence to argue for the validity of separate/independent diagnostic categories.

The outline established above indicates that the evidence concerning subtype differences is less compelling if genetic and biological research findings are taken into account. The more fundamental the measurement level is, the less obvious it becomes that the ADHD subtypes are clearly distinguishable disorders as suggested by sluggish cognitive tempo studies. If this lack of strong evidence for subtype differences on a genetic-biological level could repeatedly be replicated, then—in sum—psychological and biological research levels would reveal more similarities between ADHD-IA and ADHD-C than fundamental dissimilarities, thus supporting the present DSM-IV-TR subtypology. However, it is also plausible that the current biological and genetic research methods are not yet sensitive enough to detect subtype differences. Moreover, ADHD subtypes are less researched on these measurement levels because of the higher financial costs, the higher invasiveness of the research methods for

the participants and the higher need for a multidisciplinary approach above and beyond the clinical level. Finally, the low number of participants in many of the studies cited does not permit us to draw permanent conclusions on subtype differences.

Another way of approaching the ADHD subtype problem is to raise the question of whether it would be in some way beneficial to consider both subtypes as separate DSM entities. The answer does not appear to be unambiguous.

On the one hand, this would be appropriate: we currently risk under diagnosing children with a clear clinical profile of ADHD-IA because, despite the occurrence of sluggish cognitive tempo characteristics, only a limited number of DSM-IV ADHD-IA criteria are met. However, this diagnosis could be necessary to gain access to healthcare. Furthermore, the emphasis on ADHD-IA as an independent entity could lead to the formulation of new theories concerning this disorder. The currently leading psychological theories on ADHD focus on response inhibition deficit [75], a deviant motivational attitude [104, 105], or an energetical state dysregulation [106, 107], thereby emphasizing the construct of impulsiveness which is only comprised in ADHD-C and ADHD-HI. What is believed to be the core characteristic of a disorder in psychological theories does not apply for a large group of the children diagnosed with it. As a consequence, to date neither of the leading theoretical accounts of ADHD is able to systematically guide cognitive research on the full spectrum of this disorder.

On the other hand, splitting up the subtypes into independent disorders could create new problems. If the SCT items are to be added to ADHD-IA as a separate attention disorder, then in some cases this could lead to a very difficult differential diagnosis of internalizing disorders such as depression and anxiety. Besides, a division of ADHD-IA and ADHD-C as independent disorders does not appear to be necessary in relation to treatment. Notwithstanding the fact that Barkley [33] indicated that a standard management procedure would not be adequate for some subgroups because of their specific deficits, Pelham [6] claims the opposite for behaviour modification treatment. Indeed, after an idiographic functional analysis, the evidence-based psychosocial treatments of ADHD such as behavioural parent training and classroom management focus on a specific target behaviour concerning either symptoms of hyperactivity, impulsivity, or inattention. A final disadvantage that cannot be underestimated is the argument that opened our review. Although ADHD is very well known to both healthcare providers and the general public, changing the diagnostic categories and criteria as well as the related nomenclature will initially not benefit early detection because recognition of the disorder might be minimized and the major diagnostic instruments would have to be revised.

Summary

The core characteristics of ADHD-IA and ADHD-C have only recently become a popular research subject, not least because such a debate remained impossible until the introduction of the multidimensional conceptualization of this condition in the DSM-III [17]. As a consequence, very little fundamental research is available that compares ADHD-IA and ADHD-C. The question of whether both subtypes should be considered as two independent disorders, has still not been resolved. At this point, only irrefutable phenomenological evidence of subtype differences seems to be available, even in attention problems which were presumed to be identical. The few studies on fundamental research levels that actually do include subtypes often perform studies on a rather small subject pool and often report rather contradictory findings. Therefore, to date it is best to conclude that research on ADHD-IA and ADHD-C reports more similarities than fundamental dissimilarities. Nevertheless, it is necessary that

future study designs on fundamental measurement levels include subtype diagnoses in order to further guarantee valid and reliable diagnostics, formulations of (sensitive) theories, and psychosocial and psychopharmacological treatment.

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