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Review

Schooling and Occupational Outcomes in Adults with ADHD: Predictors of Success and Support Strategies for Effective Learning

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Abstract: Attention Deficit Hyperactivity Disorder (ADHD) is a neurobehavioral disorder that is usually diagnosed in childhood. It is characterized by attention deficits, hyperactivity, and impulsivity leading to significant impairment in academic, occupational, familiar, and social functioning. Most of the literature has been focusing on the impact of this condition on infancy and preadolescence, but little is known on its consequences in adulthood. This narrative review addresses this gap by focusing on the studies regarding the schooling outcomes of this population. After identifying the specific clinical and neuropsychological profile of ADHD in adults, this study analyzes their precise needs for effective learning and presents evidence on their academic and occupational achievements. Pharmacological, educational, and rehabilitative factors predicting a positive scholastic and career success are critically reviewed. Finally, this study focuses on the strategies that can improve the learning processes in adults with ADHD by expanding the analysis on executive functions, metacognition, and emotional dysregulation. Schooling outcomes in adults with ADHD, therefore, are conceptualized as a complex measure depending on several variables, like early pharmacological treatment, educational support, neuropsychological intervention, and targeted strategies for life-long learning.

Keywords: ADHD in adulthood; learning processes; neuropsychological functioning; metacognition; educational support

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1. Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a neurobehavioral disorder characterized by hyperactivity, impulsivity, and inattention that impairs functioning and development [1,2]. It is associated with a heavy clinical burden in the transition to adulthood, with those who are affected having higher rates of comorbidity, mortality, incarceration, and psychiatric hospitalizations than individuals without ADHD [3].

In Europe, the estimated per-person total annual economic burden ranges from $831,83–20,538.95 for all-age individuals with ADHD and $2670,43–4119,75 for family members of individuals with ADHD. In adults only, direct, indirect, educational, and justice system costs for total costs range from $356.14 million to 4126.80 million [2]. It is clear that ADHD represents a major clinical, social, and economic concern.

This is due to the multicomponent consequences of this disorder, affecting also the very first achievements of a person in their main context of socialization and learning, namely in school. Research suggests that ADHD is linked to poor school performance, both in childhood and later in life [4,5]. Indeed, children with ADHD have a higher risk of lower scores on reading and arithmetic tests, a worse grade point average, and a more

problematic inclusion in special education classes than controls [5,6]. Moreover, scientific literature reported that children who were rated hyperactive as preschoolers displayed worse reading ability than controls and were more likely to be reading-disabled [7].

The consequence is that men who were diagnosed with ADHD as children had completed on average of 2.5 years less schooling than controls, and nearly one quarter of the ADHD group did not complete high school, with an increased risk of dropping out of school [7–9]. Additionally, examining adults who continue to display symptoms of ADHD typically carry out a history of academic under-achievement, with many individuals leaving school early [7]. Pingault et al., moreover, found that inattention during the primary school years could also significantly predict a lower rate of high school graduation in early adulthood [10].

In other words, ADHD leads to a significant and long-lasting impairment of schooling outcomes, which results in lower employability and general quality of life [11]. This calls for specific interventions calibrated on the learning challenges faced by those who are affected. If, on the one hand, a higher awareness on the topic can be seen towards infant and young patients, a lower attention towards adults (>17 years) struggling with similar difficulties, on the other hand, is found in local institutions and services [12].

This is a critical gap that needs to be addressed. ADHD is often undiagnosed and untreated in adults due to lack of disease awareness, inadequate access to ADHD care, or use of diagnostic criteria prevalent before DSM-5 [13]. Many adults with ADHD see their symptoms attributed to motivational or intellectual deficits [14], and this causes detrimental effects on their academic and occupational outcomes, associated with a worse self-concept and strong beliefs of inadequacy [15].

Standard-of-care for ADHD would require psychosocial treatments, as behavior management interventions, classroom or school-based strategies, peer-based plans, and psychological and psychotherapy protocols [13], as well as a multimodal approach including behavioral/psychological interventions, pharmacological therapies, and caregiver education [16], where the best option is represented by a timely treatment during childhood. Clinical data, indeed, suggest that treatment of ADHD with stimulants before the age of 18 can decrease comorbid psychiatric/behavioral disorders in adulthood and improve academic performance [14,16,17]. However, as stated before, some cases are not early diagnosed and come to clinical attention only in adulthood, so this option is not always feasible. Moreover, most studies report data only about clinical features and psychosocial functioning of those patients, and longitudinal studies presenting data from childhood to adult age are few. Therefore, it is difficult to identify indicators to monitor and intervene in order to promote a better functioning in adulthood, as well as interventions for adults to improve their learning achievements.

The challenge, therefore, is twofold: (1) to understand the pharmacological, educational, and rehabilitative predictors of a positive scholastic and career success in adults with ADHD to allow interventions to be calibrated from an early age, with the positive consequences on self-realization stated previously; (2) to propose specific strategies for adults with ADHD to foster their ability to learn and achieve academic and vocational goals at a later age.

This narrative review aims at addressing those two goals by analyzing the recent literature published so far and indicating possible direction of future research. After a clear distinction of the clinical and neuropsychological profile of ADHD in adults from that in children, the evidence on needs in adulthood for effective learning and actual academic and professional achievements is presented. Then, pharmacological, educational, and rehabilitative factors predicting a positive scholastic and career success are examined to identify the best early-treatment targets to promote a positive quality of life. Finally, a focus on critical cognitive, emotional, and behavioral functions allows for the proposal of strategies to improve the learning processes in adults with ADHD.

2. Materials and Methods

The current narrative review was realized by collecting scientific studies on three main topics. The first one was related to the diagnostic, neuropsychological, and treatment aspects of adults with ADHD. In this case, the literature has been selected by including studies mainly from 2010 to the present in order to explore the clinical background of ADHD in adulthood and the contemporary therapeutic approach. The main keywords were "Adults with ADHD", "ADHD in adulthood", "Neuropsychology of adults with ADHD", "Diagnosis of ADHD in adulthood", and "Treatment of adults with ADHD", while Scopus, Google Scholar, PubMed, ScienceDirect, and University libraries were consulted. An initial pool of 47 studies was selected according to the previous criteria but three manuscripts were excluded because they did not present ADHD according to the international diagnostic criteria. Moreover, they dealt with narrative reports of single cases without any reference to treatment guidelines. Consequently, 44 studies were used for this section.

The second topic focused on the academic challenges faced by adults with ADHD, including their professional achievements and the best predictors of success. Therefore, studies regarding the statistics on schooling of people with ADHD, their process of learning, and their career results were the focus of the analysis. The main keywords were "Learning and ADHD in adults", "Schooling and ADHD", "Educational needs of ADHD in adulthood", "Career and ADHD", "Longitudinal studies in ADHD", and "Consequences of early treatment of ADHD in adulthood" which were used to retrieve studies published from 2010 to the present. The same previously mentioned sources of scientific information were used with the additional consultation of official institutional websites of health organizations. An initial pool of 34 studies was selected, but four of them actually dealt with the impact of treatment strategies on late adolescence and did not show a convincing longitudinal methodology; thus, a narrative approach without repeated measures was used. This section, therefore, was structured on 30 manuscripts.

The third and last topic was related to the strategies that could help adults with ADHD improve their learning results by including several cognitive functions that are involved in many study and work tasks. The keywords were "Learning support strategies for adults with ADHD", "Training for executive functions in adults with ADHD", "Behavioral strategies for effective learning in ADHD", "Metacognition in adults with ADHD", and "Management of emotional dysregulation in ADHD". Sources were consulted as explained previously, leading to the collection of 33 studies that were all used for this section since they were recent and dealt with the precise objective of our review.

Given the aim and the methodological approach of this work, no ethical permissions were required.

Our final findings are presented in the following paragraphs. Section 3 deals with the diagnostic and neuropsychological profile of adults with ADHD. Section 4 describes the main challenges faced by those patients in academic and job contexts, while Section 5 collects the pharmacological, educational, and rehabilitative predictors of occupational success in adulthood. Section 6 reviews the support strategies that can be implemented to actively help adults with ADHD in their academic and career challenges, taking into account executive functions, metacognition, and emotional dysregulation.

3. ADHD in Adulthood: Diagnostic and Neuropsychological Aspects

In this section we discuss the diagnostic criteria of ADHD, and we outline its presentation in adulthood by highlighting the differences between ADHD in childhood and adulthood, and by describing the neuropsychological profile of adults with ADHD.

3.1. General Diagnostic Criteria of ADHD

As stated before, ADHD is a neurobehavioral disorder affecting children and adults [16]. Its prevalence is around 5% in children and about 2.5% in adults [17]. Its diagnostic classification is based on the observation of behavioral symptoms [18].

The DSM-5 diagnostic criteria underline that a persistent pattern of inattention (nine symptoms) and/or hyperactivity-impulsivity (nine symptoms) interfere with functioning or development. Several of these symptoms must be present prior to the age of 12 years. ADHD can show a predominantly inattentive pattern (six or more of nine inattention symptoms), a predominantly hyperactive/impulsive pattern (six or more of hyperactivity/impulsivity symptoms), or a combined presentation (both inattention and hyperactivity/impulsivity patterns are present) [17]. In ADHD, inattention is expressed by behaviors such as wandering off task, lack of perseverance, failure to maintain attention, and lack of organization, and is not due to defiance or incomprehension. Hyperactivity is shown via excessive motor activity; impulsivity refers to hasty actions that occur without any prediction, and have a high potential of damaging the individual [17]. Behavioral symptoms cannot be better explained by other mental disorders [17,18]. Moreover, these symptoms lead to significant impairment in academic/occupational, familiar, and social functioning [19]. ADHD is often in comorbidity with other psychological or physical conditions. Among children with ADHD, learning disabilities, speech problems, anxiety, oppositional defiant disorder, and vision and hearing problems are the most common comorbidities [16,20].

3.2. The Specificity of ADHD in Adulthood

Increasing scientific evidence highlights that ADHD is often persistent into adulthood [12,21,22], and 60% of children with ADHD keep having significant ADHD-related impairments in social, academic, and occupational functioning as adults [23]. Although, it is still unclear how current diagnostic criteria capture adult ADHD complexity [21,24]. Currently, relying on the DSM-5, ADHD diagnosis between children and adults differs only in the number of symptoms shown [16]. Indeed, only five (and not six) or more symptoms are necessary to ADHD diagnosis in adults [16,17,23].

There are, though, different childhood risk factors associated with a more persistent course and, hence, with adult ADHD. Among these risk factors, higher levels of symptoms, comorbid oppositional-defiant disorder, lower IQ, and family socioeconomic disadvantage are the most important. Moreover, individuals with persistent ADHD had more functional impairment compared with those with remitted ADHD [25].

As introduced earlier, a very important topic about ADHD in adulthood is that it is undiagnosed and untreated due to lack of disease awareness, inadequate access to ADHD care, or use of diagnostic criteria before DSM-5 [23]. Nevertheless approximately 4.4% to 5.2% of adults between 18 and 44 years are affected by ADHD, fewer than 1 of every 5 of adult ADHD patients are currently diagnosed and/or treated for ADHD [25]. This condition leads to significant functional impairments and reduced quality of life [23,25,26].

In adults, ADHD is often in comorbidity with mood disorders, anxiety disorders, substance abuse disorders, impulse control disorders, learning disabilities, and sleep disorders. Additionally, with the implementation of DSM-5, autism spectrum disorder can be diagnosed as a comorbidity of ADHD [16,23,25].

3.3. Differences between ADHD in Childhood and in Adulthood

Even though childhood and adult ADHD patients exhibit related symptoms, there are differences between the two [27]. Specifically, adults with ADHD seem to be more characterized by inattentive symptoms than hyperactivity/impulsivity ones, which are more typical of childhood [19]. It is important to keep in mind that inattention at school age significantly predicts a lower rate of high school graduation, so early detection and intervention in young children before puberty is needed to offset possible adverse educational outcomes as they grow up [10]. Consequently, adults with ADHD typically unearth a history of academic underachievement, with early school dropout, addressing few or no qualifications, with bleak university prospects [7,9]. Persistent inattentive symptoms that are related to lower educational outcomes in childhood also results in unemployment in adulthood [8]. Assessing adolescents with a history of ADHD, they displayed poor read-

ing ability, completing on average 2.5 years less schooling than normal typical people in adulthood. Hence, adults with ADHD have a history of academic underachievement [7,26].

The reasons behind this evidence could be numerous. Among these, some studies found that adults with ADHD could be affected by cognitive deficits, especially in attention and memory domain [28,29]. Moreover, a strong correlation between ADHD and executive functioning impairment is also found [30,31], which could be a cause of academic problems [7,32] and occupational impairment [33]. In more detail, executive functions, metacognition, and emotional dysregulation seem to play a critical role in functional outcome.

3.4. Neuropsychological Profile of Adults with ADHD

Executive functions are defined as the ability to regulate behavior to context and maintain a response set [34]. The main executive deficits experienced by ADHD patients are response inhibition and stopping tasks, as well as also response speed, continuous performance task errors, and planning/organization, all of which represent common aspects in ADHD patients [7,34,35]. Moreover, adult patients with ADHD show more difficulties to represent tasks mentally and to select a strategy of problem solution [35,36]. Besides, adult ADHD patients meet more difficulties in the modulation of attention and in the selection of salient information [35]. In addition, among adults with ADHD, those with executive dysfunctions have also poor Theory of Mind abilities, which also impairs social skills [37].

A related aspect to executive functioning, and to cognition in general, that has been deeply investigated in adult ADHD is metacognition [29,38]. Metacognition refers to how individuals organize, control, monitor, and recognize their cognitive experiences [39]. Metacognition could be also defined as "thinking about thinking" or "knowing about knowing", referring to the understanding and regulation of our cognition [40]. It is deeply explored because it may affect a wide range of functional outcomes, including school and work performance as well as social functioning in various psychiatric disorders but also in healthy populations [41].

Metacognition encloses different cognitive processes such as self-awareness, self-monitoring, and self-regulation, impacting different aspects of life [29]. Adults with ADHD seem to be affected by a severe self-awareness deficit [28]. Butzbach et al. highlighted an interesting consideration in their research, comparing adult ADHD patients with a control group. Adult ADHD group showed impaired attention and memory cognitive domain, but they were not affected by executive functioning impairment. Even if ADHD adults did not show significant impairment in executive function tests, they rated their executive functions as impaired. Additionally, adult patients with ADHD could show a deficit in metacognition in the attentional domain, rating their performance better than it was. Concerning memory impairment, ADHD patients seemed to be aware of their underperformance [29].

When assessed with subjective and objective methods, adult ADHD patients show impairments in metacognition for self-reports (subjective) but not for self-evaluation of cognitive test performance (objective). Patients with ADHD experience problems in being aware of and reflecting on their own cognitive functioning (knowledge of cognition) [41].

Another relevant aspect to detect in adult ADHD is emotional dysregulation. Approximately 34–70% of adults with ADHD exhibit emotional dysregulation [23,27,42,43]. Next to the classic triad of ADHD symptoms (inattention, hyperactivity, and impulsivity), it is very important to pay attention to emotional dysregulation in these patients, which appears necessary to better understand the disorder, representing not only a component of the disorder, but a core symptom [44–46]. In this regard, Emotional Impulsivity (EI) and Deficient Emotional Self-Regulation (DESR) may be sufficiently specific for ADHD to function as diagnostic criteria [47].

Retz et al. had shown how adult patients with ADHD may report on mood swings, which switch more rapidly than in affective disorders. They also could have serious problems in dealing with stressful experiences and are easily irritated, getting angry for

trivial problems, and emotionally excitable. Interpersonal problems result from those emotional impairments [44,48].

Both executive functioning impairment and emotional dysregulation appear to be closely linked to the function of the frontal brain lobe [49]. Different studies have provided evidence that the disturbed prefrontal networks in ADHD patients are also involved in the regulation of emotions [44,50–52]. Moreover, emotional dysregulation in adult ADHD seems to be more frequent in combined-type ADHD patients, and to compromise the severity of the ADHD symptomatology and comorbid disorders, affecting quite negatively the most important domain of life activities [50,53]. Moreover, emotional dysregulation is often in strong association with anxiety symptoms, and comorbid anxiety and ADHD is associated with more emotional regulation problems than ADHD or anxiety alone [45,54]. In addition, experiential avoidance and cognitive-behavioral avoidance further explained the relationship between ADHD symptoms and emotional dysregulation. For these reasons, it is clinically important to take into account cognitive-behavioral avoidance, because it could be a predictor of comorbidity of ADHD with depression [45].

Emotional dysregulation gets worse, hence, social, occupational functioning, and educational history, so it is really important its identification and remedy [44,45].

4. The Impact of ADHD Neuropsychology on Learning and Occupation in Adulthood

In this section we point out the key role played by ADHD neuropsychology in adulthood, particularly by executive dysfunction, in affecting learning and occupational achievements.

Adults with ADHD: From Neuropsychology to Daily Challenges

The neuropsychological profile of adults with ADHD produces specific issues in their functional outcome. Among the domains affected by the condition, learning and working should be considered. In writing, reading, and numeracy, ADHD students are several years behind their peers. These gaps start from the primary school and represent a significant challenge for teachers and for the educational systems. In fact, without intensive intervention in secondary school, many students with ADHD are at risk not only of poor academic performance and reduced chances of college admission, but also of low job opportunities [55]. Moreover, academic underachievement has a negative influence in self-perception and future orientation [56].

As an individual with ADHD grows older, deficits in executive functions become more salient, producing impairment of sustained attention, working memory, and verbal fluency associated with consequent difficulty in handling large academic workloads, in addition to concentrating on tasks and managing the assignments, with a higher risk of school dropout [57]. At work, adults with ADHD are less employed, especially full time, change work more frequently than controls and manage to reach success only when their job does not require attention to detail [58]. The impairment in following complex instructions, in listening skills, and in tolerance to frustration leads to a higher turnover and to more frequent requests of professional interventions [59]. A common issue affecting both academic and professional achievements is represented by the difficulty of relating with others, who could in turn be peers or colleagues, due to the tendency to interrupt who is talking, low auditory attention, low social approach, behavioral impulsivity, and, when present, psychiatric comorbidities [26,60]. This could lead to a cognitive and social disengagement from childhood, potentially missing out on important experiences for positive interactions that could allow a better integration later in life in social contexts like classes and work [61]. In this regard, adolescence inattention, bullying, poor family management, and low socioeconomic status are other risk factors for academic underachievement in ADHD [62].

In this scenario, academic and social success during the early high school period is important to assure a long-term academic engagement and education attainment. Therefore, it is crucial that interventions should start early in a child's school life, requiring a

multimodal approach supported by a precise knowledge on the predictors of schooling success, in order to assure a positive quality of life [55].

5. Predictors of School and Occupational Success in Adults with ADHD

In this section we discuss the main predictors of school and occupational success in adults with ADHD. In particular, we deepen pharmacological, educational, and rehabilitative approaches by describing how they could improve the achievements of adult people with ADHD.

5.1. Pharmacological Approach

Central stimulants are considered the gold standard treatment in children with ADHD; nevertheless, some evidence of effectiveness in adults with ADHD are present. This pharmacological treatment reports good short-term efficacy for ADHD symptoms, both in children, adolescents, and adults [63]. Knowledge concerning the effect of continuous treatment from childhood to adulthood is limited. Although there is some evidence which suggests the beneficial effects of this treatment. A ten-year follow up study found that prior treatment with stimulants was associated with decreased risk for depressive, disruptive, and anxiety disorders, suggesting that stimulants have a protective effect against the onset of some psychiatric pathologies, and on functional and educational outcomes [64]. Other evidence suggests that using stimulants in childhood is linked with a reduction in the risk for subsequent drug and alcohol use disorders in adolescents and young adults [65,66], although this evidence is not accepted by everybody [67]. A recent review highlights that the use of stimulant medications in childhood lead to a reduction of risks for depression and bipolar disorder in adulthood. Additionally, the use of stimulants also mitigates criminality and substance use disorders among ADHD adults. Next to this evidence, stimulants have beneficial effects also on educational outcomes [68], improving reading and math skills [69] and decreasing school absenteeism [70].

Although recent studies have indicated that treated subjects with ADHD may have better long-term academic outcomes compared to those who are untreated [14], the link between stimulants and educational outcomes is unclear. In fact, ADHD symptoms represent only one of many factors contributing to academic difficulties in ADHD patients. Cognitive disabilities, executive dysfunction, learning disabilities, and social provenience are core features of ADHD patients' difficulties [71,72]. Scientific evidence highlights that neuropsychological dysfunction and ADHD symptoms in preschool have an additive effect on academic achievement in late adolescence [73].

Such evidence should not underestimate the importance of the effectiveness of stimulants on ADHD symptoms considering the critical importance of academic success for employment opportunities. In fact, the beneficial effects of stimulants in mitigating academic failure can have an important social impact. What all these studies share is the importance of treatment compliance in getting the improvements to be effective. According to this, it is essential to not underscore the importance of psychoeducation and compliance improvement interventions as part of any ADHD management [74].

5.2. Educational Approach

Besides pharmacological interventions, psychosocial ones are also essential to improve ADHD symptomatology and school outcome over time. Among these, educational, classroom- or school-based interventions are effective. Since ADHD is a severe mental disorder which involves disability, ADHD children need an individualized educational program. For this reason, child-specific solutions can be provided, such as reducing the number of homework assignments without decreasing their content, providing a quiet place to study, offering simple and clear directions for homework, modifying the test format, providing more time, and creating a parent-teacher communication notebook [13]. Also, peer-based interventions are effective in improving ADHD school outcome. These interventions are multiple. The first consists in peer involvement where peers facilitate each other's learning

through social interaction strategies. The second is peer-mediated intervention where a peer is selected and trained to provide instruction and facilitate change in the target child. Thanks to this strategy, social skills integration is improved. The third is peer-proximity intervention where a peer is chosen with increased skills to sit, for example, at the same table in the classroom [75]. Peer tutoring is also extended to parents. They are asked to tutor their ADHD child on oral reading tasks, finding that reading performance increased at home and at school [7]. Next to these types of intervention, different scientific studies have listed the main effective academic interventions for ADHD students [76,77]. Besides peer tutoring, they highlight task/instructional modification that involves manipulating tasks and instructions to meet the needs of the ADHD individual. For example, manipulation includes reducing task length, dividing it into sub-units, and providing explicit instruction. Intervention strategies could also involve identification and manipulation of environmental variables that influence child problem behaviors, or self-monitoring strategies to help the ADHD child to monitor his/her goals. Also, Computer Assisted Instruction (CAI) is a method that has demonstrated improvements in different school skills, such as mathematics performance. Other homework-focused interventions are useful in boosting the academic abilities of children with ADHD. The point of all these educational interventions is that they allow training, and maintaining cognitive and behavioral skills that improve the final schooling and work outcome, making them a good predictor of learning success.

5.3. Rehabilitative Approach

Next to pharmacological and educational interventions in childhood, rehabilitative strategies can also be used to reduce ADHD academic and functional problems in order to improve the final outcome in adulthood. However, in the literature there is the prevalence of studies focused only on learning positive results in childhood and preadolescence, with scarce attention towards the beneficial effects on adults. Nevertheless, some exceptions are present. For example, the use of a serious game, called Antonyms, seems to be useful to promote learning and autonomous management of impulsive behaviors, and to inhibit irrelevant thoughts in children with ADHD. This serious game resulted in enhancing self-regulation skills, waiting, reflecting upon a situation, and finding a not-intuitive solution [78]. Other studies have used Virtual Reality (VR) and video games to rehabilitate ADHD children [79,80]. It should be noted that these strategies have been studied on samples of children with ADHD. In light of their effectiveness, it could be assumed that by improving the child's academic performance, we might expect better functioning in the adult with ADHD. However, specific research assessing the long-term effects on learning and occupational outcomes could determine whether those rehabilitative treatments are predictors of better scholastic and professional success.

6. Interventions in Adulthood

As stated before, ADHD is not often diagnosed in adulthood. In this regard, approximately 4.4% to 5.2% of adults between 18 and 44 years are affected by ADHD, fewer than 1 of every 5 of adult ADHD patients are currently diagnosed and/or treated for ADHD. Adult ADHD symptoms are sometimes muddled with other psychiatric disorders [25]. This aspect represents an important clinical challenge. It is important to keep in mind that an effective treatment of adult ADHD improves symptoms, emotional lability, and patient functioning, often leading to favorable outcomes.

Executive dysfunction, metacognition impairment, and emotional dysregulation are the main areas particularly impaired in adults with ADHD. In this section, we deal with the principle intervention strategies for them.

6.1. Interventions for Executive Functions

As mentioned above, evidence showed that ADHD is associated with impairments of executive functions. The main impaired executive areas are response inhibition, vigi-

lance, working memory, and planning [81], and they seem to contribute significantly to occupational problems in adults with ADHD [33].

Some evidence shows pharmacological treatment is effective in improving executive functions in adults with ADHD [82,83]. For example, atomoxetine and methylphenidate could improve executive impairments in adults with ADHD [84,85], but this evidence is not totally confirmed [86].

In addition to medications, psychotherapy, and psychoeducational interventions are essential to manage executive dysfunctions in adults with ADHD. Cognitive-behavioral therapy (CBT) appears to be one of the most effective psychological treatments for ADHD [87]. In particular, CBT combined with medications has a more profound effect on executive functions in adults with ADHD [88].

Mindfulness training is increasingly considered an effective innovative psychosocial intervention for adults with ADHD. Mindfulness is defined as "the awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experience moment by moment" [89]. Different studies have found that mindfulness training can improve emotional regulation, working memory, cognitive inhibition, and performance monitoring [90–93]. These are all aspects that appear impaired in adults with ADHD. This evidence strengthens the hypothesis that mindfulness can be an effective psychosocial intervention for adults with ADHD to target core symptoms, such as inattention, hyperactivity, and impulsivity [94].

Another intervention strategy could help executive dysfunction is aerobic exercise. Albeit with limited evidence, it appears that exercise improves attention and processing speed in patients with ADHD, demonstrating that adults with ADHD may benefit from aerobic physical exercise [95].

Although this evidence is hopeful, further studies on executive function interventions in adult patients with ADHD are required for better management of the disorder. What appears evident is that executive dysfunction is common in such patients, impairing their cognitive, psychosocial, and occupational functioning.

6.2. Interventions for Metacognition Impairment

As previously discussed, metacognition is a deeply investigated area in adults with ADHD. Metacognition may affect several functional outcomes, ranging from performance at school and the workplace, to social functioning [96]. Considering the importance that metacognition has in daily life, it is useful to introduce some of the most effective metacognitive therapies in order to improve adult ADHD cognitive performances.

In metacognitive therapy, cognitive-behavioral principles are employed to provide contingent self-reward, to split tasks into more manageable and addressable ones, and to support motivation toward distant goals by visualizing long-term reward. This type of intervention appears to improve inattention symptoms. Metacognitive therapy provides significant benefit to adult patients with ADHD, concerning particularly inattention symptoms that reflect the specific functions of time management, organization, and planning, that appear to be the most impaired metacognitive function in these patients [97]. A similar psychosocial treatment is Metacognitive Therapy (MCT), useful to enhance the development of a general set of executive self-management skills. This therapy is effective on core symptoms of inattention in adult ADHD [98].

Another strategy that seems to be promising is cognitive-functional intervention for adults with ADHD (Cog-Fun A), a metacognitive-functional occupational therapy tool to improve occupational performance and quality of life in these patients. A pilot study of this intervention has been implemented and shows great possibilities for the treatment of this disorder [99].

To address metacognitive awareness, clinicians could also, for example, encourage patients pro-actively to reflect on their cognitive strengths and weaknesses. To facilitate this process, the clinicians could provide the patient with specific feedback on his or her cognitive performance so that the patient can adjust his or her assessment, as awareness of

one's deficits can be the first step toward an effective treatment trajectory. This indicates that feedback helps patients to engage in the self-monitoring aspect of metacognition [29].

Despite the evidence described, it should be emphasized that further research is needed to better understand metacognition in adults with ADHD in order to develop increasingly tailored and effective interventions.

6.3. Interventions for Emotional Dysregulation

Emotional dysregulation, as already stated, could be considered a core feature of adult ADHD, next to the three typical symptoms (inattention, hyperactivity, and impulsivity). For this reason, it is necessary to understand if there are and what are the most effective interventions to manage emotional dysregulation in adults with ADHD.

Different evidence highlighted that typical psychopharmacological treatment with stimulants and non-stimulants is effective also on emotional dysregulation symptoms [53,100–102].

Also, cognitive therapy can help adults with ADHD to recognize and label emotions accurately, to challenge emotions which are not context appropriate, and to cope with intense negative emotional reactions [103].

Different studies reported that cognitive-behavioral therapy (CBT) seems to enhance impairments due to emotional symptoms in adult ADHD [48,104].

In scientific literature the role of emotional regulation strategies is discussed. They are avoidance, suppression, and reappraisal. Avoidance strategy includes both cognitive strategies, such as denying or minimizing a crisis and its effects, and behavioral strategies, such as seeking alternative rewards or escape when faced with a stressor. This strategy is useful to alter the form, frequency, or situational sensitivity of difficult events [105,106]. Suppression is, indeed, a strategy that involves inhibiting external expressions of internal emotions. Finally, cognitive reappraisal is an adaptation strategy that involves constructing a potentially emotionally arousing situation so as to change its emotional impact [107]. Among these three strategies, avoidance seems to better mediate the relationship between ADHD and emotional dysregulation [46]. Moreover, also to manage emotional dysregulation, mindfulness meditation training appears to be effective [91].

As already highlighted for executive dysfunction and metacognition, emotional dysregulation needs further study to better understand how to treat it in adults with ADHD. In fact, although a lot of evidence confirms the close relationship between ADHD in adults and these three symptoms, there are not enough studies about the most effective intervention strategy to manage them.

7. Discussion

ADHD is a complex condition affecting the global functioning of people dealing with it. Even if it is a disorder widely explored and discussed, by analyzing the existing scientific literature some of its aspects still remain a challenge. With this study, we wanted to review the knowledge on the matter by starting from the point of view of health psychology, a discipline that works to ensure a positive quality of life with specific methodologies and tools [108]. As will be argued in the following paragraphs, despite the available evidence, some flaws can be still identified in the literature.

After a careful analysis of the collected studies, it should be noted that there is no equal attention towards all categories of patients suffering from ADHD. Indeed, when attention is shifted to adults, the long-term consequences of ADHD on global functioning are partially defined. As known, considering the socioeconomic and clinical burden of ADHD in adulthood, it is crucial to improve the scientific knowledge on the disorder at any age to timely diagnose it and effectively intervene [109], so more studies on the topic are needed.

According to the evidence we analyzed, the state-of-art about ADHD in adulthood highlights that the triad symptomatology (inattention, hyperactivity, and impulsivity) is common between childhood and adulthood, but inattention appears to be more common in the latter [110]. As underlined in the review, this is the reason why adults with ADHD

typically carry out a history of academic failures, with worse occupational and social functioning [111]. Despite its importance, this area of research seems to be very specialistic and little considered. We believe that educational processes are of great impact to the overall quality of life, so more attention on this topic is desired. This is particularly urgent even in consideration of the ongoing pandemic, which has already brought on its own consequences on schooling and learning strategies as documented by many studies [112,113].

This is why our work tried to go deeper in epidemiological data by taking into account the core mechanisms responsible for the scholastic outcome. More in detail, in adulthood it is possible to detect some typical aspects of the disorder like executive dysfunction, metacognition impairment, and emotional dysregulation, which could be considered as central symptoms of ADHD in adults. In particular, adults with ADHD experience deficits in response inhibition, planning, problem solving, modulation of attention, impulsiveness, self-monitoring, and emotions management, leading to worse social and work skills [114]. On this point, more studies conducted in real-life contexts would help identify more precisely how those neuropsychological impairments result in academic and job inefficacy.

Moreover, our review highlighted the lack of studies supporting specific preventing strategies to avoid such scenarios. First, there is little evidence about predictors of school and occupational success of adult patients with ADHD. This means that it is difficult to intervene from an early age by following therapeutic strategies whose long-term effectiveness on schooling and work is demonstrated. Secondly, even in the case of some evidence, the findings are incomplete. This is the case, for instance, of a timely and long-term use of stimulants and non-stimulants, which decrease the other psychiatric disorders' comorbidity and help the patients to reach a better long-term academic outcome [115]. Nevertheless, the link between stimulants and educational outcomes is still unclear for two main reasons: (1) there is little evidence about the efficacy of ADHD childhood pharmacotherapy in adulthood; (2) a lot of adults with ADHD remain untreated, or they are treated for other psychiatric disorders.

Similar considerations should be set forth regarding the strategies to manage the core symptoms of ADHD in adulthood for improving school and work success. Even if CBT psychotherapy and psychosocial interventions are effective [116,117], much work should be conducted to define precise protocols tailored for learning challenges at that age.

Despite all this evidence about impairment caused by ADHD in adults, it would be important to underline the positive aspects and strengths of these patients to move away from a deficit-focused view of mental health and towards approaches that are more empowering, strength-based, and capable of emphasizing positive aspects of human functioning [118].

These positive aspects are often undervalued in ADHD, but they could represent important allies in the management of the disorder. Among them, mental imagery, that is the ability to manipulate or generate mental images on a visual and spatial basis, and creativity have been studied. Some evidence shows that ADHD patients have great creativity skills [119], and particularly adults with ADHD show more real-time creative achievements than adults without ADHD [120].

The benefit of introducing evaluation of positive aspects such as creativity and mental imagery into the diagnostic process of adults with ADHD would be essential to be able to improve the treatment, taking into account patient's strengths, and not only deficits. In this regard, during psychometric assessment, tools useful to evaluate those positive aspects should be introduced. For instance, Mental Imagery Test (MIT) [121] allows for an in-depth assessment of visual mental imagery ability, giving indications of the subject's functioning that can be easily translated into skill recovery and enhancement plans, cognitive stimulation, or other habilitative and rehabilitative treatments that make use of mental imagery support. A limitation of this tool is that it is validated only for children and the elderly without cognitive impairments. For this reason, an MIT validation on a sample of adults—even with ADHD—would be a useful development for future research.

To conclude, what emerges is that the literature is severely lacking on the effects that ADHD in adults can generate in terms of school and work success, and that data on prevention and intervention strategies are scarce, as well as those referring to strength-based approaches. In this category of patients, schooling outcome is the last result of a more complex interaction between several factors, such as early pharmacological treatment, educational support, neuropsychological intervention, and targeted strategies for life-long learning. Each of those components deserves attention and care. For this reason, future research should address the necessity for further studies on adults with ADHD to meet their educational and occupational needs.

8. Conclusions

This review puts some firm points on the topic of the effects of ADHD on adult educational and vocational outcomes, and their effective management. However, it is hoped that more contributions will fill the gaps found. For ADHD to remain just a neurobehavioral condition to be handled, its effects on daily functioning need to be identified and reduced. This and other goals for a positive quality of life should be answered by future research.

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