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The Neuroscience of ADHD and its implications for PE and Beyond

Introduction

In this article, we explore the neurology behind Attention Deficit Hyperactivity Disorder (ADHD) and how it affects behaviour. By examining how the ADHD brain operates, we can gain valuable insight into how to teach physical education in a way that benefits those with ADHD. Additionally, understanding the experience of ADHD from a student's perspective can provide valuable insights into how to support them in the physical education (PE) lessons. By developing an in depth understanding of the neurobiology of ADHD, we can help create more inclusive learning environments that benefit all students.

Unfortunately, there are harmful stereotypes surrounding ADHD that shape how it is viewed by society. For instance, many people assume that ADHD only affects "naughty boys," even though it affects both males and females equally. This stereotype has led to a disproportionate number of males being diagnosed with ADHD and a misconception that the condition only manifests as disruptive behaviour. However, ADHD is a multifaceted neurological condition, and often the outward behaviour does not accurately reflect what is happening in a person's mind. It is important to recognise the complexity of ADHD and avoid harmful stereotypes that can hinder understanding and appropriate treatment (Horton-Salway & Davies, 2018).

The Neurology of ADHD

ADHD is a complex neurological condition that is characterised by difficulty with motivation (executive dysfunction) and difficulties with emotional control (emotional dysregulation). These symptoms stem from a deficiency in the production of dopamine (motivation/task completion), norepinephrine (attention), and serotonin (soothing/calming). Despite its name, ADHD is not a deficit of attention or hyperactivity, but rather a difficulty in regulating attention and impulsivity (Selaso, Blair, Willoughby, 2016). Individuals with ADHD often struggle to control what they pay attention to and may seek out external stimuli to help increase their dopamine levels (Volkow et al., 2011). Understanding the underlying neurobiology of ADHD can help teachers to better cater to the needs of children with ADHD.

Dopamine and serotonin are two neurotransmitters that play a crucial role in the brain's emotional regulation systems. Dopamine is associated with the drive system, which is responsible for motivation and task completion. Meanwhile, serotonin is linked to the soothing system, which promotes feelings of safety, comfort, and calmness (Carona et al., 2017). People with ADHD often struggle with executive dysfunction and emotional dysregulation, which can be traced back to deficiencies in these neurotransmitters. Understanding these neurobiological differences between ADHD and neurotypical (individuals who have a typical neurological development, without neurological conditions or disorders such as autism, ADHD, or dyslexia) individuals is crucial to understanding the behaviours that characterise ADHD (Tripp & Wickens, 2009).

In addition to the drive and soothing systems, the brain also has a third emotional regulation system known as the threat system, which is responsible for the fight-or-flight response. This system is activated by the release of adrenaline and cortisol in response to perceived threats (Scassellati et al., 2012). Individuals with ADHD may perceive threats differently from neurotypical individuals due to neurobiological differences in dopamine and serotonin production. Therefore, it is crucial to recognise that people with ADHD experience the world differently from neurotypical individuals, and situations that may seem harmless to some can be triggering for those with ADHD. This heightened

sensitivity to perceived threats can result in increased stress, anxiety, and emotional dysregulation, which can impact their academic and social functioning. (Nielsen, 2017).

Characteristics of ADHD and how to address them

ADHD is a diverse neurodevelopmental disorder that can be classified into three presentations: impulsive/hyperactive, inattentive, and combined. The impulsive/hyperactive presentation is characterised by impulsive and hyperactive behaviours without significant inattention or distractibility. The inattentive presentation is characterised by inattention and distractibility without hyperactivity. The combined presentation is the most common presentation and is characterised by a combination of inattentive, impulsive, and hyperactive behaviours. The different presentations of ADHD mean that different pupils with ADHD may behave in different ways, meaning that management of ADHD is complex and varied. However, it is important to note that the behaviours of someone with ADHD are separate from the feelings, and what you see is not necessarily what is going on inside their heads (Chhabidas, Pennington & Willcutt, 2001).

One key aspect of ADHD is time-blindness, which refers to difficulties with planning, prioritising, and managing time effectively. Time-blindness can contribute to emotional dysregulation and executive dysfunction, leading individuals with ADHD to appear impatient or short-sighted. For example, if a pupil becomes frustrated during a lesson, it can be challenging for them to look past their current emotional state and consider future solutions. Offering solutions or suggestions may be unproductive since it requires the pupil to overcome their emotional state and engage in planning or decision-making. Instead, a more effective approach may be to remove the pupil from any stressors or distractions that may be exacerbating their emotional state and allow time for their emotions to subside before addressing the behaviour. This approach can help to reduce emotional reactivity and facilitate better decision-making and self-regulation (Faraone et al., 2019).

ADHD brains are in a constant search for sources of dopamine and serotonin, making it difficult for pupils with ADHD to switch off. This tendency can lead to destructive behaviours and consequences. The brain of someone with ADHD has a defect in the link between the knowing and doing parts of the brain, which is specifically the role of dopamine. Therefore, providing reassurance to children with ADHD is extremely helpful, letting them know that while some behaviours may be unacceptable, they are not catastrophic. It's common to see a child with ADHD exhibit disruptive behaviour one moment, but once they become regulated, they transform into the sweetest child later (Rubia, 2018).

Pupils with ADHD often have a strong sense of justice and a need for clear structure. They may struggle with social cues and unspoken social rules and may not be aware of them unless explicitly outlined. To create a more inclusive environment, teachers should be clear and explicit with the rules, reinforce them regularly, ensure that decisions are fair and well-explained, and avoid reprimanding students for breaking unspoken rules that they may not have been aware of. By doing so, teachers can help students with ADHD feel more comfortable and supported in the PE lessons, especially during competitive games (Bondü & Esser, 2015).

Rejection Sensitive Dysmorphia is a common issue among people with ADHD, which can negatively affect their participation in PE. This condition causes pupils with ADHD to be hypersensitive to perceived rejection from their peers and any negative feedback from their teachers. To mitigate this, teachers should closely monitor how pupils interact with each other and provide ample opportunities for positive reinforcement and encouragement. Teachers can create a safe and

supportive environment by showing kindness, empathy, and understanding towards pupils with ADHD, and by using constructive feedback rather than criticism (Bedrossian, 2021).

Concluding thought

Physical education (PE) is a crucial subject for children with ADHD, as regular physical activity has been shown to help regulate dopamine and serotonin levels in the brain. It is important to make every effort to ensure that pupils with ADHD can participate in some way in PE, so that they can reap the benefits of physical activity that are so essential for their engagement, self-esteem, and overall well-being. By considering the complexities of ADHD, and the different ways in which ADHD brains operate, PE can be an extremely rewarding experience for pupils with ADHD and can lead to a more fulfilled overall school experience.

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