

Current Understanding of ADHD. A Critical Review

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Abstract: Attention Deficit Hyperactivity Disorder (ADHD) is a commonly diagnosed disorder in children, and is thus diagnosed during childhood years with prevalence rates of between 3% and 7%. In their own environment, children with ADHD experience many challenges in their everyday learning and self-worth perception, and thus they are in need of support throughout their lives and in several different aspects. ADHD symptoms have the potential to lead to considerable problems in children, in and with their family, and schooling. The core symptoms of ADHD have considerable negative effects on the child development of social, emotional and cognitive skills, and pose considerable costs to healthcare and education systems. For example, a child with ADHD frequently faces low levels of self-esteem, as well as frustration and depression.

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1. Introduction

Attention Deficit Hyperactivity Disorder (ADHD) can be defined as a pattern of a constant lack of attention and/or hyperactivity-impulsivity, which occurs more frequently and harshly than anticipated during average development, and which manifests itself in a diversity of situations (APA, 2000). This condition often leads to various impairments in the child's social and academic functioning (Mayes, Bagwell & Erkulwater, 2009). Attention Deficit Hyperactivity Disorder is described as being a disruptive behaviour disorder with specific deficits in neuropsychological processing — symptoms which are not included in the Diagnostic and Statistical Manual (2000) criteria. However, ADHD is assumed to have a neuropsychological foundation (Tannock & Brown, 2000).

One significant theory of ADHD is that it is ultimately a developmental disorder which mostly includes deficits in executive functions, with the main deficit being in behavioural inhibitions. As a result, these behavioural difficulties bring about shortfalls in other aspects of executive functioning, such as working memory, planning, and verbal fluency (Barkley, 1997a, 1997b; Panzer & Viljoen, 2005).

Several researchers have widely observed children with ADHD, and have subsequently noted evidence which is illustrative of the aforementioned deficits in executive functions (Chhabildas, Pennington & Willcutt, 2001; Berlin *et al.*, 2004). These cognitive impairments in executive functioning are additionally apparent in children with social and emotional functioning difficulties (DeBonis, Ylvisaker & Kundert, 2000). However, studies have

gradually proposed on a greater level that the core problem associated with ADHD is executive functioning deficits and not excessive activity (Barkley, 2006). Despite the fact that the recent DSM-IV-TR diagnostic criteria persists to heavily focus on inattention symptoms, more recent research has highlighted that self-regulation and executive functioning deficits offer a superior theory for this disorder and its associated problems (Barkley & Murphy, 2006). Consequently, this paper tends to believe in the theory of the brain executive functions deficits since it describes all behaviours of ADHD, which leads to a greater understanding of the condition.

2. Epidemiology

As stated in the Diagnostic and Statistical Manual (2000), 3–7% of children in schools are diagnosed with ADHD. However, there are differences which are apparent according to gender, whereby it is estimated that the condition is 2 to 9 times more prevalent in males than females across all socioeconomic classes, which is not so well understood, and also across ethnicities, which has so far not been clearly documented (Anastopoulos & Shelton, 2001). Moreover, when using the diagnosis criteria from the International Classification of Diseases (*ICD-10*) for Hyperkinetic Disorder (HKD) — which is an alternative classification of ADHD — the prevalence ranges from 1–3% of children (Remschmidt, 2005). It is believed that these differences are due to the differing criteria used in the diagnosis. For instance, it has been found that there are higher prevalence rates in studies using the DSM-IV criteria (Skounti, Philalithis & Galanakis, 2007), and significantly lower prevalence rates in studies

using the ICD-10 criteria (Polanczyk *et al.*, 2007). Therefore, it is also believed that the difference in prevalence rates is due to the fact that HKD requires evidence of further symptoms. However, several epidemiological studies propose that the prevalence rate amongst school children could actually be as high as 20% (Barbarese *et al.*, 2002).

In addition to the presence of symptoms, as a further criterion for diagnosis, both the DSM-IV and the ICD-10 require that there is a clinically considerable amount of academic and social impairment, although of all the epidemiological research carried out — each of which has utilised the counting of symptoms as an ADHD/HD criterion — only a very small portion have actually incorporated an impairment criterion; consequently, it is then found that research results which do not include a definition of impairment show considerably higher prevalence rates of ADHD in comparison to those studies with a definition (Graetz *et al.*, 2001; Gordon *et al.*, 2006). Besides, both DSM-IV and ICD-10 necessitate confirmation of symptoms in two different settings and, therefore, studies utilising only one setting (e.g., parents or teacher environment) frequently show higher rates than studies utilising two settings (Gomez *et al.*, 1999). In addition to the methodological factors, there are also other variables, which contribute to the prevalence rate variability found in diverse studies, such as sociodemographic, gender, age and socioeconomic status variables, which will be discussed later on.

With the aforementioned in mind, this paper therefore tends to believe that the estimation of the prevalence of ADHD is extremely dependent on several different factors, including the diagnostic criteria utilised and the population sampled. Moreover, the diverse rates are, in part, due to the national practices and the rigidity of individuals in conducting clinical standards.

3. The Causes of ADHD

Although the aetiology of ADHD is still unknown and the precise aetiological pathways of ADHD are as still as yet unidentified (Taylor *et al.*, 2004), there are numerous potential causes of ADHD which are still regularly debated. There is a great expanse of research and many theories on this element of ADHD, with brain damage forming one of the very first early theories proposed for the existence of hyperactive behaviour (Fisher & Beckley, 1998); subsequently, the association between brain injury and ADHD has been discussed in numerous literature (Barkley, 2000; Grandinette, 2006). However, a more recent theory relates to genetics (Lynn *et al.*, 2005) due to the fact that research has found that there are nine genes which appear to be linked with ADHD, which the child is believed to be more likely to

inherit from the male parent as opposed to the female (Hawi *et al.*, 2005). With this development in mind, this is why some studies now support the view that the condition is caused by congenital factors rather than environmental (Payton *et al.*, 2001), and there is some evidence to support this argument. Firstly, the disorder of ADHD never disappears, which is a distinctive feature of genetic disorders; although the severity of ADHD might alter as an individual matures and responds to treatment, it will irrespectively not entirely disappear (Levy & Hay, 2001). Secondly, there is the consideration that in a family with an ADHD-child, 25% of other family members also have the same disorder (Strock, 2003). Moreover, there is a higher psychopathology prevalence in parents and relatives of ADHD children (Faraone & Doyle, 2001); for example, between 10–35% of family members of children with ADHD have been found to have a similar condition (Biederman *et al.*, 1992; Everett & Everett, 1999).

However, in addition to congenital possibilities, environmental factors, such as family conflict, severe marital discord, large family size, antenatal exposure and obstetric complications, are seemingly apparent in ADHD cases, and are therefore believed to contribute to the development of ADHD (Hyman, 2001; Niederhofer, Hackenberg & Lanzendorfer, 2004; Mirand, Marco & Grau, 2007). However, despite the fact that factors such as the home environment, parental skills and peer influence may have an effect on the symptoms of ADHD, it nevertheless appears that such factors are not the main cause of ADHD (Remschmidt, 2005); evidently, while a child's environment is a predictor for the development of the child, it is generally not attributed to the specific development of ADHD (Biederman & Faraone, 2003).

Furthermore, there is the notion that specific foods — such as sugar and dyestuffs — may also lead — or at least contribute — to ADHD in children, and this aspect of research has received a great deal of interest (Boris & Mandel, 1994). However, methodical studies have illustrated that a precise diet or nutritional changes do not necessarily reduce the behavioural symptoms associated with ADHD (Wolraich, Wilson & White, 1995). In addition, there is also the consideration that several different toxins could be associated with, or at least effect, ADHD etiology (Bellanti, 1999); for example, it has been found that lead contamination could lead to distractibility and hyperactivity (Needleman, 1982). In a further study, a large number of children with high lead exposure did exhibit an increase in ADHD, and several children with ADHD did not exhibit lead contamination, thus this notion of contamination

cannot be adequately clarified for cases of ADHD (Biederman & Faraone, 2003).

Some studies have researched whether the cause of ADHD begins in utero, such as with the use of cigarettes and alcohol during pregnancy (Amor *et al.*, 2005), while others have considered a probable connection between delivery complications and a low birth weight (Biederman & Faraone, 2005). Some studies carried out on the brain have also shown definite differences in the brain function between children with ADHD and those without, with results showing that the brain is 3–4% smaller in ADHD children (Castellanos *et al.*, 2002) and, furthermore, that there is a shortage of the brain chemical (Vaidya *et al.*, 1998). Other theories — some of which are mentioned above — suggest genetic factors, congenital factors, toxins and environmental agents, and familial risk factors, such as causal agents (Castellanos & Tannock, 2002). However, the most broadly accepted theory is that a combination of factors causes ADHD, including biology, genetics, and environment (National Institutes of Health, 2000).

4. Persistence of ADHD into Adolescence and Adulthood

Studies have indicated that the symptoms associated with ADHD continue into adulthood in 30–70% of school-aged children diagnosed with the condition (Roth & Saykin, 2004). For a long period of time, ADHD has been seen mainly as a behaviour disorder which influences only young children, causing them to be inattentive and disruptive in school (Kordon, Kahl & Wahl, 2006). However, when attention impairments emerge in childhood — with or without hyperactivity — the symptoms tend to continue into adolescence and adulthood (Barkley, 2002a; Faraone *et al.*, 2003), and frequently in much the same way as in preschool life (Rosler *et al.*, 2009), subsequently generating problems for individuals at school, work, and in social relationships and situations (Biederman *et al.*, 2006). The harmful consequences of impulsivity could, in fact, be greater for adults than for children (Babinski, Hartsough & Lambert, 1999; Trott, 2006; Brassett-Harknett & Butler, 2007).

5. Developmental Course

It is believed that developing an in-depth understanding of the alterations that children with ADHD experience is crucial in order to make an effective identification and subsequently successful interventions, since various factors — such as biological maturation and the demands placed on children in different environments, such as home and school — are principally accountable for behavioural alterations (Batsche & Knoff, 1994). The relationship alterations between children and their teachers and/or

parents might ultimately worsen and consequently emphasise specific behavioural problems in children with ADHD as well as an increase in pressure and disappointment expressed by both teachers and parents, which will ultimately worsen the child's own self-perspectives and self-esteem (Barkley, 1998).

It has been found that infants with ADHD have temperament difficulties, such as sleep disturbances and feeding problems, and such children then progress on to show a lack of capability in relation to maintaining attention. In addition, they also fail to react to parental discipline which consequently causes further stress and frustrations (Weiss & Hechtman, 1993). Moreover, for the duration of preschool, such children frequently exhibit low frustration tolerance, high degrees of hyperactivity, and have constant play and school difficulties (Harpin, 2005). For school-aged children, the symptoms increase with the simultaneous increase of academic, social functioning and self-esteem difficulties (Barkley, 1998). Moreover, around 75–85% of children and adolescents diagnosed with ADHD continue to meet ADHD criteria into adulthood (Barkley & Gordon, 2002). However, this paper is written with the belief that it is important to bear in mind that it is difficult to make the judgment of whether a particular child has ADHD while he or she is two, three, four, or even five years old, as, at these ages, it is perfectly normal for children to demonstrate ADHD-related characteristics and, by a later age, such as seven or eight years old, they are then expected to develop their focus and self-control which would be typical to make an accurate diagnosis. Furthermore, during the different stages of the child's development, parents may feel more and more stressed over time, and this paper is written with the belief that it is important to both determine and understand the reasons causing parental stress in association with ADHD, since the parents play a key role in successfully tackling ADHD throughout the diverse processes, from identification through to the implementation of treatment. Subsequently, this paper will discuss parental stress in more detail in order to provide a clearer picture of its forms and their cause.

6. Factors Influencing ADHD

Several factors have the potential to impact ADHD, particularly in regards to the diagnosis, symptoms and treatment of the condition. These factors include gender, culture and ethnicity, socioeconomic status, co-morbidity and dual exceptionalities.

6.1 Gender

It has been found that ADHD is more prevalent amongst boys for all three subtypes (Nolan, Gadow & Sprafkin, 2001; Ersan *et al.*, 2004). On the other

hand, the proportion of girls with inattentive subtype (ADHD-I) symptoms has been found to be higher than other subtypes of ADHD (Wolraich *et al.*, 1998). However, with this in consideration, it is thus proposed that it is not the case that there is a lower prevalence in girls, but that behavioural differences might play a key role, as girls with this condition are likely to go undiagnosed (Wender, 2000). Some researchers suggest this is due to the element of hyperactivity, as males are generally more aggressive and assertive than females (Arcia & Conners, 1998); without this element taken into consideration, the rate of ADHD occurrence might in fact be similar between boys and girls. As such, therefore, the females identified are those who display severe symptoms of the condition (Bowman, 2008). On the other hand, other researchers believe this difference in prevalence in accordance with gender is due to the fact that most ADHD-related literature is based on the studies of male children (Greenblatt, 1994). Furthermore, the implication is that the diagnosis of ADHD in girls is complex due to the fact that girls are less likely to display the hyperactive and impulsive behaviours, which are frequently the first noticeable symptoms recognised in ADHD children (Adams, 2007).

Moreover, girls with ADHD are frequently becoming accustomed to adopting tactful ways of disguising their lack of attention in the classroom (Beaman, Wheldall & Kemp, 2006). From a professional perspective, I believe that boys demonstrate different behaviours, such as scribbling on paper or looking around the room or out of the window, when they are not paying attention; on the other hand, girls seem more inclined to look at the teacher and give the impression that they are actually showing an interest in what the teacher is saying when, in actual fact, their minds are elsewhere. With girls behaving in this way, their inattentiveness may subsequently go unrecognised, and they are consequently less likely to become involved in classroom incidents due to their lack of concentration being almost unnoticeable. This makes it ultimately very difficult to identify girls with ADHD.

Furthermore, girls with ADHD show their symptoms differently to boys. For example, while boys are inclined to show their aggression physically, girls are, in comparison, more inclined to verbally display their aggression towards their families and peers, which ultimately leads to social exclusion from both families and peers (Jackson & King, 2004). In general, males are likely to be diagnosed with ADHD more often than females, as is shown by the gender ratio identified for clinical samples of 9-1, and for epidemiological samples of 4-1 respectively (APA, 1994). This could be due to the fact that females are

generally quieter and suffer less from hyperactive impulsive symptoms and behavioural problems, which often commence with earlier referrals (Cantwell, 1996; Wolraich *et al.*, 1998; APA, 2000). In addition, girls with ADHD are more likely to go unidentified since teachers do not generally succeed in recognising inattentive behaviours, except if they are also displaying disruptive behaviours, as are frequently noticed in boys (Mash & Wolfe, 2002).

Regarding the diagnosis of ADHD, it has been recognised that gender is a barrier to suitable diagnosis of ADHD (National Institutes of Health, 1998). Moreover, at the time of girls' diagnoses, girls are commonly older than boys (Brown, Madan-Swain & Baldwin, 1991), which subsequently indicates that they are recognised later than boys, and consequently leads to significantly less treatment. However, no gender-significant difference has been identified concerning the co-morbidities during childhood (Biederman *et al.*, 2005) and in response to ADHD treatment, although girls seek more for the treatment (Sharp *et al.*, 2000; Barkley, & Mash, 2006). With all of these considerations in mind, this paper tends to believe that there is a need for a greater emphasis on the training and educating of clinicians, teachers and parents regarding ADHD symptoms in girls; with a clear lacking of a superior understanding of these differences, it is not viable to decide whether the DSM-IV and ICD-10 diagnostic criteria are completely applicable to girls.

6.2 Culture and Ethnicity

It has been found that there are associated values for both acceptable and unacceptable behaviours in different societies (Dwivedi & Banhatti, 2005). However, it has also been proposed that there is little empirical evidence which demonstrates that improvements in ADHD symptoms depend on a child's development according to his or her own culture (Burcham & DeMers, 1995). Since the cultural attitudes regarding acceptable behaviour could be significant in determining whether a child might be diagnosed with ADHD or not (Barkley, 1995), it is therefore vital that, when assessing students, their cultural backgrounds are taken into consideration. Of course, it is noteworthy to highlight that the different prevalence rates of ADHD in diverse cultures might be due to the fact that different criteria may be used for the diagnosis of ADHD in different countries; however, when utilising the same criteria, the prevalence of ADHD appears to be very similar (Rohde *et al.*, 2005); this highlights the fact that cultural factors play a minor part in the diagnosis of ADHD (Meyer *et al.*, 2004). In contrast, cultural factors can play a major role in the intervention of ADHD (Perry, Hatton & Kendall, 2005). Any intervention should pay cautious attention to

socioeconomic considerations — mainly the size of the family, marital troubles and economic status — and should also promote care placement (Reid *et al.*, 2001).

6.3 Socioeconomic Status

The economic status of a family can have an influence on ADHD (Pastor & Reuben, 2002), as the prevalence of children with ADHD amongst low-income families is almost double when compared with those families who have a higher income (Currie & Stabile, 2004). However, this could be due, in part, to other reasons which may also have an effect on these families, such as less medical care accessibility or being part of a single-parent family.

The association between socioeconomic status and the intervention of ADHD has been evaluated, and it was found that high-income families used longer-acting medications in comparison to low-income families (Stevens, Harman & Kelleher, 2005). It is therefore believed that the reason for the dissimilarity is that the longer-acting medications are much more expensive, which might be hard for families with lower incomes to afford (Rieppi, 2002).

6.4 Co-morbidity

Co-morbidity is determined once an individual has two or more disorders which are simultaneously present. There are some disorders which can often influence the symptoms of children with ADHD, and these include Oppositional Defiant Disorder (ODD), Conduct Disorder (CD), depression or mood disorders, and Bipolar Disorder (Buttross, 2007). A significant number of ADHD children have co-morbid psychiatric disorders; 32-40% of them have Oppositional Defiant Disorder (ODD) and 12-30% have Conduct Disorder (CD) (Barkley, 2005), with more boys than girls demonstrating this trend (Biederman *et al.*, 2002). Furthermore, while boys with ADHD appeared to be more likely to experience a mood disorder (Bauermeister *et al.*, 2007), depression is more common amongst girls and older children (Brunsvold *et al.*, 2008).

Besides, a portion of children with ADHD also have Bipolar Disorder (Biederman *et al.*, 2008), which is typified by manic and depressive episodes, and therefore makes diagnosis uncertain because, frequently, the symptoms overlap, and so it is difficult to distinguish between the two disorders (Crites, 2006). However, the treatment of one of the co-morbid disorders subsequently lessens the severity of the other, therefore making dealing with the other one much easier and simplistic (Wilmshurst, 2005).

Co-morbidities also include neurological disorders (Dunn *et al.*, 2003), Obsessive Compulsive Disorders (OCD) (Geller *et al.*, 1996), bladder and bowel control problems (Duel *et al.*, 2003), sleep-related problems (Corkum *et al.*, 1999; Mick, 2000),

motor tics (Pliszka, Carlson & Swanson, 1999), chromosomal-genetic disorders (Hagerman & Hagerman, 2001), height problems (Biederman *et al.*, 2003), anxiety disorders (Brown, 2000), learning disabilities and internalising disorders (Barkley, 1998), and language disorders (Tannock, 2000). In addition, although PDD-NOS (Pervasive Developmental Disorder, not otherwise specified) and ADHD are characterised as clearly separate syndromes in the DSM-IV-TR (APA, 2000), the two nevertheless frequently emerge simultaneously, and so it is consequently difficult to distinguish between the two disorders in clinical practice (Jensen, Larrieu & Mack, 1997; Clark *et al.*, 1999). Moreover, around half of all children diagnosed with Autistic Spectrum Disorder (ASD) meet DSM-IV criteria for moderate to severe ADHD (Gadow *et al.*, 2004; Gadow, Devincent & Pomeroy, 2006).

6.5 Dual Exceptionalities

Dual exceptionalities children are said to be both gifted and disabled, and it is argued that their disabilities frequently go unnoticed (Willard-Holt, 1999). It has been further argued that these kind of children are inappropriately diagnosed owing to definite behaviours that he or she might display, because if a child exhibits an exacting behaviour in a definite situation, it might point to that child being gifted, while if the similar behaviour seems to be evident in every situation, it is more likely to be linked to ADHD (Webb & Latimer, 1993). Moreover, many ADHD-related behaviours are displayed by gifted children and so, in order to adequately differentiate between gifted children and those with ADHD, more careful and intricate examinations need to be performed in order to accurately identify their response in different situations (Johnsen & Kendrick, 2005). It has been suggested that, if a child exhibits behaviours in certain circumstances but not all, he or she is, most likely, gifted, and the cause of the behaviour is merely boredom, whereas if he or she displays the same behaviours in all settings without consideration of the circumstances, he or she is then most likely to be diagnosed as having ADHD (Webb, 1993). Furthermore, this kind of child suffers from the feeling that they do not belong to either the gifted or the ADHD group (Ramirez-Smith, 1997).

The presence of a gifted or ADHD-diagnosed child in the classroom is hard for many teachers to handle. However, when a child is both, the level of problems increase; for example, if a child is not paying attention, it is then difficult for teachers to establish whether it is because of ADHD or boredom (Turk & Campbell, 2002). In my professional opinion, I believe that the intelligence of gifted children frequently assists them in handling their

symptoms of ADHD better than those children who have ADHD alone, and it is the gifted children whom are subsequently able to mask their ADHD symptoms, instead highlighting their gifted abilities.

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