THE ASIAN EDUCATIONAL THERAPIST

ISSN: 2972-4104, Volume 2, Issue 3, Page 34 - 41

EDITORIAL ARTICLE

Unveiling ADHD: Exploring the Biological, Psychological and Social-Emotional Dimensions

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Article DOI: https://doi.org/10.64663/aet.40

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Cite as: *Tan, V. L. (2024). Unveiling ADHD: Exploring the biological, psychological and social-emotional dimensions. The Asian Educational Therapist, 2(3), 34-41.*

ABSTRACT

This article is an exploratory journey of the author in her personal attempt to know and understand the enigmatic condition of the attention-deficit/hyperactivity disorder (ADHD) through three dimensions - biological, psychological and social-emotional - based on the Biopsychological Model. In the biological dimension, the author touches on brain structure and connectivity as well as neurochemical balance. As for the psychological dimension, the author focuses on the way of thinking, emotions, and related psychological disorders. Lastly, in the social-emotional dimension, the emphasis is on social interaction during the childhood period and also social interaction during the adulthood period. Hence, according to this model, ADHD is best known and understood through these three dimensions.

Keywords: *Attention-deficit/hyperactivity disorder (ADHD), Biological dimension, Biopsychological Model, Psychological dimension, Social-emotional dimension*

1. INTRODUCTION

Attention-Deficit/Hyperactivity Disorder (ADHD) has become more prevalent worldwide and the symptoms would exist during childhood and persist into adulthood. ADHD is often defined as the inability to sit still, pay attention, and act without thinking. Consequently, individuals with ADHD may face unfair treatment, as they are perceived as disobedient, disruptive, and lazy. However, our understanding of them may be incomplete without identifying the underlying issues that affect their daily

functioning. Therefore, in this paper, I would like to discuss about how these three dimensions (biological, psychological, and social-emotional) are correlated with ADHD's symptoms (inattention, hyperactivity, and impulsive) using the Biopsychosocial Model (BPSM) (Delfos, 2004).

First, let me start by explaining what ADHD is. ADHD is a condition that impacts an individual's behaviour in multiple settings such as at home or in school. According to the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5), individuals with ADHD will show persistent pattern of inattention and/or hyperactivity-impulsivity that impacts daily functioning (American Psychiatric Association, 2013). To diagnose ADHD, an individual must exhibit six or more symptoms persisting for at least 6 months, which significantly impact social-emotional, academic, or occupational activities. ADHD is classified into three types: combined presentation (individuals met the criteria for inattention and hyperactivity-impulsivity for the past 6 months), predominantly inattentive presentation (individuals met the criteria for inattention but not hyperactivity-impulsivity for the past 6 months), and predominantly hyperactive/impulsive presentation (individuals met the criteria for hyperactivity-impulsivity but not inattention for the past 6 months).

Based on National Institute of Mental Health (2023), inattention refers to an individual's difficulty in paying attention, sustaining focus, and organizing their work. Hyperactivity is when an individual moves around constantly and is unable to sit still, regardless of any situation, or talks excessively and appears restless. Impulsivity is when an individual acts without thinking or has difficulty exercising self-control to delay gratification. An impulsive individual would also make decisions without contemplating the long-term effects.

Back to the main topic, what is the Biopsychosocial Model (BPSM) as put forth by Delfos (2004) in relation to ADHD? As the name suggests, it takes into account the interrelationship of biological, psychological, and social-emotional factors that affects an individual's experiences and behaviors (Engel, 1977). It is not necessary for all individuals with a disorder to be affected by these three domains; but we need to consider the possibility of these three domains contributing to the dysfunction of the individual. In BPSM, we are more focused on how biological, psychological, and social-emotional dimensions contribute to the disorder. However, in this paper, I will also focus on how the disorder could impact biological, psychological, and social-emotional dimensions in daily functioning.

2. BIOLOGICAL DIMENSION

2.1 Brain Structure and Connectivity

One of the major issues that will impact ADHD individuals is executive functioning. Executive functioning is a set of mental skills that includes working memory, flexible thinking, and self-regulation (Belsky, 2023). It helps the individual to manage daily activities such as time management, planning, and problem-solving. The abnormal functions in several parts of the brain would affect executive functioning, especially the prefrontal cortex that plays an important role in regulating the mental skills. Based on Wilkins and Nikolaidis (2024), research has shown that the prefrontal cortex of the children with ADHD would mature slower than typical children. The size of the brain regions would also impact on the cognitive functions. For instance, a smaller cerebellum would lead to difficulty with motor response inhibition, which means the ability to restrain actions that will disrupt current task, such as remaining seated during class, whereas a smaller hippocampus and amygdala would affect the regulation of memory, emotion, and behaviour. Therefore, individuals so affected might have a poor memory, experience emotional disturbance, and behave inappropriately in public.

Individuals with ADHD have shown irregular activity in the brain regions involving motor, cognitive, and emotional regulation. The Default Mode Network (DMN) was found to be overactive in ADHD brains especially when performing a task (Wilkins & Nikolaidis, 2024). Presumably, DMN would be less active

when performing a task requiring attention, and more active during daydreaming. This explains why children with ADHD have trouble focusing in the classroom, and displaying a blank mind most of the time. DMN is also related to Task-Performing Network (TPN) that helps to perform attention-demanding tasks (Wilkins & Nikolaidis, 2024). In functional connectivity (brain areas that are connected if the functional behaviours are correlated with each other), DMN has reduced negative correlation with TPN due to weakened connectivity that causes inattention in a goal-oriented task. This may be observed in children with ADHD, who may 'wander' while doing schoolwork. Due to the irregular connectivity in selective visual attention system (ability to determine the important visual things to pay attention), children with ADHD would look at irrelevant things around them that makes it hard to focus on the correct task.

2.2 Neurochemical Balance

Neurochemical imbalances in the brain could contribute to the onset of ADHD symptoms. In normal function, the neurotransmitters which are the chemical messengers would be in charge of allowing the messages to be passed along the neurons so that the brain could send and receive the messages throughout the body (Wilkins & Nikolaidis, 2024). The neurotransmitters that bring significant influence on ADHD symptoms are dopamine and norepinephrine.

Dopamine is a neurotransmitter that plays an important role in ADHD symptoms as it influences learning and motivation by providing the feelings of pleasure or satisfaction (Sikström & Söderlund, 2007). Tokko et al. (2022) found that due to the genetic makeup of an individual with ADHD, the dopamine activity has decreased significantly. Individuals with ADHD usually have at least one defective gene, such as the DRD_2 dopamine receptor gene that makes it difficult for neurons to respond to dopamine (Blum et al., 2008). This abnormal function in the brain leads to insufficient amount of dopamine that would be used in dopamine receptor sites to produce pleasure feeling. Therefore individuals with ADHD may be especially sensitive towards the stimuli that could lead to dopamine release such as binge eating and alcoholism, believing that engaging in these risky behaviours could increase their satisfaction. But in fact, such behaviors put the individuals affected at risk as they are overstimulated and unable to think rationally.

Norepinephrine (NE) also plays an important role in ADHD symptoms, especially in the fight-or-flight response, attention, as well as executive functioning. Research has found that ADHD affects the proper functions of NE. The lower levels of NE impairs inhibitory control, thus impairing the ability to suppress distractions, wills, or behaviors that interfere with goals set earlier (Brautigam, 2023). It shows that abnormal transmission of NE in the brain could lead to impulsivity as the individuals do not think carefully before making decisions. For instance, when they are triggered, they might respond aggressively without considering the consequences.

3. PSYCHOLOGICAL DIMENSION

3.1 Way of thinking

In the inattention aspect, individuals with ADHD would have challenges focusing on a boring task or have difficulties starting and finishing the tasks given (Dodson, 2024). It might be due to sensory 'overload', leading to sustained and undivided attention issues such as easily get distracted by even the slightest sound in a room since they have difficulties screening out sensory input. However, they might focus on a task that interests them. This phenomenon is named hyperfocus, and refers to the individual appearing to completely ignore the things around him, and fully focusing on the task (Ashinoff & Abu-Akel, 2019).

Regarding impulsivity, individuals with ADHD often live in the present moment, struggling to learn from past mistakes or predict the consequences of their actions (Ashinoff & Abu-Akel, 2019). This would affect their executive functioning, especially task-planning and time management. They sometimes attempt to perform all tasks at once, and end up feeling overwhelmed, and unable to sustain their attention since they do not prioritize their work. They may be perceived as naive since they may overly be optimistic about what they can do and hence make unrealistic decisions (Touger, 2024).

Persons with hyperactivity tend to talk a lot and may keep interrupting the conversation during a group discussion. As they sometimes do not stop and listen to others, they may miss out on important information. They may be seen as forgetful as the information that is 'out of sight' is also 'out of mind' (Ashinoff & Abu-Akel, 2019). It is correlated to poor working memory, which means they have poor ability to store and manipulate the information to plan for valid action (Ashinoff & Abu-Akel, 2019). Therefore, limited space to store new information and memories may cause a big problem when they required to retrieve the information learned to apply to a challenging task.

3.2 Emotions and related psychological disorders

Katzman et al. (2017) found that ADHD does coexist with emotional dysregulation and other psychiatric disorders, which include depression, anxiety disorders, and substance use disorder (SUD). In addition, there are also other emotional regulation-related challenges faced by individuals with ADHD, such as rejection sensitivity dysphoria (Dodson, 2024) and recognition responsive euphoria (Hallowell, 2019; Hallowell & Ratey, 1994). In fact, Hallowell and Ratey (2024) have argued that "ADHD is not purely a disorder; it is a mix of assets and liabilities. A more representative name for the condition is VAST (Hallowell & Ratey, 2021), or variable attention stimulus trait. This new model recognizes the phenomenon of rejection sensitive dysphoria and its flip side 'recognition responsive euphoria' - the super-charged response to perceived encouragement:" (para. 1). The proposal to have the concept of VAST to replace ADHD is also supported by Xie, Chua and Singh (2023).

The prevalence rates of depression in individuals with ADHD are from 18.6% to 53.3% (Torgersen et al., 2006; Kessler et al., 2006). Sometimes it is hard to differentiate them due to the possibility of isolation in the society such as trouble getting along with peers that may lead to persistent negative mood, for instance feelings of hopelessness which contribute to higher risk of suicidal ideation. Due to the side effects of ADHD medications, the similar symptoms may appear to comorbid with depression such as irritability, poor concentration, sleep problems, and appetite changes (Daviss & Bond, 2016). Therefore, a proper diagnosis should be done to avoid misdiagnosis.

According to Kessler et al. (2006), the risk for individuals with ADHD to be diagnosed with anxiety disorders are approximately 50%. ADHD was commonly comorbid with social phobia (or sociophobia) compared to panic disorder and the individuals tend to have more severe anxiety symptoms and it occurs in earlier age (Mancini et al., 1999). For instance, they have trouble socializing with classmates and being irritable and argumentative during the interaction with friends. Looking from neurobiological aspect, this comorbidity is due to the poor activity of prefrontal cortex which plays a crucial role in regulating attention, behaviour and emotion, and deficits in top-down regulation which responsible for regulating rational emotional responses to events (Katzman et al., 2017).

Kessler et al. (2006) suggest that nearly a quarter of young adults with SUD meet the diagnostic criteria for ADHD. In individuals with ADHD, SUD would occur in an earlier age, will have a higher rate of relapse, more hospitalizations, and lower treatment adherence (Pallucchini et al., 2021). The characteristics of ADHD including impulsivity and inability to delay gratification increased the risk of developing SUD due to the dysfunctions of the brain's inhibitory and reward systems (Vink & Schellekens, 2018). Hence, it could explain the reason why individuals with ADHD would have drug and alcohol abuse.

4. SOCIAL-EMOTIONAL DIMENSION

4.1 Social interaction during childhood

Children with ADHD face a lot of social-emotional issues that not only impact peer relationships but also academic performance. In communication, the verbal communication (volume, speed, and tone of voice) and non-verbal communication (eye contact, facial expressions, and body language) are crucial for the individuals to grasp the social-emotional (socio-affective) cues. However, due to the inattention symptom, children with ADHD may not notice all these social-emotional cues as they may get distracted by other stimulants such as background noises (Gill & Hosker, 2021). As a result, they struggle to properly listen to others and retain vital information presented during a discussion.

Individuals with ADHD always have good ideas in their mind; however, with the hyperactive characteristic, they have difficulty combining the scattered thoughts to share with others. This may lead to confusion among others regarding their intended message. The most irritated behaviors are the frequent interruption when others are talking and excessive talking (Gill & Hosker, 2021). Due to these behaviors, peers may see them as impolite and this may lead to peer rejection.

In a successful peer relationship, cooperation, negotiation, and problem-solving are the key criteria for making and keeping friends (Gill & Hosker, 2021). Due to the impaired executive functioning in children with ADHD, they may have difficulty managing their impulsive behaviors as well as their emotional responses. For instance, they may show goofy behaviors at inappropriate times such as during the group assignment discussion which others may perceive them as uncooperative. When peers trigger their emotions, they may also respond aggressively without thinking through. All these behaviors would lead them to experience social isolation that may further lead to low self-esteem.

Poor self-esteem may indirectly impact their academic performance. Research suggests that one of the outcomes of poor self-esteem is the increased negative beliefs about self that cause the individuals to develop maladaptive coping strategies which include avoidance, procrastination, and poor social-emotional (or socio-affective) functioning skills (Harpin et al., 2013). In this case, children with ADHD may withdraw from working with group projects to avoid conflicts which may lead to work procrastination. Furthermore, when they face difficult tasks, they may find it challenging to ask for help from peers or teachers that contributes to poor understanding of lessons.

4.2 Social interaction during adulthood

ADHD symptoms often affect the work performance such as the absenteeism of work as well as the employment rate such as poor job stability. Adamou et al. (2013) found that adults with ADHD experienced impairment from the beginning of job search until they are working in a workplace. During the job application stage, the employer may find out that they are disorganized in a sense that their resumes are not neatly designed. They sometimes miss out on details due to inattention and do not reflect properly on their answers when filling in the application form due to impulsivity (Adamou et al., 2013).

During the job interview, they may be viewed as friendly and chatty due to their hyperactivity characteristic. However, they may overstate their ability to fulfil the job requirements where in fact, they might face challenges in completing the tasks (Adamou et al., 2013). When the company discovers that they are violating promises, this behaviour may be viewed as irresponsible.

They could mask up their ADHD symptoms if they are working in an environment requiring creativity and innovative but if the job requires the organizational skills, they may be hampered by their symptoms

(Adamou et al., 2013). They may also face difficulties with time management by organizing their work schedule and prioritizing the important task (Koseva, 2023). All these behaviors would impact their work productivity or even become a risk of losing job. The social-emotional relationship with colleagues might be impacted as they might delay their task or miss out on details that had been assigned during the group discussion. The criticism from their colleagues and employers towards their job performance would demotivate them and may eventually quit their job (Adamou et al., 2013). As a result, they are required to learn some strategies to better cope with the challenges in the workplace in order to improve their job performance.

5. CONCLUSION

Based on the BPSM, we have discussed the three dimensions of ADHD (biological, psychological, and social-emotional). The BPSM is commonly used to consider how these three dimensions contribute to a disorder. However, it also must take into account that ADHD would also affect these three dimenions in an individual's daily living. The discussion above highlights the significant impact of ADHD symptoms on these three dimensions as they have different brain structures that influences their thinking and behaviors compared to those without ADHD.

As an educational therapist (ET), it is crucial for me to take into consideration these multiple perspectives of ADHD. Understanding the interrelationship between ADHD and these three dimensions can assist myself as an ET in devising comprehensive treatment plans aimed at improving overall development of my clients diagnosed or identified with ADHD. However, it is important for me also to take note that not every individual with ADHD would have impairment in all dimensions. It also means that they might have different level of severity in certain dimensions. Thus, by looking into different dimensions of an individual with ADHD, it could help the ETs (such as myself) to attend to the more severe aspect before treating the other aspects.

There are many myths about ADHD and therefore, parents of individuals with ADHD and the society should consult professionals to verify the information and understand more about ADHD. Wrong perceptions about ADHD may delay seeking help from the professionals or even lead to a misdiagnosis. This would lead to missing out on the prime time of treatment for the individuals with ADHD, and cause them to face many issues in their later life.

Unfortunately, it is a sad fact that ADHD can impact the entire life of an individual. Even so, it does not mean that individuals with ADHD cannot *survive* in society. On the contrary, if they are trained to improve their skills such as social skills training, attention training, mindfulness-based cognitive therapy, etc., they could be equipped with the necessary skills to function well in society. Hence, the society should provide ample opportunities to them so that they could realize their potentials. Individuals with ADHD face numerous challenges throughout their lives. From the discussion above, we also could see that it could impact their mental health if they are living in an unsupportive environment. Individuals with ADHD should not be stigmatized; instead, the community around them should seek to understand the challenges such individuals face and try to provide appropriate care and support. In this way, children, adolescents as well as adults with ADHD would be able to cope better in their everyday life.

6. ACKNOWLEDGEMENT

None.

7. COMPETING INTERESTS

The author has declared that no competing interests exist.

8. FINANCIAL DISCLOSURE

There is no funding obtained.

9. ARTIFICIAL INTELLIGENCE DISCLOSURE

No generative AI or AI-assisted technologies were used in the preparation of this manuscript.

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