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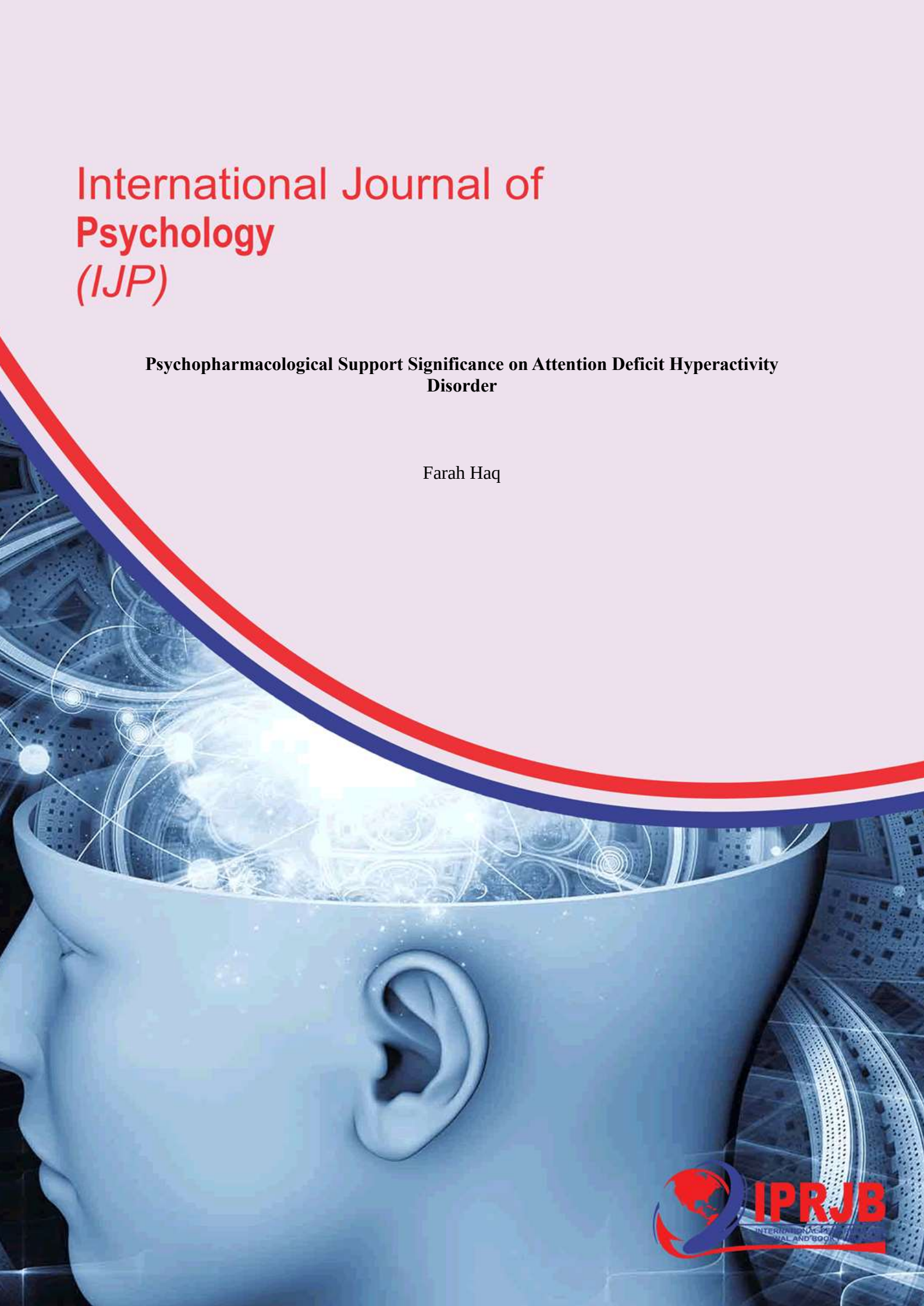
Farah Haq



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[1*]Farah Haq
Department of Psychology, California Southern University, USA

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Abstract

Purpose: This paper explores Attention-Deficit Hyperactivity Disorder (ADHD), focusing on its treatment approaches, based on its multifaceted etiology, and symptomatology.

Methodology: Literature review of current research on the topic was selected as the methodology for the paper. Drawing from an extensive current and peer reviewed articles, the study examines genetic, neurological, environmental, and sociocultural influences on ADHD. Psychopharmacological treatments, particularly stimulants like Methylphenidate, are identified as highly effective, along with considerations for potential side effects and misuse. Alternative therapies such as Acetyl-L-Carnitine, Cognitive Behavioral Therapy (CBT), and Sensory Integration have also been examined through the review process.

Findings: With the help of an exhaustive review process, the paper initiates a discussion for the complementary and possibly influential elements for creating a best support system for ADHD. Findings also lead to research gaps due to the limited data on working memory dysfunction, maternal stress impacts, and neurofeedback interventions, alongside inadequate exploration of diet-based treatments. Key findings emphasize the importance of combining pharmacological and behavioral therapies to address ADHD's cognitive, emotional, and behavioral dimensions. While genetic predispositions play a significant role, sociocultural contexts and environmental factors critically influence symptom expression and management.

Unique Contribution to Theory, Practice and Policy: The findings of this review underscore several important recommendations. There is a clear need for culturally adaptive and holistic treatment strategies to address ADHD effectively. Future research should prioritize the expansion of evidence-based approaches, investigate neurodevelopmental connections more deeply, and enhance the accessibility of alternative and integrative treatment options.

Keywords: *ADHD, DSM-V-TR, ICD-10, Psychopharmacology, Cognitive Behavioral Therapy, Working Memory, Neurodevelopment*

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INTRODUCTION

Explorations of mental disorders, is perhaps the most intriguing aspect of the field of Psychology. Such explorations involve a thorough investigation on unique life experiences, biochemical balances, environmental impacts, genetic history tracings, and pharmacologic influences. Attention-Deficit/Hyperactivity Disorder (ADHD) was chosen to illustrate and explore multiple factors that define and describe the disorder, with especial focus on psychopharmacological support significance.

Definition and Description

Huang-Pollock et al. (2020) has defined Attention-Deficit/Hyperactivity Disorder (ADHD) as an inability to sustain focus, uncontrollable restlessness, easy distraction, and being prone to impulsive behaviors. Usually, it is diagnosed in childhood, but may have variations of symptoms around restlessness, distraction, and impulse control challenges in adulthood as well. It can be environment or genetically based, but situational stress or conflict can potentially make its symptoms even worse (Huang-Pollock et al., 2020).

A typical ADHD behavior has been described as uncontrolled restlessness while having a generally slower response towards collecting data to make well-informed choices (Wells et al., 2020). This unique combination of restlessness, and slower pace for response, result in impulsivity or challenges with emotion recognition or regulations.

Austin and Zupanick (2020) has described the most common ADHD behavior patterns as follows;

- Extreme excitability;
- Low tolerance for frustrations;
- Lack of patience towards peers;
- Inconsistency meeting goals or responsibilities;
- Risk taking behaviors;
- Social immaturity.

The current study aims to delve into the multifaceted causes of ADHD and examine the intricate interplay of its symptoms. By exploring these complexities, this research seeks to provide a deeper understanding of the condition while critically evaluating the effectiveness of available treatment options.

Statement of the Problem

According to Diagnostic and Statistical Manual of Mental Disorders-V-TR (American Psychiatric Association, 2022), the prevalence of ADHD in most cultures of the world is around 5 percent in children and 2.5 percent in adults. However, the sociocultural aspect of the disorder is unique, based on different interpretations, and acceptance levels of the support network around the ADHD diagnosed individual. Johnston et al. (2016) has further explored the symptomatic behavior around patterns of inattention and hyperactivity, where impulsivity may be manifesting itself in different ways based on the environment, and cultural pressures.

The sociocultural context of the disorder is crucial when considering the risk-taking behaviours, or distress tolerance skill challenges. Many cultural studies have shown that community and familial support impact the reporting of the ADHD behavior. The sociocultural

perspective also provides an initial recognition and tolerance for the behavioral challenges faced by an ADHD child (Huang-Pollock et al., 2020).

Narimoto et al. (2018) has explored venues to understand the neurological underpinnings of ADHD. The visuospatial memory performance of the individuals, mostly children, have been described as mostly lowered than with individuals or children who do not have the disorder. It was recognized that lack of cognitive retention in children with ADHD was due to not only inefficient use of learning markers when rehearsing for a task, but also to the fast deterioration of memory traces (Narimoto et al., 2018).

.Some of the research gaps that have been identified with the review, were based on the limited availability of scientific data on ADHD memory dysfunctions and possible connections to its etiology, genetical influences, and impact of maternal stress on memory blocks deterioration. Perhaps the most significant research gap can be seen in the lack of peer reviewed and current scientific data on the neurofeedback methodology and diet-based ADHD treatment plans.

The research-based studies like Huang-Pollock et al. (2020) and Narimoto et al. (2018) have enhanced awareness of the inter-connectedness of various elements on ADHD treatments. An attempt has been made to address these elements like the significance of socio-cultural perspectives towards the disorder and functionality patterns of ADHD.

LITERATURE REVIEW

Shephard et al. (2018) has examined the challenges faced by young individuals with ADHD around acquisition and processing of cognitive functions. The medically based study showed lower neurophysiological ability in ADHD brain, especially in fronto-central and parietal regions (Shephard et al., 2018). These finding suggest a marked distinction between ADHD brain and other; where there is predominance of risky behavior and inconsistencies around limits or boundaries.

Kofler et al. (2020) has also provided comprehensive details on workings of short-term memory and possible deficits for ADHD brain. The study findings were very interesting on the basis that short-term memory functions were found intact and normal in ADHD brain; but the working memory functions were impaired. It was postulated that symptoms of ADHD were more related to the impaired working memory issues than anything else (Kofler et al., 2020).

The idea of challenges with working memory, cognitive functioning, and attentional selection of ADHD brain has been the subject of many neurological research studies. Carr et al. (2010) concluded that there is a difficulty in the last stage response inhibition in ADHD brain when compared with other subtypes of the disorder like Attention Deficit Disorder (ADD) brain functions. The study demonstrated the value of poor performance as compared to cognitive controls. Thus, putting forth the argument that for a correct focus on ADHD brain it is important to consider both cognitive and neurobiological profiles of symptomology (Carr et al., 2010).

Grimm et al. (2018) has done an exhaustive research on the role of genetics on ADHD. The research concluded that there is a strong genetic connection on the etiology of ADHD. The replication of neurotransmitter receptors and signalling, along with synaptic signaling during neurodevelopmental phase was contributed to the heritability factor (Grimm et al., 2018). However, it is important to note that in spite of the strong genetic influence, the study falls short on identifying the genetic risk factors that may help in exploring the ADHD links to neurodevelopmental phase of the brain.

LaBianca et al. (2018), while exploring the epigenetic correlation of ADHD behavior patterns, found out that children with ADHD, carrying a copy-number of genetic and epigenetic variants, seem to have more adult life mental health challenges. Thus, they pointed towards the value of early diagnosis, and timely interventions that may relieve some of the challenges for ADHD adults.

Taylor et al. (2013) in their research study, have highlighted the environmental factors that can have significant underpinnings on ADHD along with the genetical influences. External factors such as socioemotional dispositions, daring, or negative emotionality experiences, were considered as having an impact on ADHD symptoms, especially in children.

A literature review conducted by Markham and Spencer (2022) have pointed towards the relationship between the home environment, socio-economic status, and the experiences of ADHD challenges in children. Nguyen et al. (2018) has researched the correlation between school engagement, community influences, and the development of ADHD symptoms. The research has explained the direct connection between the school age experiences of stress or other-wise on the mental health of children. The conclusion of the research signified the value of environmental safety in reducing the symptoms of ADHD.

Another very important environmental factor, to be considered for understanding ADHD behavior, is the issue of historical mental illness in the family of origin. Septier et al. (2018) has researched the shared effects of genetics and home environment where there are other individuals dealing with the mental health challenges. According to Septier et al. (2018), there is a significant connection in the ADHD behavioral patterns of children in such households.

On the other hand, Mahdi et al. (2018) in their international clinical study, on the temperaments, social skills, and experiences of early life trauma; have found the common challenges with attention and hyperactivity that is regardless of particular cultural components. The study sheds new light on the universality of the ADHD symptoms, and points towards the need for a comprehensive yet culturally focused treatment strategies, that would include therapeutic and psychopharmacological interventions.

.The review has revealed certain significant overlaps in the findings of the selected research studies. Studies conducted by Grimm et al. (2018) and LaBianca et al. (2018) have come together to emphasize the fact of epigenetic correlations with ADHD behavior patterns and adult life mental health challenges. While Septier et al. (2018) further strengthened their findings with the addition of environmental factors with the histories of mental illnesses within the families.

Treatment Part-1

There are several options available for the treatment and management of the ADHD symptoms. Psychopharmacological support is considered to be the most crucial part of the ADHD treatment. There are many research studies debating the role of stimulants and non-stimulant for the treatment. However, stimulants are more popular than any other prescription drug for ADHD. A large number of individuals do improve their symptoms when using the stimulants (Benson et al., 2018). In fact, the use of stimulants is so prevalent that the study has cautioned against its probable misuse, especially in the college students. The promised high cognitive functioning seems to be the main reasoning behind the possibility of misuse of stimulants.

Taipale et al. (2024) when conducting a cohort-based research on the ADHD medications and their effects on the mental health; have pointed towards the positives of both stimulants and non-stimulant medications. The interesting point to note here is that these latest findings are not against the benefits of the stimulant treatments. Instead, these are adding to the efficacy potentials of all possible treatment strategies.

Brown and La Rosa (2002) has talked about adding tricyclic antidepressants to stimulant treatment when children are showing comorbid symptoms of anxiety and emotional unease. Such combinations seem to be more helpful than basic stimulant treatments. A comparative study between treated and untreated ADHD children showed a marked reduction in the symptomology of children who have been given a complex pharmacologic treatment (Semrud-Clikeman, et al., 2008).

Helseth et al. (2015) has provided details of positive results in school age children when given psychopharmacologic treatment of methylphenidate on regular basis. Johnston and Leung (2001) have further expanded the treatment-based attributions to ADHD symptoms. The remarkable result of pharmacologic and behavior treatment on ADHD children, is their resistance towards the peer pressure, and a better show of control towards the emotional stimulus. The positive impact of a well-treated child on the functioning and health of a family has described as a resource for the continued support and improved behavior for the child.

A comparative clinical study was conducted between Acetyl-L-Carnitine (ALC), Methylphenidate (MPH), and placebo (Abbasi et al., 2011). The study revealed that ALC can be equally effective for the treatment of ADHD symptoms with lesser side effects than MPH. But the lack of research for ALC treatment advise caution when considering it as an alternative.

In a recent evidence-based study, Mechler (2022) have pointed towards the interindividual and intraindividual symptomology aspects of ADHD that adds complexity to the treatment claims. The relatively large effect size, in short term trials, has been identified as the main factor contributing to the need for a novel and improved pharmacotherapeutic strategy. Interestingly, these complex findings show up for all available medicines that include stimulants like methylphenidate and non-stimulants like atomoxetine (Mechler, 2022).

Barbuti et al. (2023) have highlighted the considerations for treatment challenges for the clinician especially when dealing with a varied population mix. Individuals diagnosed with ADHD may have the comorbidity of substance use disorder (SUD), which in turn can impact the efficacy of pharmacotherapeutic treatments. They (Barbuti et al., 2023) have further explored these challenges by adding both stimulants and non-stimulant to their research. With simulants there is the possibility of increased dependency on the medication with the escalated addictive behavior patterns, while the non-stimulants-based treatment may not be effective enough for chronic ADHD behavior challenges (Barbuti et al., 2023).

Treatment Part-2

Smith et al. (2000), has emphasized the value of combining the pharmacological treatment with therapeutic behavioral therapy interventions for continuous relieve of ADHD symptoms. Cognitive behavioral therapy interventions along with psychoeducational support, and parental validation would offer a comprehensive support for individuals who are already on psychopharmacological treatment.

There have been many studies showing the benefits of Cognitive behavioral therapy (CBT) treatments. Halldorsdottir and Ollendick (2016) have examined CBT interventions like cognitive challenges, and thought redirections; and have described these as the best ADHD therapeutic treatment tools.

Sprich et al. (2016) has broken down the CBT interventions into seven modules;

1. Initial goal identification.
2. Provision of an unbiased and accepting environment.
3. Addressing distractibility through cue-control processes. In case of children, therapeutic board games to promote learning cues, can be used.
4. Step by step breaking of procrastination, thought adoption, and attention challenges.
5. Relapse prevention, through positive reinforcements for staying persistent with newly learned coping skills.
6. Group or family sessions between patient and care provider sessions.
7. Care provider support sessions.

For children dealing with ADHD, CBT treatment that includes parental psychoeducational support would be essential to enhance the feelings of validation for their efforts while providing care to their children. Wong at al. (2017) has talked about the CBT support group for the parents of ADHD children. The enhanced parental self-efficacy, and normalized cognition patterns achieved through CBT parental group, would offer a more practical and timely support for the children with ADHD issues.

Adolescents with ADHD usually have two dominant behavioral challenges; namely difficulty planning around social or school activities, and staying motivated to use coping skills to manage the symptoms. Boyer et al. (2014) has talked about two CBT modalities to address these ADHD challenges. Solution focused therapy (SFT) module, and plan my life (PML) module, provide the step-by-step therapeutic support to adolescent to help them in not only planning their activities, but also to bring the sense of control in maintaining their levels of motivation towards positive change.

The evidence-based CBT treatment also provide the radical reality acceptance to adults with ADHD to promote thoughts of engagement to tasks, and lesser triggers for avoidance skills (Ramsay, 2017). A meta-analysis of CBT treatment also explored the significance of identifying the positive change in adult ADHD, with the construct that it supports the CBT therapist to continue to reinforce the successful skills and focus on expected behavioral responses (Knouse et al., 2017).

An important aspect of comprehensive ADHD treatment is the careful consideration for the diet for children with ADHD. Heilskov Rytter (2014) has provided details of the elimination diets and fish-oil based diets in reducing the ADHD symptoms for children. However, the lack of comprehensive research puts limitations to the diet-based ADHD treatment. But it does offer consistent positive short-term results for children with ADHD.

Tzang et al. (2019) has also described another alternative therapeutic treatment for ADHD, as Sensory Integration Therapy. According to the study, the particular treatment method is significant for those ADHD children who show comorbidity for other psychiatric disorders. The treatment offers interventions around regulation of sensory motor skills, and other related cognitive difficulties that the child dealing with comorbid issues may experience.

Shrestha et al. (2020) have emphasized the need for non-pharmacological treatments when addressing various levels of ADHD symptom severity. Factors such as physical discomfort, psychosocial challenges, environmental biases, and the potential side effects of medication have been considered to evaluate the available support for individuals with ADHD. Their findings highlight the complexity of non-pharmacological treatments. According to Shrestha et al. (2020), these treatments are often used alongside pharmacological support and have generally yielded positive results. The severity of ADHD symptoms is typically influenced by unique factors, including cultural perspectives, environmental conditions, comorbidity patterns, and situational challenges (Mahdi et al., 2018). Additionally, the clinician-client relationship plays a crucial role in addressing individual severity levels of ADHD (Tzang et al., 2019). Therefore, a combination of medication and therapeutic interventions offers the most promising approach for managing the diverse severity levels experienced by individuals with ADHD.

Cherkasova et al. (2016), while comparing the efficacy of CBT modules in medicated and unmedicated individuals, have highlighted better outcomes in those receiving medication. However, these outcomes may change over time with follow-ups. This finding points to a research gap that future ADHD studies could address. Additionally, there is a significant need to better understand CBT modules and their efficacy to tailor them to the interindividual and intra-individual needs associated with ADHD.

In recent years, many studies have provided valuable insights into CBT modules and their potential for treating ADHD symptoms. Lopez et al. (2018), in their comprehensive research study, examined various levels of ADHD symptom improvement achieved through CBT treatments. However, a research gap persists regarding the selection of specific treatment modules based on factors such as age or gender.

Limitations and Research Gaps

Considering the latest trends in psychotropic and psychotherapeutic treatments for the mental disorders; there is limited research on the results of alternative methods of ADHD treatments. DuPaul et al. (2018) has described the possibility of on-line behavioral parent training to better support their ADHD children. The on-line parent training could be great for parents who are busy and struggling to learn how to best support their children with ADHD symptoms. Unfortunately, there is very little evidence-based data available to make it viable options for the ADHD treatment. The limitation of the information can be a source of frustration for the professional trying to offer the best possible support to the ADHD child or the family.

Perhaps, one significant research gap in the ADHD treatment is the lack of focus on the functioning of working memory. It has been proven through various research studies that most of the challenging ADHD behavior stem from the under functioning of working memory. Chacko et al. (2014) has pointed towards the lack of therapeutic and pharmacological treatment interventions to address the other venues of brain functioning that may be impacting the working memory of an ADHD brain.

Nahum-Shani et al. (2020) has talked about the lack of comprehensive data on the outcomes of even the most prevalent treatments. Absence of information on the efficacy of the adoptive interventions, poses pressure and hesitations of use for the treatment providers like family therapists, or psychologists. There has been a lot of solution focused dialogue between professionals around the possible efficacy of adoptive CBT interventions that may be very

successful for the ADHD treatment. But the lack of clinical research to back these adoptive interventions, make most of the care providers reluctant to utilize the adoptive interventions.

There is another obvious research gap around the relationship implementations between the children with ADHD and their mothers. Häge et al. (2018) has explored the possible impact of maternal stressors on the behavioral patterns of ADHD children. It has been argued that there may be a direct correlation between the maternal abilities and challenges for ADHD children. It is also important to note the limited data around maternal stressors, or maternal dietary issues that may affect the fetus and may result in ADHD behavior patterns for the child.

The increasing need for an optimal treatment plan to address ADHD symptoms, has also resulted in the escalated consciousness about the lack of certain evidence-based information. Perhaps, the most significant research gap can be seen in the lack of comprehensive information about the potential of neurofeedback methodology. According to Pakdaman et al. (2018), there are studies that are studies have been conducted to address the gap. However, not enough data has been generated to conclusively understand the efficacy of neurofeedback methodology. The clinical trials for the neurofeedback methodology offer successful future results for the treatment of ADHD symptoms and behavioral challenges. But there is not a whole lot of research that has been done to show its significance when used along with psychopharmacologic methods of treatment. Pakdaman et al. (2018) has discussed the possible positive outcomes of neurofeedback when applied on the children who have been taking Ritalin. The controversial use of Ritalin, and the clinical trial behind its effectiveness, can be researched through neurofeedback-based assessments. The efficacy of neurofeedback is also proven to be highly successful for the parents who do not favor psychotropic treatment for their children' s ADHD issues.

Tamm et al. (2017) has examined the clinical trials for alternative psychopharmacologic treatment approach for ADHD children. There is very little scientific data available to explain the neurobiological connections between cognitive abilities and ADHD behavior patterns. The trials have highlighted the limitation of the scientific knowledge on the connection of reading abilities and challenging behavioral issues of ADHD children (Tamm et al., 2017). One can only hope that with the future research studies, the gap will be filled to offer a more comprehensive understanding of the disorder.

Conclusion and Future Considerations

Evidence based disorder therapy approaches can lead to the eventual ideal treatment that may provide a complete cure for ADHD related challenges. The prospect of success of the disorder focused treatments is tremendous, especially when considering the fact that most children with ADHD have the comorbid symptomology of anxiety, oppositional defiance, or other related disorders.

Keeping in mind all the evidence-based studies, and scientific advancements, it will be safe to surmise that a new understanding of the disorder is emerging. The future pharmacologic and therapeutic advancements will lead the professionals and care providers to offer comprehensive treatment approaches for the disorder. As DuPaul et al. (2018) has pointed out that for an ideally successful treatment, we need to look beyond the current approaches and belief patterns to offer long term intervention support, and possible complete cure from the disorder.

. Perhaps, the most significant contribution of the current study lies in its creation of optimism that a better more personalized treatment plan is possible. It seems that a combination of psychopharmacological support along with psychotherapeutic interventions can provide the best treatment for ADHD symptom management. The study has also been able to identify certain research gap that may offer future researchers to path to improve upon the current knowledge about the ADHD etiology and symptoms.

An integrative approach combining psychopharmacological treatment with evidence-based psychotherapeutic interventions holds significant promise for addressing ADHD. Studies suggest that this dual approach not only improves symptom management but also facilitates the development of long-term coping skills and resilience. The inclusion of complementary methods such as mindfulness-based cognitive therapy and neurofeedback has gained traction in recent years, although further research is needed to substantiate their efficacy. Tailoring treatment plans based on an individual's developmental stage, cultural context, and comorbid conditions will likely enhance the therapeutic outcomes. Moreover, leveraging advancements in digital therapeutics, such as mobile apps and virtual reality for ADHD symptom tracking and management, could pave the way for accessible and personalized care.

To bridge the existing research gaps, there is a pressing need for multidisciplinary collaboration among psychologists, neuroscientists, educators, and pharmacologists. Future studies must delve deeper into the neurobiological underpinnings of ADHD, focusing on areas such as executive function, working memory deficits, and emotional regulation. Additionally, longitudinal research is crucial to understanding the long-term impact of combined treatment modalities, particularly for understudied groups like adults and minority populations. Integrating caregiver education and community-based support programs will further bolster the effectiveness of ADHD treatment, ensuring that it caters to the holistic needs of individuals and their families. As research evolves, a more nuanced understanding of ADHD will emerge, fostering innovation in both therapeutic and preventative strategies.

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