# EVALUATING THE EFFECTIVENESS AND SUSTAINABILITY OF CLASSROOM BREAKS: PERCEPTIONS OF SECONDARY TEACHERS

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by

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## ABSTRACT

Many secondary schools face challenges balancing academic rigor with students' social, emotional, and behavioral needs. Although brain breaks are widely used in elementary classrooms, there is limited knowledge about how secondary teachers perceive and implement them. The purpose of this mixed-methods study is to explore secondary teachers' perceptions of brain breaks, identify factors that support or hinder their use, and understand how teachers perceive their impact on student focus, behavior, and engagement. Guided by Cognitive Load Theory, Self-Determination Theory, and the Ecological Model of Physical Activity, this study addresses three research questions: teachers' perceptions of brain breaks, factors influencing acceptance or resistance, and perceived impacts on students. Data were collected from eleven secondary teachers using an online survey with demographic questions, the Teacher Efficacy Toward Providing Physical Activity in the Classroom Scale (TETPPACS), and open-ended questions. Quantitative data were analyzed using descriptive statistics and one-way ANOVAs, and qualitative responses were coded thematically. Results showed that teachers generally value brain breaks for improving focus and behavior but face barriers such as time constraints, classroom management concerns, and limited physical space. Teachers felt more confident when they had administrative support, peer modeling, and clear routines. The study concludes that sustaining brain breaks requires more than teacher buy-in; it depends on supportive leadership and practical training. Recommendations include providing relevant professional development and creating school cultures that normalize brain breaks as part of effective instruction. These findings may contribute to positive social change by encouraging schools to adopt simple practices that help students reset, refocus, and ultimately learn more efficiently.

## DEDICATION

This dissertation is dedicated to all my students with ADHD and every neurodivergent student who has ever felt different in a world that doesn't always understand how brightly they shine. Most of all, this work is dedicated to my student I call "Robin Hood," whose courage and perseverance in the face of trauma inspired this research and reminded me why every student deserves a safe chance to pause, reset, and thrive. I am endlessly proud of your strength and your spirit.

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## GLOSSARY OF TERMS

ABs – Active Breaks

ADHD – Attention-Deficit/Hyperactivity Disorder

AIT – Aerobic Interval Training

ASD – Autism Spectrum Disorder

BB – Brain Breaks

BDNF – Brain-Derived Neurotrophic Factor

CABs – Classroom Activity Breaks

CBPA – Classroom-Based Physical Activity

CBT – Cognitive Behavioral Therapy

CDC – Centers for Disease Control and Prevention

CD – Conduct Disorder

DSM – Diagnostic and Statistical Manual of Mental Disorders

EEG-NF – Electroencephalography-Neurofeedback

EF – Executive Functions

ERD – Emotional Regulation Difficulties

fMRI-NF – Functional Magnetic Resonance Imaging Neurofeedback

GWAS – Genome-Wide Association Studies

ICD-10/11 – International Classification of Diseases, 10th/11th Revision

IEP – Individualized Education Program

MI – Movement Integration

NIMH – National Institute of Mental Health

NIRS-NF – Near-Infrared Spectroscopy Neurofeedback

ODD – Oppositional Defiant Disorder

OHI – Other Health Impairment

PA – Physical Activity

PD – Professional Development

PMTM – Perceptual Motor Training and Meditation

rTMS – Repetitive Transcranial Magnetic Stimulation

SCT – Sluggish Cognitive Tempo

SLD – Specific Learning Disabilities

tDCS – Transcranial Direct Current Stimulation

## Chapter 1: Introduction

This research focuses on the implementation and impact of brain breaks in secondary education, specifically for students with Attention-Deficit/Hyperactivity Disorder (ADHD). ADHD is a common neurodevelopmental disorder marked by inattention, hyperactivity, and impulsivity, significantly impacting children's academic performance, social interactions, and emotional stability. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V), classifies ADHD with specific subcategories based on predominant symptoms (American Psychiatric Association, 2013).

Given the high prevalence and significant impact of ADHD on school-aged children, addressing this disorder in educational settings is crucial. Research indicates that ADHD affects approximately 5-10% of children worldwide, underscoring the need for practical classroom strategies to manage ADHD symptoms and enhance educational outcomes and overall well-being (Faraone et al., 2021).

Brain breaks (BB) are short, structured breaks involving physical activity or cognitive relaxation that have emerged as an intervention for managing ADHD symptoms. These breaks enhance attention, reduce disruptive behaviors, and improve classroom engagement. Break integration into daily classroom routines has gained popularity due to its potential to provide physical and cognitive benefits, helping students with ADHD maintain focus and productivity (Centers for Disease Control and Prevention [CDC], 2024).

However, there is a lack of comprehensive understanding regarding secondary teachers' perceptions of brain breaks and the factors that facilitate or hinder their implementation in the classroom (Stylianou et al., 2015). This knowledge gap necessitates further research to develop effective strategies and support systems for integrating brain breaks into secondary education.

Understanding these perceptions and factors is essential for creating supportive and inclusive educational environments that cater to the diverse needs of all students, particularly those with ADHD in the secondary school setting.

**Overview of ADHD**

ADHD is the most prevalent neurodevelopmental disorder globally. The disorder is characterized by symptoms of inattention, hyperactivity, and impulsivity that are developmentally inappropriate (American Psychiatric Association, 2013). ADHD affects approximately 5-7% of children worldwide, with boys being more commonly diagnosed than girls (Polanczyk et al., 2007). Research has shown that ADHD can significantly affect academic performance, social interactions, and overall quality of life (Barkley, 2015).

Children with ADHD often struggle with sustaining attention, following through on tasks, and regulating their behavior in a classroom setting (CDC, 2024). These difficulties can lead to academic underachievement, increased classroom disruptions, discipline issues, and strained teacher-student relationships (DuPaul & Stoner, 2014). Moreover, children with ADHD are at a higher risk for comorbid conditions such as anxiety, depression, and learning disabilities, further complicating their educational experience (Pliszka, 2015).

Interventions for ADHD typically include a combination of behavioral strategies, psychoeducation, and, in some cases, medication (Evans et al., 2014). Physical activity has also been recognized as a beneficial intervention for children with ADHD, as it can help improve attention, reduce hyperactivity, and enhance executive functioning (Pontifex et al., 2013; Verret et al., 2012). Given the challenges faced by students with ADHD, incorporating brain breaks that include physical activity can be a valuable strategy for managing symptoms and promoting a positive learning environment for students of all ages.

**Overview of Brain Breaks**

The implementation of BB has garnered attention in educational settings due to its potential to improve student engagement and cognitive functioning. BB helps students re-energize, refocus, and enhance their learning experience. Research shows that these breaks particularly benefit students with ADHD, who often struggle with sustained attention and impulsivity (Centers for Disease Control and Prevention [CDC], 2024).

Over the past decade, research on physical activity levels among children with disabilities has indicated that these children generally do not meet the recommended daily or weekly physical activity guidelines (Frey et al., 2008; McCoy et al., 2016). Furthermore, children with disabilities tend to exhibit higher rates of sedentary behavior compared to their peers without disabilities (Stanish et al., 2019). The increased sedentary behavior and physical inactivity raise concerns, as they can lead to higher rates of morbidity and mortality, cardiovascular disease, and elevated healthcare costs (González et al., 2017). On the other hand, increased physical activity can help reduce the risk of obesity and Type 2 Diabetes, and it can improve a child's psychosocial well-being by mitigating stress, anxiety, and depression (Archer, 2014).

While the benefits of physical activity and the risks of inactivity apply to all children, they are more pronounced for children with disabilities. Inactivity often exacerbates delays in gross motor development, poor balance and coordination, and reduced cardiovascular fitness in these children (Shields & Synnot, 2016).

Individuals with disabilities are less likely to meet physical activity guidelines compared to the general population, highlighting health disparities linked to physical inactivity among people with disabilities (Carroll et al., 2014).

For example, watching more than two hours of TV per day is associated with a greater risk of cardiovascular mortality. Youth with disabilities, particularly those who experience bullying at school, often watch more TV than their peers without disabilities (Foster et al., 2020). Hsieh et al. (2017) found that among 1,618 adults with intellectual disabilities, a high percentage of participants were obese and spent significant time watching TV daily.

The CDC defines physical activity as any bodily movement produced by skeletal muscles that increases energy expenditure (Centers for Disease Control and Prevention, 2017). In contrast, sedentary behavior involves a metabolic equivalent (MET) of less than 1.5 and minimal energy expenditure above resting levels (Tremblay et al., 2017). The Centers for Disease Control and Prevention (1999) categorize physical activity behaviorally into light (<3 METs), moderate (3.0 to 6 METs), and vigorous (>6 METs) activities. The 2018 Physical Activity Guidelines for Americans recommend that children aged 6 to 17 engage in at least 60 minutes of moderate to vigorous physical activity daily (U.S. Department of Health and Human Services, 2018). These guidelines also acknowledge that while children with disabilities should aim to meet these recommendations, they should be as active as possible if they cannot comply fully (U.S. Department of Health and Human Services, 2018).

Research has demonstrated variations in sedentary behavior patterns among children with disabilities compared to those without, especially as they age (Jung et al., 2018; Ross et al., 2020). Lobenius-Palmer (2018) found that children with disabilities spent significantly less time engaging in light physical activity and more time in sedentary behavior than their peers without disabilities when monitored with accelerometers. Additionally, children with disabilities are involved in fewer minutes of moderate-to-vigorous physical activity than recommended, which

can increase their risk of secondary health issues (Fox et al., 2019; Okur et al., 2019; Stanish et al., 2017).

Since children spend nearly 40 hours per week in school, it is imperative for schools to deliver behavioral interventions, including physical activity programs (Hall & Eric, 2020). Schools cater to diverse student populations and have been sites for various public health interventions targeting obesity, physical activity, and nutrition (Greening et al., 2011; Gibson et al., 2008; Driessen et al., 2014; Micha et al., 2017). Legislation like the Every Student Succeeds Act (ESSA) of 2015 supports equal opportunities for all students, including those for physical activity (U.S. Department of Education, 2015).

However, access to physical education classes and recess is only sometimes available, reducing opportunities for physical activity, especially at the secondary level, where recess and breaks are virtually nonexistent. Nettlefold et al. (2011) found that only a small percentage of elementary school children engaged in sufficient physical activity during recess. Research has shown that students with disabilities and secondary students engage in limited physical activity during school hours, emphasizing the need for additional interventions (Sit et al., 2007).

Classroom-based physical activity breaks (CBPAs), which involve short intervals of physical activity in the classroom, can help increase physical activity and reduce sedentary behavior during the school day (The Foundation for Global and Community Health, 2021). BB, synonymous with CBPAs, allows students to refocus after extended periods of sitting and can be incorporated into lessons or as stand-alone activities. Research has shown that CBPAs can improve behavior management, academic performance, and overall well-being (Cothran et al., 2010; Stylianou et al., 2016; Watson et al., 2017). Although beneficial, secondary teachers'

perceptions and use of BB and the factors that facilitate or hinder their classroom implementation remain poorly understood.

### *Types of Brain Breaks*

BB can be categorized into several types based on their activities and intended outcomes. Each type serves a distinct purpose and can be strategically used to address different needs within the classroom.

Physical activity (PA) breaks involve exercises and movements that increase students' physical activity levels. These include stretching, jumping jacks, dance routines, or simple aerobic exercises. The primary goal of physical activity breaks is to get students moving, which can help boost their physical fitness, energy levels, and cognitive function. Research has shown that short bouts of physical activity can lead to improved attention, better behavior, and enhanced academic performance (Mahar et al., 2006; Watson et al., 2017). For example, integrating brief periods of exercise into the school day has been linked to improvements in students' on-task behavior and overall engagement in classroom activities.

Mindfulness and relaxation breaks focus on calming the mind and body through deep breathing exercises, guided imagery, or progressive muscle relaxation. Designed to help students manage stress and anxiety, breaks enhance emotional regulation and improve focus. Mindfulness practices in schools have been associated with reduced symptoms of stress, better emotional regulation, and increased attention span (Zenner et al., 2014). Engaging in activities like deep breathing or listening to soothing music can provide students with a sense of tranquility and help them approach their academic tasks with a clearer mind and improved focus.

Cognitive breaks involve activities that stimulate the brain differently from typical classroom tasks. These activities include puzzles, brainteasers, or creative thinking exercises.

Cognitive breaks aim to refresh the mind and encourage creative and critical thinking. By providing a mental refresh, these breaks can enhance problem-solving skills and boost creativity (Bishop, 2014). For example, a quick game of Sudoku or a short brainstorming session on an unrelated topic can shift students' cognitive focus and give their brains a break from continuous academic strain.

Sensory breaks cater to students' sensory needs through activities that provide tactile, auditory, or visual stimulation. Examples of sensory breaks include using sensory bins filled with various textured objects, listening to calming music, or engaging in visually stimulating activities such as watching a video of flowing water or colorful patterns. Sensory breaks can be particularly beneficial for students with sensory processing issues, helping them to regulate their sensory input and maintain focus in the classroom (Case-Smith et al., 2015). These activities can help students who are easily overstimulated or understimulated achieve a sensory balance, enabling their academic participation.

Understanding and utilizing different BB modalities can help educators create a more dynamic and responsive learning environment. Each type of break addresses specific needs and can be incorporated into the school day to support students' physical, emotional, and cognitive well-being.

**Statement of the Problem**

The average attention span of secondary students typically ranges from 10 to 20 minutes, influenced by factors such as age, individual differences, task complexity, and interest levels (Best & Miller, 2010). Adolescents aged 12 to 18 are still developing executive function skills, including attention regulation, leading to shorter attention spans in younger adolescents compared to older ones. Engaging or interactive tasks tend to maintain attention longer than

passive activities like lectures (Bligh, 2000). External factors such as the classroom environment, teaching methods, and individual student characteristics, including motivation and fatigue, also impact attention span (Mayer, 2011). Research supports these observations, indicating that high school students need brief breaks to refocus after 10-20 minutes of focused attention (Sousa, 2017). To sustain engagement, educators should adopt strategies like breaking up lectures and lessons with interactive activities, incorporating BB, and using varied teaching methods such as group work and technology integration (Mahar et al., 2006; Prince, 2004). For students with ADHD, attention spans are even shorter, typically about 3 to 5 minutes, up to around 20 minutes for older adolescents (DuPaul & Stoner, 2014; Barkley, 2015). ADHD symptoms of inattention, hyperactivity, and impulsivity exacerbate difficulties in maintaining focus, particularly in traditional classroom settings (American Psychiatric Association, 2013). Practical strategies for managing shorter attention spans in ADHD students include breaking tasks into manageable segments, using visual and auditory cues, incorporating frequent breaks, and providing a structured classroom environment (Evans et al., 2014; DuPaul et al., 2014). The length of class periods at the secondary level in the United States varies from 50 to 90 minutes, depending on the school's scheduling model, which influences how instructional strategies are implemented to optimize student focus and learning outcomes (Queen, 2000; Veal & Schreiber, 1999).

The implementation of brain breaks in daily lessons among secondary teachers in the U.S. varies, and specific statistics on the exact number or percentage of secondary teachers who regularly use brain breaks are not widely documented. Available research and surveys provide insight into the prevalence and attitudes toward using BB in the classroom. While using brain breaks is highly encouraged and has gained significant popularity, particularly in elementary education, its implementation at the secondary level must be more consistent. For instance, a

survey by GoNoodle, a popular platform providing brain break activities, indicated that over 90% of elementary school teachers use brain breaks. However, this adoption rate drops in middle and high schools, with a study by Webster et al. (2015) showing that about 50% of secondary teachers use some form of physical activity breaks in their classes. Secondary teachers often need assistance with challenges such as time constraints, curriculum demands, and lack of training or resources, which hinder the consistent use of brain breaks (Cothran et al., 2010; Stylianou et al., 2016). These barriers suggest that while many teachers recognize the benefits of brain breaks, fewer integrate them regularly into their daily lessons. There is, however, a growing trend towards incorporating more physical activity and mindfulness practices into secondary education, supported by organizations like SHAPE America and the CDC. Despite this positive trend, the shift is gradual, and widespread adoption across all secondary classrooms is still pending progress.

The study addresses the problem of understanding secondary teachers' perceptions of brain breaks, including the facilitators and barriers to implementation. While research supports that brain breaks offer significant benefits for student engagement and focus (Mahar et al., 2006; Webster et al., 2015), secondary teachers face challenges that may impede their adoption of these breaks. These challenges include time constraints, loss of control, lack of training, and concerns about losing instructional time (Cothran et al., 2010; Stylianou et al., 2016). Identifying these barriers and facilitators is crucial to promoting the effective use of brain breaks in secondary education settings.

**Organizational Context**

The study will be conducted in the Central York School District in York County, Pennsylvania. This district serves diverse student populations in terms of socioeconomic status

(SES), ethnicity, and academic abilities. The selected schools will include middle and high schools to cover a broad range of secondary education settings. This district's political, economic, social, and ethical systems play a significant role in shaping the educational environment and the feasibility of implementing brain breaks. For instance, varying funding levels and resources across schools and districts can impact the availability of professional development opportunities for teachers (Evans et al., 2014). Societal views on innovative teaching methods and the ethical obligation to address every student's learning needs provide additional context.

Assumptions about the problem include the belief that teachers' perceptions significantly influence the implementation of brain breaks and that a supportive organizational culture can facilitate their adoption. Previous studies have indicated that teacher training and administrative support are critical factors in successfully integrating new educational practices (Stylianou et al., 2015).

**Research Questions**

1. What are secondary teachers' perceptions regarding using brain breaks in the classroom?
2. What factors influence the acceptance or resistance to brain breaks among secondary teachers?
3. How do secondary teachers perceive the impact of brain breaks on student focus, behavior, and overall classroom engagement?

**Existing Research**

The researcher reviews several key concepts and topics to understand the problem better and design the intervention. Research consistently shows that physical activity significantly positively affects cognitive function, including improved attention, memory, and executive

function (Hillman et al., 2008). These benefits are significant for students with ADHD, who often face challenges in maintaining focus and controlling impulses (CDC, 2024). In contrast, sedentary behavior, characterized by prolonged sitting and minimal physical activity, is associated with various health risks, including obesity, cardiovascular disease, and metabolic syndrome (Tremblay et al., 2017). For children with disabilities, these risks are even more pronounced due to their generally lower levels of physical activity (Stanish et al., 2017).

BB has shown improved classroom behavior, reduced off-task behavior, and increased student engagement (Mahar et al., 2006; Webster et al., 2015). Understanding teachers' perceptions of brain breaks and identifying the barriers to implementation is crucial for designing effective interventions. Common barriers include lack of time, inadequate training, and concerns about managing classroom time effectively (Stylianou et al.,2016; Cothran et al., 2010).

Several seminal studies and theories inform this study. Cognitive Load Theory (CLT) suggests that the human brain has a limited capacity for processing information and that excessive cognitive load can hinder learning (Sweller, 1988). BB helps manage the mental load by providing rest intervals, thus enhancing learning efficiency and effectiveness.
Self-determination theory (SDT) emphasizes the role of intrinsic motivation in driving human behavior (Deci & Ryan, 1985). Providing students with enjoyable, short breaks can increase their intrinsic motivation for learning and participating in class activities. The Ecological Model of Physical Activity highlights the multiple levels of influence on physical activity behavior, including individual, interpersonal, organizational, community, and policy factors (Sallis et al., 2008). Understanding these levels helps design comprehensive interventions that address various barriers and facilitators to physical activity in schools.

The conceptual framework for this study is grounded in the intersection of educational psychology, physical activity research, and behavioral health theories. The framework integrates CLT, SDT, and the Ecological Model of Physical Activity to provide a holistic understanding of how BB can be effectively implemented in classrooms to improve student outcomes. CLT informs the study by highlighting the importance of managing students' cognitive load to enhance learning and retention. BBs are a practical application of this theory by providing necessary pauses to prevent cognitive overload (Sweller, 1988). SDT provides insight into the motivational aspects of brain breaks. By incorporating activities that students find enjoyable and engaging, brain breaks can foster a more motivated and enthusiastic learning environment (Deci & Ryan, 1985). Finally, the Ecological Model of Physical Activity helps understand the broader context of brain break implementation, considering factors at multiple levels that influence teachers' ability to incorporate physical activity into their classrooms (Sallis et al., 2008).

**Significance of the Study**

This study is significant for several reasons. It addresses a gap in the literature by focusing on secondary general and special education teachers' perceptions of brain breaks, an area that has received less attention than primary and general education. The findings will provide valuable insights for educators, administrators, and policymakers to develop effective strategies and supportive policies that promote the use of BB in secondary education. Ultimately, this research aims to enhance secondary students' educational experiences and outcomes, particularly those with ADHD, by fostering a more supportive and engaging learning environment.

## Delimitations

The study is limited to secondary regular and special education teachers within the Central York School District in York County, Pennsylvania. The focus is on teachers' perceptions of brain breaks, excluding the perspectives of different stakeholders such as students and parents. Additionally, the study will primarily use surveys and five open-ended questions to gather data, which may limit the depth of insights compared to qualitative methods like interviews or focus groups.

## Definition of Terms

**Attention-Deficit/Hyperactivity Disorder (ADHD)**: ADHD is a common neurodevelopmental disorder characterized by developmentally inappropriate symptoms of inattention, hyperactivity, and impulsivity. It significantly impacts children's academic performance, social interactions, and emotional stability. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V), classifies ADHD into specific subcategories based on predominant symptoms (American Psychiatric Association, 2013).

**Brain Breaks (BB)**: Brain breaks are short, structured breaks that involve physical activity or cognitive relaxation techniques. These breaks help students re-energize, refocus, and enhance their learning experience. Brain breaks have been shown to improve attention, reduce disruptive behaviors, and increase classroom engagement, particularly for students with ADHD (Centers for Disease Control and Prevention [CDC], 2024).

**Physical Activity (PA)**: Physical activity is defined by the Centers for Disease Control and Prevention (CDC) as any bodily movement produced by skeletal muscles that increases energy expenditure. Physical activity is categorized behaviorally into light (<3 METs), moderate (3.0 to 6 METs), and vigorous (>6 METs) activities (Centers for Disease Control and Prevention, 1999).

**Sedentary Behavior**: Sedentary behavior is characterized by a metabolic equivalent (MET) of less than 1.5 and minimal energy expenditure above resting levels. It includes activities such as sitting or lying down while awake and engaging in minimal physical activity (Tremblay et al., 2017).

**Classroom-Based Physical Activity Breaks (CBPAs)** are short intervals of physical activity integrated into the classroom setting. They aim to increase physical activity and reduce sedentary behavior during the school day. These breaks can be incorporated into lessons or conducted as stand-alone activities to help students refocus and improve classroom behavior and academic performance (Mok et al., 2020).

**Traditional Schedule**: In secondary education, a traditional schedule typically involves students attending six to eight daily classes, each lasting 45 to 55 minutes. This model is still prevalent nationwide in many middle and high schools (Queen, 2000).

**Block Schedule**: In secondary education, a block schedule involves students attending fewer classes per day, but each class period lasts longer, usually around 80 to 90 minutes. Schools using a block schedule often rotate classes every other day, meaning students might have four courses on one day and a different set of four classes the next day (Canady & Rettig, 1995).

**Modified Block Schedule**: This scheduling model combines traditional and block scheduling elements. For example, students might have some classes that meet daily for shorter periods (50-60 minutes) and other classes that meet less frequently but for more extended periods (80-90 minutes) (Queen, 2000).

**Self-Determination Theory (SDT)**: SDT is a theory of motivation that emphasizes the role of intrinsic motivation in driving human behavior. Providing activities that students find enjoyable

and engaging can increase their intrinsic motivation for learning and participation in class activities (Deci & Ryan, 1985).

**Cognitive Load Theory (CLT)**: The theory posits that the human brain has a limited capacity for processing information and that excessive cognitive load can hinder learning. Brain breaks help manage cognitive load by providing rest intervals, thus enhancing learning efficiency and effectiveness (Sweller, 1988).

**Ecological Model of Physical Activity**: This model highlights the multiple levels of influence on physical activity behavior, including individual, interpersonal, organizational, community, and policy factors. Understanding these levels helps design comprehensive interventions that address various barriers and facilitators to physical activity in schools (Sallis et al., 2008 ).

**Summary**

This chapter underscores the significance of understanding secondary teachers' perceptions of brain breaks and the factors that facilitate or hinder their implementation. Given the short attention spans of secondary students, particularly those with ADHD, integrating BB can significantly enhance student engagement, focus, and overall academic performance. BB helps manage cognitive load and provides mental rest, fostering a more effective and enjoyable learning environment. However, challenges such as time constraints, curriculum demands, and lack of training can impede their consistent use. The chapter also highlights various educational scheduling models and theoretical frameworks, including Self-Determination Theory and Cognitive Load Theory, which support the strategic implementation of BB. By addressing these perceptions and barriers, the study aims to develop effective strategies that create supportive and inclusive educational settings, ultimately enhancing educational outcomes for all students, especially those with ADHD.

## Chapter 2: Literature Review

ADHD is a pervasive neurodevelopmental disorder that has a considerable impact on children. It is characterized by inattention, hyperactivity, and impulsivity. The core symptoms limit functioning in academic performance, social relationships, and emotional stability in children, and these limitations may persist into adulthood. Historical data describe ADHD-like symptoms as reported in the medical literature, dating back to 1775, which outlines the chronic nature of the condition (Faraone et al., 2021).

The DSM-V, classifies ADHD as a neurodevelopmental disorder. It divides the symptoms into two significant categories: inattention and hyperactivity/impulsivity. The DSM-V outlines three presentations of ADHD: Predominantly Inattentive Presentation, Predominantly Hyperactive/Impulsive Presentation, and Combined Presentation. Similarly, the International Classification of Diseases, 10th/11th Revision (ICD-10/11) also categorizes ADHD but includes more subcategories and does not restrict symptom onset with strict age limits.

ADHD influences an estimated 5-10 percent of school-aged children worldwide, constituting one of the most prevalent conditions in childhood. Concerning the difference between ADHD and Specific Learning Disabilities (SLDs), which are limited to some facets, like math or reading, ADHD can affect all areas of cognitive functioning. About 30% of children with ADHD also have an SLD, with the majority diagnosed with dyslexia (Barkley et al., 2021).

### Historical Evolution of Terminology and Diagnostic Criteria

The DSM-II (1968) initially termed ADHD a "hyperkinetic reaction of childhood," which the American Psychiatric Association (APA) later renamed "Attention Deficit Disorder (ADD)" in the DSM-III (1980) before incorporating hyperactivity. According to the current DSM-V, ADHD falls under three presentations requiring symptoms to persist for at least six months, with

onset before age twelve and causing significant impairment in social, academic, or occupational functioning (American Psychiatric Association, 2013).

## Lifespan Perspective

Both in the DSM-V and ICD-11, ADHD has been identified as a lifespan neurodevelopmental condition. It is one of the most frequent childhood disorders, with symptoms persisting into adolescence and adulthood in many cases. ADHD is a persistent pattern of inattention, hyperactivity, and impulsivity that is more frequent and severe than is typically observed in individuals at comparable age and developmental levels. Definitions of ADHD evolved from various editions of the DSM and ICD, with advances in concepts and understanding of the disorder (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024).

Understanding ADHD requires considering its historical context, diagnosis, prevalence, impact, and the evolution of its definitions and classifications.

## Etiology

The exact causes of ADHD are still unclear, but research suggests a substantial genetic influence. Other potential risk factors include brain injuries, exposure to environmental toxins (e.g., lead) during pregnancy or early childhood, prenatal exposure to alcohol and tobacco, premature delivery, and low birth weight. Myths such as sugar consumption or excessive television watching lack empirical support (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024).

### *Genetic Factors*

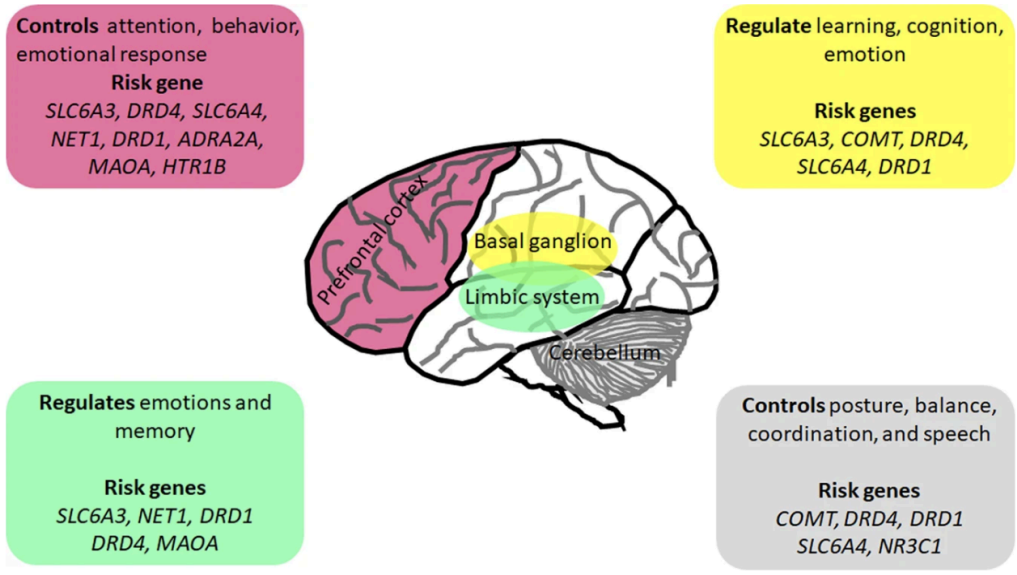
Studies on ADHD have revealed heritability estimates ranging between 70% and 90%, indicating a strong genetic influence. Family and twin studies consistently demonstrate this genetic predisposition. Children are more likely to have ADHD if their relatives have been

diagnosed with the disorder. The Genome-Wide Association Studies (GWAS) indicate that ADHD is influenced by genetic risk factors associated with multiple psychiatric conditions, suggesting shared biological pathways in their development (Sonuga-Barke et al., 2023). Sex-dependent genetic effects of ADHD are also evident, contributing to differences in prevalence and symptom presentation between males and females.

**Figure 1**

*Genetic Variations of Brain Changes in Patients with ADHD*

From: Genetic variations influence brain changes in patients with attention-deficit hyperactivity disorder




Multiples genes are associated with altered structural and functional brain changes, mainly in the frontal lobe, basal ganglion, limbic system, and cerebellum.

(Genetic variations influence brain changes in patients with attention-deficit hyperactivity disorder, 2021)

### *Environmental Influences*

Environmental factors, along with prenatal and perinatal influences, also contribute to ADHD. Notable risk factors include maternal smoking, prenatal stress, low birth weight, and early exposure to environmental toxins (Sonuga-Barke et al., 2023). Fetal exposure to teratogens such as tobacco and alcohol has been implicated in the development of ADHD. Teratogens can disrupt normal prenatal development, leading to symptoms characteristic of both fetal alcohol syndrome (FAS) and ADHD, such as memory problems, poor judgment, and hyperactivity

(Faraone et al., 2005). Complications during pregnancy, such as hypoxia, toxemia, and eclampsia, have also been linked to an increased risk of ADHD in children (Linnet et al., 2003).

The interaction between genes and the environment demonstrate how complex the etiology of ADHD is, where environmental factors may elevate genetic risk or vice versa (Sonuga-Barke et al, 2023). ADHD rarely has a single cause, whether it is genetic or environmental. Most cases occur due to the combined effects of several genetic and environmental risks, each having a minimal impact (Faraone et al., 2021). Neuroimaging studies have shown that the structure and function of the brain in people with ADHD are subtly different from those without it, especially in the frontal, cingulate, and temporal regions. This provides further evidence that ADHD has a neurobiological basis (Faraone et al., 2021).

**Neuroscience/Pathophysiology**

Neurobiologically, ADHD is associated with alterations in brain structure and function, specifically in the frontal cortex, which plays a crucial role in executive functioning such as problem-solving, decision-making, and behavioral control (Shaw et al., 2007). Studies have shown morphological differences in the brains of individuals with ADHD, including smaller volumes in the Corpus Callosum, which is responsible for communication between the brain's hemispheres. Additionally, there is often asymmetry in the brains of children with ADHD, with the right frontal region being more prominent than the left in most typical brains (Shaw et al., 2007).

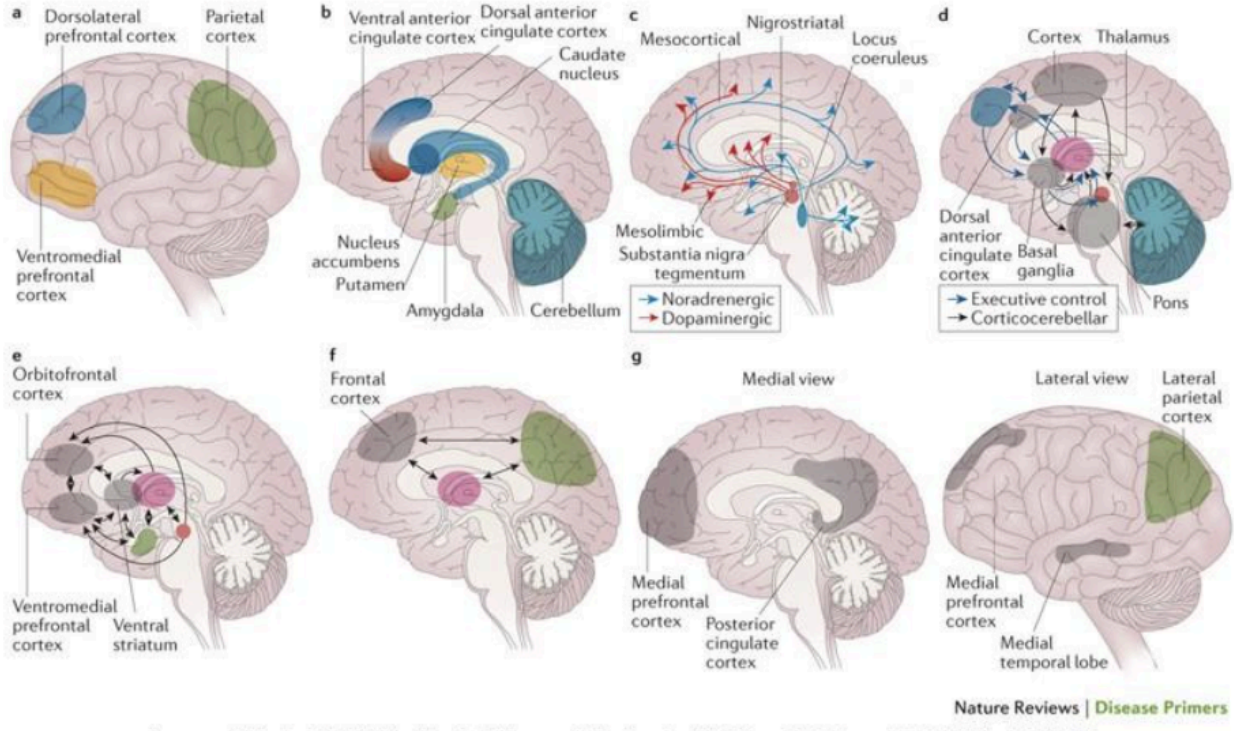
A prevailing theory in understanding the etiology of ADHD is the imbalance of neurotransmitters, particularly norepinephrine and dopamine. These neurotransmitters are crucial for stimulating brain activity and supporting the neural circuits that regulate attention and behavior. Neuroimaging studies have demonstrated abnormalities in brain areas related to these

functions, primarily in the prefrontal cortex and the dopaminergic mesolimbic system (Posner et al., 2020). The effectiveness of stimulant medication in alleviating ADHD symptoms further supports this theory, as these medications increase the availability of neurotransmitters in the brain, thereby improving symptoms related to attention and hyperactivity (Faraone et al., 2015).

Additionally, ADHD psychopathology includes Emotional Regulation Difficulties (ERD), which indicate symptom severity, continuity, and adverse outcomes such as comorbid anxiety and depression. ERD involves failing to regulate and react appropriately to emotional experiences, adding additional complexity to the clinical presentation of ADHD (Sonuga-Barke et al., 2023).

**Figure 2**

*Brain Mechanisms in ADHD*




Faraone, S. V. *et al.* (2015) Attention-deficit/hyperactivity disorder *Nat. Rev. Dis. Primers* doi:10.1038/nrdp.2015.20

### *Developmental and Transdiagnostic Perspectives*

ADHD is a lifelong disorder with various developmental trajectories. Therefore, this is relevant to early intervention and preventive strategies, although it is still somewhat limited by the restricted knowledge on early predictors of ADHD (Posner et al., 2020). Current studies view ADHD as a dimensional disorder from a categorical perspective, characterized by symptom severity and increased variability in symptom presentation (Sonuga-Barke et al., 2023). Furthermore, there is an overlap in the etiology and pathophysiology of this condition with other psychiatric conditions. A transdiagnostic framework may help to identify standard vulnerability processes and improve treatment approaches across disorders (Posner et al., 2020).

### *Genetic and Environmental Interactions*

Neuroimaging research has shown that the combined effects of genetic predispositions and environmental exposures lead to altered brain development, increasing the risk of ADHD (Pereira-Sanchez & Castellanos, 2021). Professionals can understand these interactions in the context of prevention and early intervention. These factors include maternal pre-pregnancy obesity, antibiotic use, and acetaminophen use during pregnancy, maternal smoking, prenatal opioid exposure, and perinatal complications such as preeclampsia and low birth weight (Chaulagain et al., 2023). Additional contributors that may increase an individual's risk for ADHD include postnatal factors like breastfeeding duration and exposure to secondhand smoke (Chaulagain et al., 2023).

## Comorbidities

ADHD often coexists with many other disorders, such as anxiety, depression, learning disabilities, and sleep disorders. These comorbidities complicate the diagnosis and treatment of

ADHD, and therefore, its treatment should be multifaceted (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024).

Other Common Comorbidities:

Psychiatric Disorders

- Anxiety and Depression: ADHD often co-occurs with anxiety and depression, exacerbating the conditions of children with ADHD and affecting their academic performance and social life (Chan et al., 2022).
- Oppositional Defiant Disorder (ODD) and Conduct Disorder (CD): The presence of ODD and CD is pervasive in children with ADHD, and it adds to behavior management problems and complexities in the treatment and intervention of ADHD.
- Bipolar Disorder and Tourette Syndrome: Frequently coexisting with ADHD necessitates detailed diagnostic assessment in these cases (Chaulagain et al., 2023).

Neurodevelopmental Disorders

- Autism Spectrum Disorder (ASD): ADHD often coexists with ASD, so interventions need to be focused on the comorbidity of the two conditions and approaches directed at the impairment of each (Chaulagain et al., 2023).
- Learning Disorders: Dyslexia, dyscalculia, and dysgraphia are common types of learning disorders that children with ADHD usually experience, making the process of learning increasingly challenging for them (Danielson et al., 2018).
- Sluggish Cognitive Tempo (SCT): SCT is characterized by dreaminess, mental fogginess, and a slow cognitive process. It is not considered to be ADHD but often presents with ADHD, which makes diagnosis and treatments even more complex (Sonuga-Barke et al., 2023).

Somatic Conditions

- Sleep Problems: Sleep problems are common in ADHD and add to the overall impairment of ADHD. Poor sleep quality exacerbates attention deficit symptoms, and it may give rise to other psychiatric comorbidities (Sonuga-Barke et al., 2023).
- Obesity and Eating Disorders**:** Individuals with ADHD experience increased obesity and eating disorders that require ADHD healthcare services (Chaulagain et al., 2023).

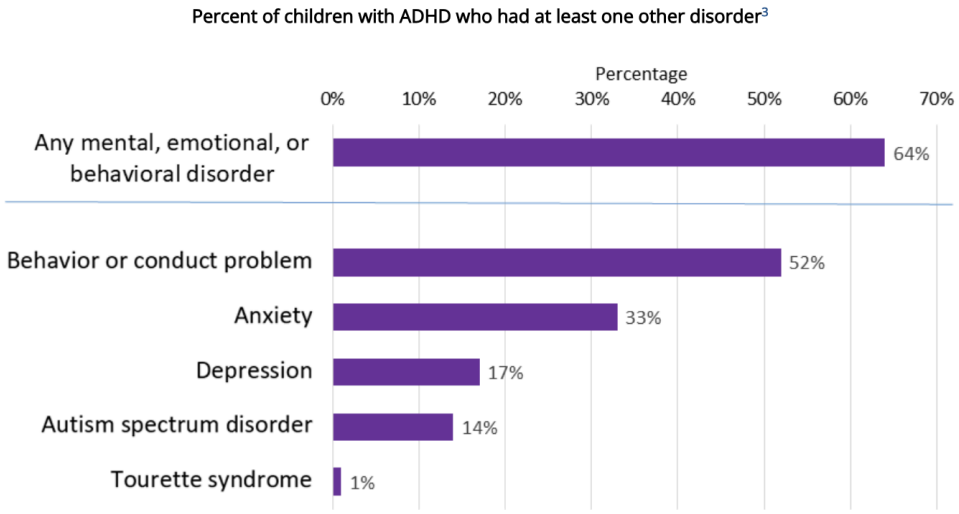
Genetic studies indicate significant genetic overlaps between ADHD and its various comorbidities, like major depression, autism, and bipolar disorder. This gene comorbidity suggests shared biological pathways and challenges the notion of ADHD as a distinct, isolated condition (Sonuga-Barke et al., 2023). Environmental factors also play a role, and gene-environment interactions contribute significantly to the complexity of ADHD etiology (Sonuga-Barke et al., 2023).

***Prevalence and Impact of Comorbidities***

A 2016 parent survey by the CDC indicated that approximately 64% of children with ADHD had at least one other disorder. Common comorbidities include behavioral or conduct problems (52%), anxiety (33%), depression (17%), ASD (14%), and Tourette syndrome (1%). These coexisting conditions create a need for thorough screening and personalized intervention strategies, particularly for individuals already diagnosed with ADHD (Danielson et al., 2018).

**Figure 3**

*Percent of children with ADHD who had at least one other disorder*




(Percent of children with ADHD who had at least one other disorder, 2016)

The high degree of comorbidity between ADHD and other psychiatric, neurodevelopmental, and somatic conditions necessitates an integrated approach to diagnosis and treatment. This approach should include thorough screening for co-occurring conditions, individualized interventions, and a strong emphasis on managing challenges in emotional regulation. Understanding and addressing the complex interactions between ADHD and its comorbidities can enhance outcomes and improve the quality of life for affected individuals.

**Diagnosis and Symptomatology**

Diagnosing ADHD involves a comprehensive assessment that includes medical examinations to rule out other disorders, symptom checklists, and thorough histories from parents, teachers, and the child.

Licensed clinicians diagnose ADHD based on clinical interviews, behavioral assessments, and rating scales like the Conners' Rating Scale (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024). Explicit criteria document symptoms and make the

diagnosis valid across all ages and cultures, even when comorbid with other psychiatric disorders.

***Diagnosis Criteria***

The DSM-V criteria for the diagnosis of ADHD indicate that, in the last six months, there should exist either symptoms of hyperactivity-impulsivity, inattentiveness, or both in various settings, with an associated functional impairment (Faraone et al., 2021). The DSM-V identifies three presentations for classifying ADHD: predominantly inattentive, predominantly hyperactive-impulsive, and combined (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024). The diagnosis is made according to criteria in DSM-V and ICD-11 to ensure consistency in diagnosis between regions and population studies.

Symptoms of Inattention:

- Difficulty sustaining attention
- Forgetfulness
- Disorganization

Symptoms of Hyperactivity-Impulsivity:

- Fidgeting
- Excessive talking
- Impulsive actions

Subtypes of ADHD Each subtype has distinct diagnostic criteria:

Predominantly Inattentive Presentation (A1):

- Failing to give close attention to details
- Difficulty holding attention on tasks
- Not listening when spoken to directly

- Poor follow-through on instructions
- Difficulty organizing tasks
- Avoiding tasks requiring mental effort
- Losing things
- Being easily distracted
- Forgetfulness in daily activities (American Psychiatric Association, 2013)

Predominantly Hyperactive-Impulsive Presentation (A2):

- Fidgeting
- Leaving one's seat in inappropriate situations
- Running about or climbing excessively
- Inability to play quietly
- Seems to be "on the go"
- Talking excessively
- Blurting out answers
- Difficulty waiting for turns
- Interrupting others (American Psychiatric Association, 2013)

Combined Presentation:

- A combination of hyperactive and inattentive symptoms
- Associated with higher rates of behavior disorders and other psychiatric conditions
- Lower average intellectual, academic, and social functioning compared to non-ADHD children (American Psychiatric Association, 2013)

### *Symptom Presentation Over Time*

ADHD symptoms often persist into adolescence and adulthood, though their expression may evolve (Sonuga-Barke et al., 2023). Hyperactivity and impulsivity generally initiate in early childhood, and longitudinal studies ascertain that some will exhibit a remission of symptoms; however, most individuals have ADHD symptoms continuing into their adult life, indicative of the intermittent nature of ADHD. Additionally, the symptoms of ADHD can begin in adolescence or adulthood, as recent data suggests, including cases of late-onset ADHD. This further complicates the traditional view that ADHD must exist from early childhood (Sonuga-Barke et al., 2023).

## Incidence and Prevalence

ADHD is the most common neurodevelopmental disorder diagnosed in children and teens, with global prevalence rates ranging from 5.29% to 7.2% (Chan et al., 2022; Drechsler et al., 2020). This variability can be attributed to differences in diagnostic criteria, methodological variations, and region-specific factors. Generally, the rate remains constant, around 5% to 7% between children and adolescents; additionally, boys are diagnosed more frequently than girls. This gender difference is observed worldwide and may result from boys displaying more overtly hyperactive and impulsive behaviors, which are more easily recognizable than the inattentive symptoms that girls typically show (Drechsler et al., 2020).

The prevalence of ADHD in adults is estimated to be around 2.5-2.8% globally (Posner et al., 2020; Drechsler et al., 2020). Compared to children, the lower prevalence implies either a decrease in the symptoms with age or underdiagnosis in adulthood. Longitudinal studies indicate that while some individuals alleviate their symptoms as they age, most continue to exhibit these characteristics into adulthood, albeit in a different form (Posner et al., 2020).

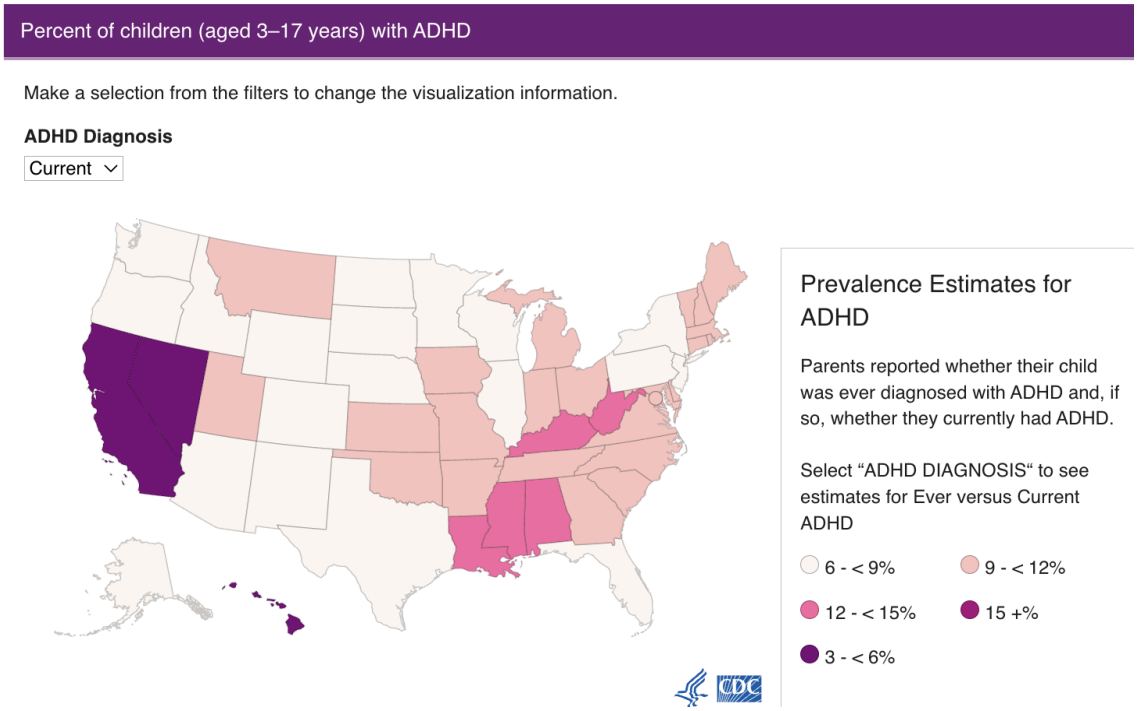
### *Regional Variations*

Studies utilizing clinical interviews conducted in North America often report higher rates of ADHD prevalence, which may vary based on geographic location and the nature of the research study (Chaulagain et al., 2023). According to the CDC, the prevalence of ADHD among children aged 3 to 17 years in the United States was approximately 9.8 percent based on data pooled from 2016 to 2019. This translates to about 6 million children, with diagnosis rates higher in older children: 2 percent in children aged 3 to 5 years, 10 percent in those aged 6 to 11 years, and 13 percent in those aged 12 to 17 years (Danielson et al., 2018).

ADHD diagnosis and treatment rates also vary significantly across US states, with diagnosis rates ranging from 6% to 16%. Treatment rates, including medication and behavioral treatment, fluctuate between 58% to 92% and 38% to 62%, respectively (Danielson et al., 2018).

**Figure 4**

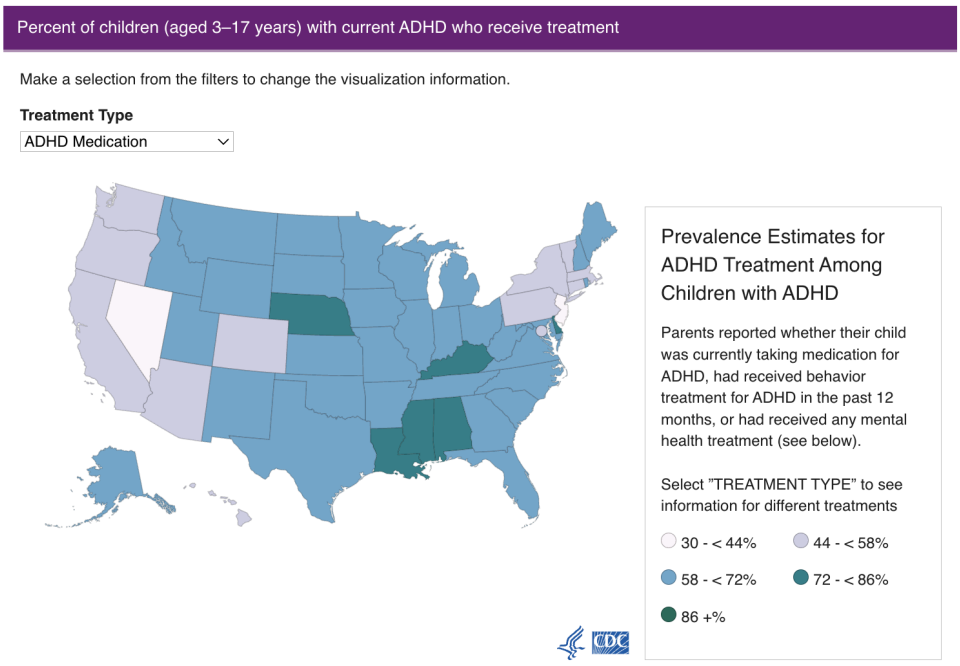
*Percent of children (aged 3-17) with ADHD*




(Prevalence, 2016)

**Figure 5**

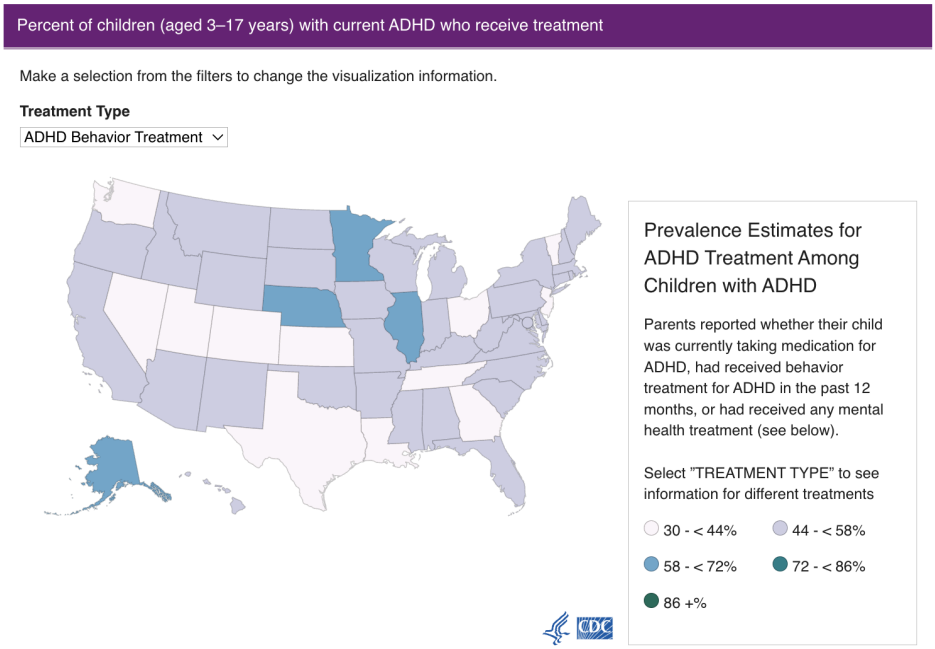
*Percent of children with ADHD who receive ADHD medication*




(Treatment: Medication, 2016)

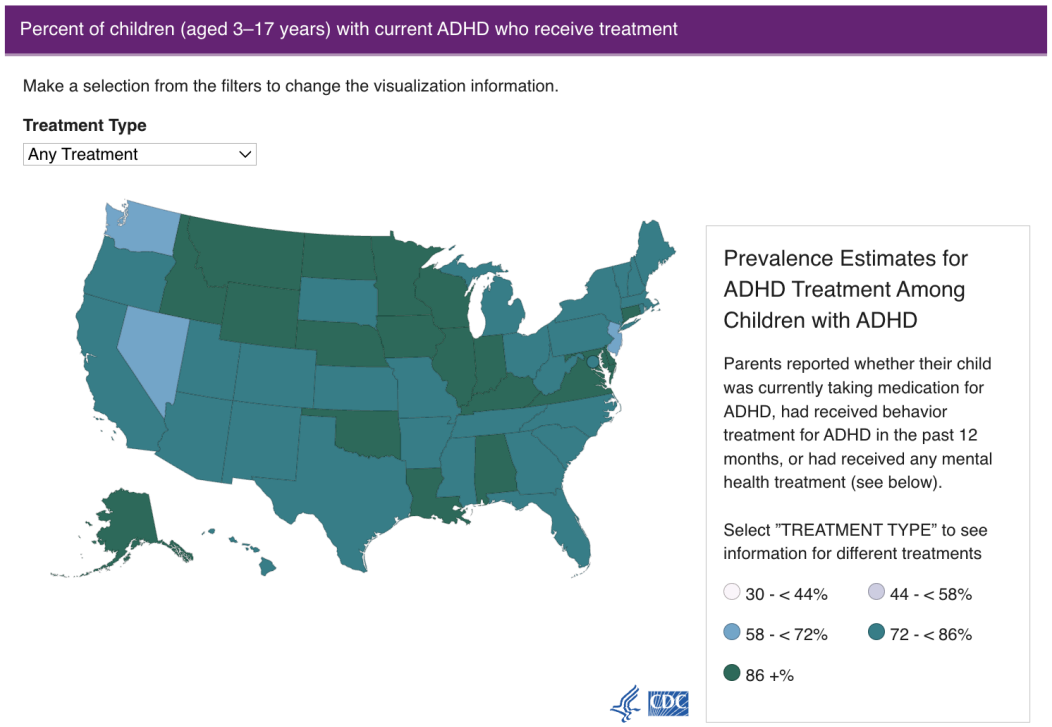
**Figure 6**

*Percent of children with ADHD who receive behavior treatment*




(Treatment: Behavior Treatment, 2016)

**Figure 7**
*Percent of children with ADHD who receive any treatment*




(Treatment: Any Treatment, 2016)

Millions of children and adults worldwide are affected by ADHD, leading to its widespread incidence and prevalence. While prevalence rates vary somewhat, seemingly due to methodological differences and regional factors, the disorder consistently appears more common in males. Research indicates an increasing trend in diagnoses over time. Understanding these patterns will be crucial for developing effective strategies for diagnosis, treatment, and support for individuals with ADHD across various populations and settings.

### *Ethnic and Socioeconomic Variations*

The prevalence of diagnosis also varies among different ethnic and socioeconomic groups. Data from a 2016 CDC survey indicate higher diagnosis rates for children identified as

Black non-Hispanic (12%) and White non-Hispanic (10%) compared to those classified as Hispanic (8%) or Asian non-Hispanic (3%) (Danielson et al., 2018).

***Historical Trends***

Over the past few decades, the number of children diagnosed with ADHD has increased significantly. Specifically, between 2003 and 2011, ADHD diagnoses among children in the U.S. surged by 42% (Attention-Deficit/Hyperactivity Disorder, n.d.). This surge has occurred partly due to a better understanding of ADHD and increased awareness among healthcare professionals and the general public. As more people recognize the symptoms, more children are being diagnosed. However, the increase may also stem from changes in diagnostic practices and heightened vigilance by doctors and educators (Morrow et al, 2012).

Furthermore, the increasing ADHD diagnosis trend isn't unique to the United States. Globally, around 5% of children and adolescents are diagnosed with ADHD, though this rate varies significantly across different regions. These variations suggest that cultural attitudes and diagnostic criteria play a crucial role in how ADHD is recognized and reported (Polanczyk et al., 2007). For instance, Europe has seen a similar rise in ADHD diagnoses, though the rates differ due to varying healthcare systems and cultural perceptions (Hinshaw & Scheffler, 2014).

As mentioned earlier, boys are diagnosed with ADHD significantly more often than girls. Studies indicate that 13% of boys are diagnosed with ADHD compared to 6% of girls (Danielson et al., 2018). This disparity may be because boys often exhibit more pronounced and disruptive symptoms, such as hyperactivity and impulsivity, making them easier to notice and report. In contrast, girls typically display inattentive symptoms, like daydreaming, which can be easily overlooked due to their less disruptive nature (Gaub & Carlson, 1997).

The criteria for diagnosing ADHD have also evolved. The DSM has undergone several revisions impacting ADHD diagnosis. The DSM-IV, released in 1994, expanded the diagnostic criteria to include a broader range of symptoms and subtypes, likely contributing to the rise in diagnoses during that period (American Psychiatric Association, 1994). The DSM-V, published in 2013, further refined these criteria, stressing the need for consistent symptoms across different settings over time (American Psychiatric Association, 2013).

Society itself has influenced the rising rates of ADHD diagnoses. Increased academic pressures, changes in educational policies, and a greater emphasis on standardized testing may have heightened awareness and diagnosis of ADHD (Sax & Kautz, 2003). Plus, the rise of technology and social media has spread information about ADHD, boosting public and professional awareness.

Finally, it is vital to evaluate how the COVID-19 pandemic has impacted ADHD diagnoses and management. The transition to remote learning and the disruption of daily routines exacerbated ADHD symptoms for many children, leading to an increase in the number of diagnoses during the pandemic (Bobo et al., 2020). The lack of structured environments and the challenges of virtual classrooms made it difficult for students with ADHD to stay focused and engaged. Additionally, COVID-19 underscored the need for mental health services and support systems for kids with ADHD (Lee, 2020).

Ergo, the historical trends in ADHD diagnosis reflect a combination of improved recognition, evolving diagnostic criteria, and broader societal influences. Understanding these factors is essential for ensuring accurate diagnosis and effective management of ADHD.

## Understanding Neuroscience and Its Role in Special Education

Investigating the connection between neuroscience and special education reveals promising opportunities to enhance the teaching methods for students with ADHD. Research involving brain imaging offers crucial insights into the brain's structure and functioning associated with ADHD, aiding in the development of more effective Individualized Educational Plans (IEPs) and targeted interventions.

### *Key Brain Differences*

Studies using neuroimaging have found notable structural differences in the brains of children with ADHD. These children often have smaller volumes in brain areas crucial for attention, impulse control, and executive functions, such as the prefrontal cortex, basal ganglia, and cerebellum (Pereira-Sanchez & Castellanos, 2021). Additionally, researchers have observed smaller volumes in subcortical structures such as the accumbens, amygdala, caudate, hippocampus, and putamen, alongside reduced cortical thickness and surface area in the frontal, cingulate, and temporal cortices (Pereira-Sanchez & Castellanos, 2021). Understanding these structural differences allows educators to tailor IEPs, 504s, and differentiated instruction to address specific cognitive deficits, ensuring that educational interventions are customized to each student's unique brain development.

### *Functional Brain Networks*

Research on brain function highlights impairments in networks like the default mode network (DMN), frontoparietal network (FPN), and salience network (SN) in children with ADHD. These networks are crucial for maintaining sustained attention, managing tasks, and recognizing and responding to important stimuli (Pereira-Sanchez & Castellanos, 2021). Special education programs can include strategies to strengthen these networks through specific

cognitive and behavioral interventions. Methods like regular breaks, multimodal instruction, and structured routines can help improve focus and executive functioning in students with ADHD.

### *Multimodal Approaches*

Integrating genetic, neuroimaging, and behavioral data can help identify students who are at greater risk for severe ADHD symptoms, facilitating early and tailored interventions. This strategy enables the development of personalized learning environments that meet the specific needs of students with ADHD, providing a more comprehensive understanding of their developmental profiles (Pereira-Sanchez & Castellanos, 2021).

### *Neuroplasticity and Educational Strategies*

Research on brain plasticity, the brain's ability to change and adapt, highlights the potential for developing effective educational interventions for students with ADHD. Customized learning approaches based on neuroscientific insights can cater to the unique cognitive profiles of these students (Diamond, 2013). Differentiated instruction methods enhance attention and executive functions, while technology-based learning tools provide interactive and engaging experiences (Diamond 2013).

Incorporating physical activity and sensory integration exercises into the curriculum can enhance neuroplasticity, boost focus, and improve cognitive functions. Techniques addressing sensory processing issues help students concentrate more effectively and learn more efficiently (Pascual-Leone et al., 2005). Additionally, mindfulness and relaxation practices can promote focus and self-regulation by leveraging the brain's adaptive capacity (Diamond 2013).

### *Collaborating Across Disciplines*

Integrating neuroscientific findings into educational strategies requires collaboration between educators and neuroscientists. This partnership is crucial for translating research into

practical classroom applications, leading to the development of evidence-based teaching strategies tailored to the needs of students with ADHD (Willis, 2008). Educators must stay current with the latest research to avoid misconceptions and outdated ideas, such as the debunked notion of left-brain/right-brain learning styles (Willis, 2008). A solid understanding of brain function supports the implementation of effective educational practices.

Educators should stay open to incorporating neuroscientific insights into teaching methods, regularly assessing their impact, and sharing successful practices within the educational community (Willis, 2008). As neuroscience advances, we expect to see more direct links between brain research and classroom strategies, promoting inclusive and supportive learning environments.

To conclude, advancements in neuroscience offer valuable insights into the unique needs of students with ADHD. By leveraging these insights, educators can develop more effective and personalized interventions, creating learning environments that significantly improve learning and behavioral outcomes for these students. The collaboration between educators and neuroscientists is essential for bridging the gap between research and practical classroom applications, ensuring that scientific advancements lead to meaningful improvements in special education.

## Treatments for ADHD

### *Behavioral Therapy and Behavioral Interventions*

Behavioral therapy is a vital part of ADHD treatment, especially for younger children. It focuses on modifying behavior through structured techniques. Traditional ADHD treatments include medications, psychological counseling, and behavioral therapy. Physical exercise has

recently been recognized as a practical addition that benefits cognitive function and overall health (About Attention-Deficit/Hyperactivity Disorder (ADHD), 2024; Chan et al., 2022).

### *Neurophysiological Changes from Physical Exercise*

Physical exercise triggers neurophysiological responses that enhance cognitive functions, including memory and executive function. Exercise increases neurotransmitters such as serotonin and dopamine, and promotes the synthesis of brain-derived neurotrophic factor (BDNF), thereby enhancing neuroplasticity (Chan et al., 2022). Both short-term and long-term exercises benefit cognitive functions, with moderate to high-intensity aerobic exercises efficiently improving attention, executive function, and motor skills. Even a single exercise session can have a positive impact on cognitive functions, such as improved inhibitory control and attention (Chan et al., 2022).

### *Specific Exercise Interventions*

- ***Aerobic Interval Training (AIT).*** AIT involves repeated bouts of high-intensity effort followed by recovery periods. It suits children with ADHD due to their impulsive and hyperactive nature, improving cognitive functions and reducing ADHD symptoms (Chan et al., 2022).
- ***Perceptual Motor Training and Meditation (PMTM).*** The intervention involves rhythmic dancing and mindfulness practices that enhance sensory perception and coordination of motor control. PMTM has shown potential benefits for improving attention and self-control in children with ADHD (Chan et al., 2022).

### *Neurotherapeutics*

Further exploring non-pharmacological treatments, biofeedback and neurofeedback are becoming crucial tools, reflecting the growing trend of using personal data to enhance health.

Biofeedback assists individuals with ADHD in gaining control over physiological functions like heart rate variability, which helps manage symptoms related to anxiety and impulsivity. Neurofeedback, a specific type of biofeedback that concentrates on brain activity, is especially effective in treating ADHD. It trains individuals to regulate brain functions through protocols such as theta/beta ratio (TBR), sensorimotor rhythm (SMR), and slow cortical potential (SCP) training (DuPaul et al., 2013). These methods are effective in meta-analyses and randomized controlled trials, providing a non-pharmacological alternative to traditional ADHD treatments, which frequently have limitations regarding long-term symptom remission and potential side effects. However, the clinical application of neurofeedback is not yet standardized, and further research is needed to understand and optimize its use (DuPaul et al., 2013). Integrating these innovative, non-invasive tools with traditional ADHD treatments could enhance overall patient care, empowering individuals with ADHD to improve their self-regulation skills and, thus, their quality of life.

Researchers have explored several neurotherapeutic approaches for ADHD treatment:

- ***EEG-Neurofeedback (EEG-NF).*** This method trains self-regulation of brain oscillations linked to ADHD, such as the theta/beta ratio. While it has shown small to medium improvements in symptoms, its overall effectiveness and self-regulation outcomes are inconsistent (Rubia et al., 2021).
- ***Functional Magnetic Resonance Imaging Neurofeedback (fMRI-NF).*** This targets specific brain regions with poor activation in ADHD. Although promising, more extensive trials are needed to confirm its efficacy (Rubia et al., 2021).

- ***Near-Infrared Spectroscopy Neurofeedback (NIRS-NF):*** A pilot study demonstrated improvements in ADHD symptoms and cognitive functions, although it did not outperform other neurofeedback methods (Rubia et al., 2021).

***Brain Stimulation***

- ***Repetitive Transcranial Magnetic Stimulation (rTMS).*** rTMS is a non-invasive method that targets cortical excitability. Studies show mixed results, with some improvements in ADHD symptoms but limited cognitive benefits (Rubia et al., 2021).
- ***Transcranial Direct Current Stimulation (tDCS).*** tDCS applies a weak, continuous, direct current to the brain, modulating cortical function. Studies show minor cognitive improvements, but the effects on clinical symptoms are mixed. tDCS is considered safe and well-tolerated, especially in children (Rubia et al., 2021).

***Parent Training***

Parents undergo training to employ positive reinforcement and consistent discipline to manage their child's behavior. Techniques include setting clear expectations, implementing reward systems, and offering immediate feedback (About Attention-Deficit/Hyperactivity Disorder (ADHD), 2024).

***Cognitive Behavioral Therapy (CBT)***

CBT is an effective non-pharmacological treatment for ADHD. CBT focuses on modifying dysfunctional thoughts and behaviors, improving organizational skills, and developing coping strategies (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024). A meta-analysis by Knouse and Safren (2010) found that CBT significantly improves ADHD symptoms, particularly in adults. Randomized controlled trials have shown that by teaching techniques to control core symptoms and cope with related emotional challenges, CBT can

significantly improve clinician-reported ADHD symptoms and self-reported inattention, as well as reduce associated depression and anxiety. In some studies, integrating CBT with pharmacotherapy is more effective than medication alone.

The American Academy of Pediatrics recommends CBT as the primary approach for children under six, while advising a combination of medication and behavioral therapy for older children (Wolraich et al., 2019).

### *Organizational Skills Training*

Organizational training teaches children and adolescents time management, planning, and organizational skills, which are particularly effective for secondary students struggling with managing assignments and school materials (About Attention-Deficit/Hyperactivity Disorder (ADHD), 2024).

### *Holistic Approaches*

Recent approaches emphasize holistic, person-centered assessment and intervention, focusing on reducing impairment and improving overall quality of life rather than solely targeting symptom reduction (Sonuga-Barke et al., 2023).

### *Pharmacological Treatments*

Several medications are recognized globally as safe and effective for reducing ADHD symptoms. Stimulant medications are more effective than non-stimulants but have a higher potential for misuse and abuse. Non-medication treatments, such as behavioral therapy, help address residual problems after medication optimization (Faraone et al., 2021).

- ***Stimulants.*** Methylphenidate and amphetamines are first-line pharmacotherapies, showing immediate symptom reduction. Side effects include reduced appetite, sleep disturbances, and potential cardiovascular issues (Drechsler et al., 2020).

- ***Non-Stimulants.*** These include atomoxetine, guanfacine, and clonidine. Atomoxetine is a norepinephrine reuptake inhibitor with common side effects like nausea, vomiting, and fatigue. Clonidine and guanfacine enhance noradrenergic neurotransmission in the prefrontal cortex (Mechler et al., 2022).

### *Novel Medications*

New medications such as Centanafadine, Mazindol, Serdexmethylphenidate, Tipepidine Hibenzate, and Viloxazine are being developed. They have shown varying degrees of efficacy in clinical trials (Mechler et al., 2022).

### *Non-Pharmacological Treatments*

Behavioral interventions, cognitive training, neurofeedback, mindfulness, and physical activity demonstrate modest efficacy, particularly when tailored to individual needs and used in conjunction with medication (Chaulagain et al., 2023).

### *Comprehensive Treatment Approach*

The most comprehensive method for managing ADHD is a multimodal treatment approach combining pharmacology, CBT, neurofeedback, and educational support. This approach addresses various aspects of ADHD, contributing to a comprehensive treatment plan that caters to the individual's unique needs. Despite controversies and challenges surrounding pharmacological interventions, this approach remains highly effective, as evidenced by extensive research and clinical practice (Sibley et al., 2023). Continued research and interdisciplinary collaboration are essential for refining these treatments and improving outcomes for individuals with ADHD (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024; Chan et al., 2022; Rubia et al., 2021; Faraone et al., 2021; Mechler et al., 2022; Sibley et al., 2023; Chaulagain et al., 2023).

### *Multimodal Approach to ADHD Treatment*

Managing ADHD effectively often requires a multimodal approach that combines behavioral therapy and medication. For preschool-aged children, behavior therapy, especially parent training, is recommended before considering medication. This early intervention focuses on teaching parents techniques to manage their child's behavior, providing a foundation for future treatment. For school-aged children and adolescents, combining behavioral therapy with medication is typically the most effective approach. Behavioral therapy helps address specific challenges related to attention, hyperactivity, and impulsivity. At the same time, medication can significantly reduce core symptoms, allowing for better engagement in therapeutic activities and daily tasks (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024).

Close monitoring and regular follow-up are crucial components of any ADHD treatment plan. This ongoing assessment involves collaboration among healthcare providers, parents, teachers, and individuals with ADHD to ensure the chosen interventions are effective and make necessary adjustments. Regular check-ins help track progress, address any side effects from medications, and adapt strategies to meet the evolving needs of the individual (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024).

Lifestyle and environmental changes also play a significant role in managing ADHD symptoms. Maintaining a healthy lifestyle, including a nutritious diet, regular physical activity, and adequate sleep, is essential. A balanced diet of fruits, vegetables, whole grains, and lean proteins supports overall health and cognitive function. Regular physical exercise reduces hyperactivity and improves focus, while sufficient, quality sleep is crucial for managing symptoms and enhancing overall well-being (About Attention-Deficit/Hyperactivity Disorder (ADHD), 2024).

Creating a structured and predictable environment at home and school can help children with ADHD manage their symptoms more effectively. Establishing routines, minimizing distractions, and utilizing organizational tools provide the stability and predictability essential for enhancing focus and reducing anxiety. These adjustments support individuals in developing better organizational skills and self-regulation (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024).

## School-Based Interventions for ADHD

Effective school-based interventions for ADHD are crucial in assisting students in managing symptoms and attaining academic success. These interventions generally encompass behavioral classroom management, organizational skills training, and IEPs or 504 Plans, working together to establish structured environments with clear expectations and consistent feedback (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024).

### *Behavioral Classroom Management*

Behavioral classroom management is a cornerstone of these interventions, with teachers employing structured techniques to foster positive behavior in the classroom. Key methods include reward systems, clear rules, and consistent consequences. Reward systems encompass strategies where students earn rewards for exhibiting desired behaviors, promoting consistent adherence to rules and expectations. Establishing and communicating clear, concise classroom rules provides a predictable environment, reducing anxiety and impulsivity. Applying consistent consequences for rule-breaking helps students understand the relationship between actions and outcomes, which is crucial for behavioral regulation (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024).

### *Organizational Skills Training*

Organizational skills training is particularly beneficial for students with ADHD who have difficulty with time management, tracking assignments, and organizing school materials. This training equips students with skills in time management, task organization, and effective study techniques. Time management training teaches students how to use planners, prioritize tasks, and allocate time efficiently to complete assignments. Task organization enables students to break down large tasks into manageable steps while maintaining organized materials and study spaces. Offering strategies for effective note-taking, summarizing information, and preparing for tests improves their study skills (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024).

### *IEPs and 504 Plans*

IEPs and 504 Plans are customized educational frameworks designed to address the unique needs of students with disabilities, including ADHD, which is classified under the Other Health Impairment (OHI) category. These plans provide specific, individualized accommodations, such as extended time on tests, preferential seating, flexible seating, breaks, and reduced distractions to support students' learning needs. It's essential to set realistic, measurable academic and behavioral goals based on each student's strengths and needs. These plans are developed and regularly reviewed in collaboration with parents, teachers, and school specialists to ensure they remain adequate and relevant. (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024).

### *Counseling and Communication*

Counseling and communication between home and school are effective educational interventions. Counseling, which encompasses family and child therapy, is crucial in managing ADHD. Together with home-school communication, these interventions foster a supportive

environment to tackle the emotional and behavioral aspects of ADHD (DuPaul et al., 2013). Family therapy and communication, in particular, can assist in addressing the challenges that ADHD presents to family dynamics and daily functioning.

### *School-Based Intervention Summary*

Effectively executing school-based interventions demands robust teamwork and collaboration among parents, students, and educators. This partnership involves ensuring open lines of communication between home and school to monitor progress, share observations, and adjust strategies as needed. Utilizing resources and guidelines provided by organizations such as the National Institute of Mental Health (NIMH) to inform treatment and management strategies is essential. Consistent behavioral management techniques and accommodations at home and school create a cohesive support system for the child (Attention-Deficit/Hyperactivity Disorder, n.d.).

In conclusion, school-based interventions for ADHD, including behavioral classroom management, organizational skills training, IEPs or 504 Plans, and counseling, are critical in creating supportive educational environments for students with ADHD.

## Impact of ADHD on Secondary Students

ADHD can significantly impact the academic performance, social relationships, and daily functioning of secondary students. Effective management of ADHD in this age group often requires a combination of medication, behavioral therapy, and educational interventions tailored to the individual's needs (Attention-Deficit/Hyperactivity Disorder, n.d.).

Rubia et al. (2021) link ADHD to deficits in executive functions (EF), which include motor response inhibition, working memory, sustained attention, cognitive shifting, and temporal processing. Individuals with ADHD face higher risks of academic underachievement,

unemployment, substance abuse, and involvement in the criminal justice system (Chaulagain et al., 2023). These risks underscore the importance of comprehensive management strategies that address both the symptoms of ADHD and the related challenges for secondary students. Additionally, ADHD is linked to higher rates of smoking and substance use disorders, an increased risk of injuries, and a greater likelihood of suicidal ideation (Chaulagain et al., 2023).

ADHD can also lead to various medical conditions, including obesity, asthma, allergies, diabetes mellitus, and sleep problems, underscoring the need for comprehensive healthcare that addresses both ADHD and its comorbidities (Faraone et al., 2021). The disorder imposes a substantial economic impact on society, with costs running into hundreds of billions of dollars annually worldwide. These costs encompass healthcare expenses, productivity losses, and expenditures associated with comorbid conditions (Faraone et al., 2021).

The impact of ADHD extends to the quality of life, affecting not only academic performance but also social relationships and daily functioning. The stigma associated with ADHD can lead to reduced self-esteem and reluctance to seek help, further complicating the challenges faced by adolescents with ADHD (Sonuga-Barke et al., 2023).

Secondary students with ADHD experience unique challenges that often differ between boys and girls. Males with ADHD typically exhibit more overt hyperactivity and impulsivity, which can lead to frequent disciplinary issues and academic difficulties. Interventions incorporating physical activity and structured environments are particularly beneficial for these students (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024).

In contrast, females with ADHD are more likely to present predominantly inattentive symptoms, which can result in underdiagnosis and internalized struggles such as anxiety and low

self-esteem. Thus, secondary girls benefit from interventions that focus on organizational skills and emotional support (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024).

ADHD significantly impacts secondary students' academic performance, social relationships, and emotional well-being. Effective management requires tailored approaches that address the specific needs of all genders with ADHD, ensuring that both groups receive the support necessary to succeed academically and socially.

**History of Implementation of Breaks and Their Effectiveness**

Research indicates that breaks, particularly those involving physical activity, can significantly improve attention and reduce disruptive behaviors in students with ADHD. Breaks that allow movement and sensory engagement are especially beneficial (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024). Studies demonstrate that incorporating cognitive breaks and activities that engage multiple brain functions can enhance learning outcomes, supporting the effectiveness of brain-based learning strategies. For example, the BRAVE Study highlights the significance of integrating physical activity into the daily routines of secondary school students, emphasizing the role of schools in promoting healthy habits during adolescence (Longo et al., 2022).

Extensive studies have examined the effects of Classroom Activity Breaks (CABs) on the on-task behavior and physical activity levels of primary school children. CABs, implemented in formats such as the Tabata routine, have been shown to improve on-task behavior and reduce off-task behaviors. For instance, a study found that CABs improved on-task behavior regardless of the time of day, with significant improvements noted in students who initially exhibited higher levels of off-task behavior. Additionally, these breaks contributed to increased physical activity levels during the school day (Broad et al., 2023).

Researchers explored the benefits of daily outdoor walking breaks. A study involving British Columbia high school students and teachers found that participants welcomed these breaks, reporting improvements in mental clarity, focus, energy levels, and social interactions. This study underscored the logistical ease of organizing such breaks and highlighted the benefits of integrating nature and physical activity into the school routine, particularly during the COVID-19 pandemic (Robillard, 2021).

Active breaks (ABs) have shown moderate, significant effects on selective attention, suggesting their utility in educational settings without compromising students' attention (Infantes-Paniagua et al., 2021). Adequate breaks include structured activities such as short physical exercises, mindfulness practices, or sensory tasks that help reset attention and improve focus. These breaks should be short, frequent, and integrated into the daily routine (About Attention-Deficit / Hyperactivity Disorder (ADHD), 2024).

The BRAVE Study and other research highlight that teachers believe that ABs improve psycho-physical well-being and classroom behavior. This finding aligns with research suggesting that PA breaks can enhance cognitive functions and classroom dynamics (Longo et al., 2022).

The importance of PA breaks is well-documented, with benefits including better sleep, reduced depression, improved cognitive functioning, and social benefits. Breaking up sedentary periods with PA is recommended to counteract health issues linked to inactivity (Masini et al., 2024). The TransformUs initiative and similar programs emphasize integrating PA and reducing sedentary behavior through active breaks and supportive environments (Lander et al., 2024).

Professional development for teachers on integrating movement and classroom management strategies can help them effectively implement PA breaks. Incorporating PA breaks into daily lesson plans and routines can simplify the process for teachers to include them

consistently (Campbell & Lassiter, 2020). The decreasing opportunities for physical activity in schools due to academic pressures underscore the necessity for empirical research on the effects of movement in middle and high school environments, particularly in lecture-style classrooms. Movement fosters cognitive growth, memory retention, and overall academic performance, reinforcing the importance of incorporating breaks into the educational setting. (Henry, 2023).

Integrating physical activity and breaks within the school day has substantially benefited students' attention, behavior, and academic performance. Effective implementation requires structured activities, teacher professional development, and a supportive school environment that values the importance of movement and breaks.

## Perceived Barriers and Enablers of Breaks

Implementing breaks in educational settings for students with and without ADHD presents both challenges and opportunities. Understanding these barriers and enablers is crucial for developing effective interventions that enhance student outcomes.

### *Barriers*

Several barriers hinder the implementation of breaks, including misconceptions about lost instructional time and a lack of teacher training on integrating breaks effectively. A recent study revealed that teachers often feel inadequate, embarrassed, or lack the knowledge to conduct ABs, and concerns about maintaining authority and managing class behavior further complicate their efforts (Masini et al., 2024). Research indicates that teachers frequently struggle with classroom control during ABs, highlighting the need for effective management strategies to maintain order and engagement (McMullen et al., 2014). Additionally, social-level barriers such as the potential for student injury and the perceived lack of pedagogical value among students also play a role.

Environmental barriers include limited classroom space, time constraints, and the physical layout of school buildings (Masini et al., 2024). The variability in exercise intensity and protocols indicates the need for standardized guidelines and comprehensive teacher training. Teachers often favor activities that align with academic content, making integration more seamless and increasing their likelihood of adoption (McMullen et al., 2014). However, many educators still view ABs as separate from learning, which hinders their implementation (Lander et al., 2024).

Common challenges include time constraints, crowded curricula, lack of teacher confidence, limited resources, space constraints, and the perception that active breaks disrupt learning (Lander et al., 2024; Routen et al., 2018). The ease of implementation and student enjoyment are also critical factors influencing whether teachers regularly incorporate ABs, with many preferring simple, engaging activities that do not disrupt class flow (McMullen et al., 2014).

Additional barriers include behavioral management issues, particularly with students who have poor self-control, making it challenging to manage the class effectively during and after breaks (Campbell & Lassiter, 2020). External pressures from school observations and parental perceptions also influence the adoption of movement integration (MI) (Routen et al., 2018). Teachers must navigate these challenges while considering individual student differences, including physical fitness and activity preference (Routen et al., 2018). Addressing these barriers through professional development, practical implementation strategies, and curricular alignment can enhance the effectiveness of ABs and encourage widespread adoption.

### *Enablers*

Despite these barriers, several enablers can facilitate the effective implementation of breaks. A 2024 study illustrated that personal motivation and trying activities before class implementation can help teachers feel more confident (Masini et al.). Support from school administration and colleagues is also crucial, as is the use of outdoor spaces and simple exercises that require minimal space. Compatibility with teaching philosophy, strong administrative support, and ease of implementation are significant facilitators (Campbell & Lassiter, 2020).

Teachers' observations of student enjoyment and the positive impact on attention and energy levels encourage the continued use of breaks (Campbell & Lassiter, 2020). Positive student responses and engagement with MI activities also support their use (Routen et al., 2018). The BRAVE Study and other research emphasize the importance of ongoing support and flexibility in physical activity programs to ensure long-term implementation (Longo et al., 2022).

Teacher autonomy and flexibility, allowing them to integrate MI based on their teaching style and classroom needs, are also essential enablers (Routen et al., 2018). Establishing routines and consistently delivering MI can help mitigate behavioral issues, making breaks a more integral part of the classroom environment (Routen et al., 2018). Most teachers favor classroom-based physical activity, citing benefits such as enhanced student focus, engagement, and learning readiness (Stylianou et al., 2015).

### *Teacher Perceptions and Practices*

Teacher perceptions of ADHD and the use of breaks are crucial. While many teachers recognize the benefits of breaks, they often feel constrained by curriculum demands and a lack of resources. Training and administrative support are essential to overcoming these barriers and promoting effective practices (About Attention-Deficit/Hyperactivity Disorder (ADHD), 2024).

A 2023 study revealed that teachers believe CABs benefit students, as evidenced by more focused behavior post-CAB and a willingness to implement CABs multiple times per week (Broad et al.).

Teachers' values, confidence, and teaching styles have a significant influence on the adoption of MI (Routen et al., 2018). Professional development and resources tailored to enhance teacher confidence and competence in delivering MI are essential. Both teachers and students preferred 5-10 minute ABs at the beginning or end of lessons, suggesting low-intensity exercises that could integrate with academic content (Masini et al., 2024).

Addressing the barriers and leveraging the enablers identified can significantly enhance the implementation of breaks in educational settings for students with ADHD. By fostering an environment that values physical activity and provides the necessary resources and support, schools can help students with ADHD improve their academic performance, behavior, and overall well-being.

## Recommendations from the Literature

### *Professional Development*

Continuous training and support for teachers are critical for successfully implementing MI strategies and classroom management techniques. Professional development (PD) programs should include practical modeling of these strategies to build teacher confidence and competence (Routen et al., 2018). For instance, teachers in a PD program increased their daily use of CBPAs from 0.83 to 3.38 and consistently applied the management strategies they learned (Stylianou et al., 2015). To address teachers' concerns about feeling inadequate and managing classroom behavior, PD should emphasize the need for short, simple ABs to integrate with academic content, leveraging outdoor spaces and multimedia tools for engagement (Masini et al., 2024).

### *Resources and Planning*

Providing simple, easy-to-implement resources and integrating MI into lesson plans without increasing teachers' workload is essential (Routen et al., 2018). The BRAVE Study highlights the importance of flexibility in AB content, timing, and implementation, suggesting that PA interventions must be adaptable and co-designed with teachers to ensure sustainability (Longo et al., 2022). This approach aligns with recommendations for creating resources that are accessible and user-friendly, making it easier for teachers to incorporate ABs into their daily routines.

### *Further Research*

Further studies are needed to determine the optimal types and durations of active breaks for different age groups and to investigate their long-term effects on academic performance (Mazzoli et al., 2021). Future research should encompass a range of educational settings to gain a deeper understanding of how to tailor these interventions to meet the diverse needs of all students, particularly those in secondary education.

### *Communication*

Effectively communicating the benefits of MI to teachers, parents, and school leadership is vital for gaining broader support and ensuring alignment with educational goals (Routen et al., 2018). Clear communication highlights the positive impacts on student outcomes, encouraging teacher buy-in and support from the wider school community.

### *Whole School Policy*

Integrating MI into a comprehensive school policy, accompanied by ongoing monitoring and support from administrators, can help ensure these practices are practical and sustainable (Routen et al., 2018). Incorporating a 15-minute daily outdoor walking break into the high school

curriculum benefits both students and teachers by enhancing mental clarity, physical health, and social interactions (Robillard, 2021).

### *Focus on Student Outcomes*

Interventions should emphasize the positive impact of CBPA on student outcomes, including improved focus, behavior, and academic performance (Stylianou et al., 2015). Teachers should be encouraged to reflect on these benefits to maintain their motivation and commitment to implementing PA breaks.

### *Continued Support and Follow-up*

Ongoing PD and support are crucial for sustaining new practices. School administration involvement and support can help alleviate barriers and facilitate the integration of CBPA into daily routines (Stylianou et al., 2015).

### *Management and Practical Strategies*

PD programs should incorporate practical strategies for managing CBPA, including effective transition back to academic tasks (Stylianou et al., 2015). Teachers prefer short, easy-to-implement PA activities that are quickly integrated into lessons and should be included in the training.

### *Resources and Training*

Providing accessible and user-friendly resources is essential for successful implementation. Training should include demonstrations and opportunities for teachers to practice these activities and receive feedback, ensuring they feel prepared and confident to use them in their classrooms (Stylianou et al., 2015).

Addressing these recommendations can help schools create a supportive environment that enhances the effectiveness of breaks and improves outcomes for students with ADHD and other learning challenges.

**Main Findings**

The literature review highlights several critical areas related to using breaks in secondary education for students with ADHD. Firstly, teacher perceptions are essential to the successful implementation of breaks. Teachers' beliefs about the benefits and challenges of breaks significantly influence their willingness to integrate these strategies into classroom routines. Secondly, various types of breaks, especially those involving physical activity and mindfulness, have been shown to improve behavior, attention, and academic performance in students with ADHD. However, implementing these breaks faces practical challenges, particularly in secondary education, where academic demands and classroom management issues are more pronounced. The review also identifies significant gaps in the current literature, including a need for long-term studies on the impact of breaks, the need for standardized guidelines, and the necessity of tailored interventions for secondary students.

**Purpose**

The purpose of this study is to explore and understand secondary teachers' perceptions regarding the use of brain breaks in the classroom. Specifically, this research investigates how secondary teachers perceive the effectiveness and practicality of brain breaks for managing classroom dynamics and enhancing student focus, behavior, and overall engagement. By examining the factors that influence teachers' acceptance or resistance to incorporating brain breaks into their teaching routines, the study aims to identify the challenges and barriers they encounter and the supports that encourage the adoption of brain breaks. Additionally, the study

seeks to assess teachers' views on how brain breaks affect student outcomes, particularly in improving attention, reducing disruptive behavior, and fostering a more positive and engaged classroom environment. Through qualitative methods, including surveys and interviews, the study will gather detailed and nuanced data that will be analyzed thematically to identify patterns and key themes. The findings will provide valuable insights for educators, administrators, and policymakers to develop effective strategies and supportive policies that promote the use of brain breaks in secondary education, ultimately aiming to enhance the educational experiences and outcomes for students with ADHD and the broader student population.

**Research Questions:**

The forthcoming study will focus on the perceptions of secondary teachers regarding brain breaks to address the gaps in the aforementioned research. The primary research questions are:

1) What are secondary teachers' perceptions regarding using brain breaks in the classroom?
2) What factors influence the acceptance or resistance to brain breaks among secondary teachers?
3) How do secondary teachers perceive the impact of brain breaks on student focus, behavior, and overall classroom engagement?

**Need for the Study**

Brain breaks have become increasingly prominent in schools nationwide due to the need for proactive, restorative approaches to managing inattentive, hyperactive, and impulsive behaviors in school settings. Critical factors related to managing ADHD among secondary students underscore the importance of this study. ADHD is highly prevalent among school-aged

children and adolescents, significantly impacting their academic, behavioral, and social development (Centers for Disease Control and Prevention, 2020). While extensive research exists on ADHD interventions in primary education, secondary education presents unique challenges that require tailored strategies. Secondary students face increased academic pressures, complex social dynamics, and higher expectations for self-regulation, underscoring the need for practical, age-appropriate interventions (American Psychiatric Association, 2013; Barkley et al., 2021).

Teacher perceptions are pivotal in the successful implementation of classroom interventions. Teachers' beliefs about the practicalities and benefits of breaks for students with ADHD profoundly influence their adoption and efficacy (Evans et al., 2014). This study aims to shed light on these perceptions and their effect on implementation. Furthermore, there is an urgent need for focused professional development to prepare secondary educators with the skills and confidence necessary to integrate breaks effectively into their teaching practices (DuPaul & Stoner, 2014).

Adequate breaks have demonstrated the potential to mitigate ADHD symptoms, enhance attention, and reduce disruptive behaviors, thereby improving academic performance and classroom dynamics (Raggi & Chronis, 2006; Diamond, 2013). However, there is a notable need for long-term studies on their sustained impact on secondary education. This study seeks to fill this gap by identifying teacher perceptions of breaks in the secondary setting, specifically for students with ADHD.

The implications for policy and practice highlight the urgency of this study. Establishing standardized guidelines for implementing breaks can ensure consistency and effectiveness across various educational settings (Rief, 2016). Additionally, customizing breaks to address the diverse

needs of students with ADHD fosters inclusivity and equity in education. This study aims to provide evidence-based recommendations that inform educational policies and enhance classroom practices (Pelham & Fabiano, 2008).

**Summary**

Chapter 2 focused on the existing literature on the research problem, specifically examining the use of breaks in secondary education for students with ADHD. The researcher analyzed, summarized, and presented key findings related to ADHD, including its definition and history, etiology and pathophysiology, and diagnostic criteria and symptomatology. The literature review also covered the prevalence and incidence of ADHD, the impact of ADHD on secondary students, and common comorbidities. Additionally, the chapter explored various treatment approaches, including behavioral and pharmacological interventions, school-based strategies, and the implementation of breaks in educational settings.

The literature review highlighted the importance of understanding teacher perceptions of breaks for students with ADHD. It emphasized that teachers' beliefs about the benefits and challenges of breaks significantly influence their willingness to integrate these strategies into classroom routines. The review identified significant gaps in the current literature, particularly the need for long-term studies on the impact of breaks, the need for standardized guidelines, and the necessity of tailored interventions for secondary students.

The forthcoming study will focus on secondary teachers' perceptions of brain breaks to address the research gaps. This study will employ a qualitative methodology to explore these questions. Data will be collected through surveys and interviews with secondary teachers. Thematic analysis will identify key themes from the survey and interview transcripts, including

familiarization, coding, theme development, reviewing themes, defining and naming themes, and reporting with supporting quotes.

Chapter 3 presents the study's methodology. The content reflects the research design, approach, instrumentation, participants, setting, validity, and reliability. Later in the chapter, the researcher elaborates upon the site permission and selection process, data collection and analysis procedures, ethical considerations, and potential limitations.

# Chapter 3: Methodology

Chapter 3 describes the research design and methods used to explore secondary teachers' perceptions of classroom brain breaks and the factors that influence their implementation and sustainability in middle and high school settings. This chapter outlines the study's mixed-methods approach, participant selection, data collection procedures, rationale for the use and adaptation of the TETPPACS, data analysis strategies, site permissions, and study limitations.

## Action Plan: Intervention

This research examines the implementation and sustainability of break programs in secondary schools, focusing on educators' perspectives on their effectiveness. Classroom breaks, also known as brain breaks or movement breaks, have been shown to enhance student focus, engagement, and overall academic performance. Evidence suggests that brief, structured breaks during instructional time can enhance cognitive function and reduce stress, leading to a more effective learning environment. Nevertheless, while numerous schools have adopted break programs, their sustainability and effectiveness over time can differ. This study aims to identify common traits among sustainable break programs by examining teachers' perceptions of their efficacy, the obstacles they face, and the elements that contribute to long-term success.

The research question guiding this study is: (1) What are secondary teachers' perceptions regarding using brain breaks in the classroom? (2) What factors influence the acceptance or resistance to brain breaks among secondary teachers? (3) How do secondary teachers perceive the impact of brain breaks on student focus, behavior, and overall classroom engagement?

Participants will include secondary teachers (grades 7-12) from Central York Middle School and Central York High School. The study will feature a diverse sample of educators from

various subject areas, with differing years of teaching experience, educational levels, and familiarity with break programs. Demographics such as age and gender will also be considered to ensure a comprehensive analysis. The selected schools are located within the Central York School District in York, Pennsylvania, which serves a diverse student population with varied socio-economic backgrounds, ethnicities, and academic abilities.

**Data Collection**

This research employs a mixed-methods approach, integrating quantitative and qualitative data collection methods. The primary data source comprises teacher surveys to assess their views on the effectiveness, practicality, and sustainability of break programs. A validated demographic survey, such as a version of the National Assessment of Educational Progress (NAEP) questionnaires, will be implemented to gather background information. The researcher will assess teacher perceptions by applying the Teacher Efficacy Toward Providing Physical Activity in the Classroom Scale (TETPPACS) (Centeio et al., 2022). Requests for permission to replicate and modify existing validated tools were obtained.

In addition to utilizing the standardized TETPPACS, the researcher added five open-ended questions to the survey, which were explicitly designed to capture more in-depth perceptions and experiences of secondary teachers using brain breaks in their classrooms. The inclusion of open-ended questions was motivated by the need to delve deeper into the qualitative aspects of teachers' perceptions and experiences that are not fully captured by the closed-ended format of TETPPACS. These questions aim to provide richer, contextual insights into the factors influencing the adoption and implementation of brain breaks, as well as the perceived impacts on student focus, behavior, and overall classroom engagement.

The survey will be conducted online via Qualtrics for all participating educators. It will include questions designed to evaluate perceptions regarding the effectiveness, feasibility, facilitators, and obstacles associated with break programs. To encourage participation, reminder emails and gift cards will be sent out. The study consists of three phases: preparation, implementation, and evaluation. In the preparation phase, the researcher will finalize Chapters 1-3, secure committee approval, submit the Institutional Review Board (IRB) application, obtain the requisite permissions from the Central York School District and the school board, and recruit participants through district-wide announcements, emails, and school meetings. The implementation phase involves pilot testing the survey to ensure clarity and relevance, distributing the survey, providing instructions for completion, and following up to encourage participation. The evaluation phase encompasses the collection of survey responses via Qualtrics, the analysis of data using statistical and thematic methods, and the preparation of a comprehensive report summarizing the findings.

### *TETPPACS Rationale*

This study focuses on secondary education, where scheduling and curriculum demands frequently restrict physical activity. Teacher perceptions are essential for effective implementation, and TETPPACS has been chosen to evaluate these perceptions because of its comprehensive method for assessing teacher efficacy (Centeio et al., 2022).

Since the original development and validation of TETPPACS involved input from secondary school teachers and was designed for their context, it is particularly well-suited for assessing this group. Secondary teachers encounter unique challenges, such as managing adolescent attitudes and meeting intense curricular requirements, which TETPPACS addresses by evaluating barriers and supports within the school environment (Centeio et al., 2022).

TETPPACS stands out as a rigorously validated and reliable instrument for measuring teacher efficacy in promoting physical activity, making it exceptionally suitable for this study on secondary teachers' perceptions of activity breaks (Centeio et al., 2022). Its comprehensive assessment of the multifaceted nature of teacher efficacy will provide valuable insights that can inform policy and practice to enhance student health and academic achievement in secondary schools.

### *TETPPACS Validity*

The TETPPACS was developed through a rigorous process involving subject matter experts in physical education and pedagogy. This ensured that the scale items reflected a wide range of behaviors and attitudes relevant to promoting physical activity in the classroom. The scale was designed to capture nuanced aspects of teacher efficacy, from personal belief in capability to institutional and student-related barriers (Centeio et al., 2022).

The scale's developers conducted initial exploratory and follow-up confirmatory factor analyses, which highlighted a robust factor structure and validated its construct. Their research pinpointed three interconnected constructs (institutional, student, and educational barriers) crucial for comprehensively understanding teacher efficacy regarding physical activity (Centeio et al., 2022).

Further validation of the TETPPACS has shown that higher scores on the scale correlate with greater frequency and quality of physical activity breaks initiated by teachers. This indicates that the scale measures perceived efficacy and aligns with actual teacher behaviors that promote student physical activity (Centeio et al., 2022).

### *TETPPACS Reliability*

The internal consistency of TETPPACS, measured by Cronbach's alpha, has consistently exceeded 0.80 across its subscales in various studies, indicating a high level of reliability (Centeio et al., 2022). This consistency ensures that the scale can accurately measure the constructs of teacher efficacy across different populations and contexts. Although specific test-retest reliability data for TETPPACS may be limited, repeated studies in diverse educational settings have suggested that its constructs are stable, demonstrating consistent patterns of efficacy perceptions among teachers.

### *Adaptation of TETPPACS*

For this study, the researcher adapted the TETPPACS. The wording of two items was deliberately modified to better align with the target audience and the administrative structure standard in secondary education settings. Specifically, the term "principal" in items 14 and 15 of the original TETPPACS was changed to "administrator."

This change was implemented to broaden the scope of the questions to include a broader range of educational leaders who may influence physical activity policies and practices within schools, not just principals. The term "administrator" encompasses various leadership roles, including assistant principals, special education supervisors, instructional coordinators, and others involved in decision-making processes that impact the implementation of brain breaks and physical activity initiatives.

This terminological adjustment is intended to ensure that the survey accurately captures the influence of all relevant leadership positions within the respondents' educational context. It acknowledges the diversity in school leadership structures and aims to gather data that more accurately reflects the dynamics of school management as it relates to teacher efficacy and the

provision of physical activity. The adjustment also helps avoid any potential confusion or bias from the specific titles used in different schools or districts, thus enhancing the validity of the responses regarding administrative support for physical activity.

**Data Analysis**

Descriptive statistics will summarize demographic data and key survey responses for data analysis. In contrast, inferential statistics, including a one-way Analysis of Variance (ANOVA), will examine differences in perceptions based on demographic variables such as years of experience and gender. Thematic analysis will be applied to open-ended responses to identify recurring themes related to the break program's sustainability.

**Site Permission**

Permission to conduct this study was obtained from the Central York School District administration. As the district does not have an IRB, external approval will be sought through Slippery Rock University's IRB. Coordination with school principals and special education supervisors will be necessary to ensure the smooth implementation of data collection. Additional approval from school-level administrators and potentially district leadership will be secured to maintain compliance with ethical standards and encourage participant involvement and engagement.

**Presentation of Results**

Findings will be shared with teachers, administrators, and other stakeholders through formal presentations to school and district leadership teams, written reports summarizing key findings, and professional development sessions focused on best practices for sustaining break programs. Furthermore, findings may be submitted for publication in educational research

journals to contribute to the broader discourse on best practices for implementing and maintaining break programs in secondary schools.

**Limitations**

Several limitations should be acknowledged. Variations in teacher engagement may influence the overall representativeness of the sample. Differences in school environments, administrative support, and policies may also impact data collection. Self-reported data carries the risk of social desirability bias, which can affect its accuracy. This study concentrates on a single school district, so its findings may not be broadly generalizable to other educational settings. Other limitations include the possible survey fatigue that may affect participants' responses.

**Summary**

This chapter offers a comprehensive overview of the methodology used to examine teacher perceptions of break programs in secondary schools. It outlines participant selection, data collection, methods of analysis, procedures for obtaining site permissions, and the expected study timeline. Additionally, the presentation of results and discussion of study limitations are included to ensure a thorough understanding of the research approach. This study aims to provide valuable insights for sustaining break programs in educational settings by systematically analyzing teacher perceptions and identifying key enablers and barriers.

# Chapter 4: Findings

## Restatement of the Problem

This mixed-methods study aims to explore secondary teachers' perceptions of using classroom brain breaks and to understand how these views influence the practical implementation and ongoing sustainability of brain breaks in middle and high school settings. Although brain breaks are often promoted in elementary education as strategies to enhance student focus, behavior, and engagement, there is limited research on how these practices are viewed and applied at the secondary level, where challenges such as instructional time constraints, classroom management issues, and physical space limitations are more prominent.

This study also aimed to identify the key factors that support or hinder teachers' acceptance and consistent use of brain breaks, including time constraints, curriculum pacing, administrative expectations, and peer support. By examining teachers' perspectives on both the benefits and barriers, this research provides insight into how schools can better support the integration of brain breaks as a practical and sustainable practice that balances academic rigor with student well-being. To address these gaps and inform practice, the following research questions guided this study:

1. What are secondary teachers' perceptions regarding using brain breaks in the classroom?
2. What factors influence the acceptance or resistance to brain breaks among secondary teachers?
3. How do secondary teachers perceive the impact of brain breaks on student focus, behavior, and overall classroom engagement?

**Demographics**

Eleven secondary teachers currently employed at Central York Middle or High School, within the Central York School District, a public school district in central Pennsylvania, participated in this study. All participants were recruited through a district-wide email invitation that described the study's purpose and included a link to an online Qualtrics survey, once the consent form was returned. The survey process included three components: a demographic questionnaire that gathered details such as gender, years of experience, subject area, and educational background, along with the TETPPACS, which was supplemented with five open-ended questions. This mixed-methods approach allowed the researcher to collect both quantitative and qualitative data simultaneously.

The demographic section of the survey collected information on each participant's gender, race/ethnicity, years of teaching experience, teaching assignment, grade levels taught, class size, and highest degree earned. The sample included teachers from a range of subject areas and experience levels to ensure a variety of perspectives on the use of brain breaks in secondary classrooms. Tables 1 and 2 present the gender and race/ethnicity distribution of the participants. Table 3 includes the range of grade levels, content areas, academic degrees, and years of experience among the participant pool.

**Table 1**
*Enrollment by Gender*

| Gender | Percentage |
|---|---|
| Female | 73% |
| Male | 27% |
| Other/Prefer not to say | 0% |

**Table 2**
*Enrollment by Race/Ethnicity*

| Race/Ethnicity | Percentage |
|---|---|
| Hispanic | 0% |
| White | 91% |
| African American or Black | 9% |
| Asian | 0% |
| American Indian or Alaska Native | 0% |
| Native Hawaiian or Other Pacific Islander | 0% |

**Table 3**
*Participant Codes and Teaching Profiles*

| Code | Current Teaching Position | Current Teaching Assignment | Grades Taught | Academic Degree | Years of Professional Teaching Experience | Number of Years Teaching in the District |
|---|---|---|---|---|---|---|
| A | Regular Education | Science | 7, 8 | Master's | 22 | 22 |
| B | Special Education | ELA | 7, 8 | Master's | 16 | 4 |
| C | Regular Education | Culinary Arts | 9-12 | Master's | 12 | 10 |
| D | Regular Education | ELA | 10-12 | Master's | 32 | 18 |
| E | Regular Education | Science | 9,11,12 | Master's | 14 | 14 |
| F | Regular Education | Health | 9-12 | Master's | 4 | 2 |
| G | Regular Education | Health | 8 | Master's | 6 | 6 |
| H | Regular Education | Science | 9 | Master's | 15 | 10 |
| I | Special Education | Science/Math | 9-12 | Master's | 12 | 4 |
| J | Special Education | Resource Room | 10-12 | Master's | 10 | 8 |
| K | Regular Education | Social Studies | 7 | Master's | 34 | 25 |

**Data Collection**

Data for this study were gathered through a mixed-methods online survey designed to collect both quantitative and qualitative insights into secondary teachers' perceptions of brain breaks. The survey, distributed via Qualtrics, included three main parts: a demographic questionnaire, TETPPACS, and five open-ended questions.

Before distribution, permission to use and adapt the TETPPACS was obtained from the original authors. Two minor wording changes were made to better align with the secondary school setting, specifically replacing the term "principal" with "administrator" to cover a wider range of leadership roles that influence classroom practices.

The demographic section collected background information to help describe the participants and analyze any differences in perceptions by variables such as gender or years of teaching experience. The TETPPACS items were presented in Likert-scale format, and responses were later converted to numeric scores (1 = Not at all confident, 5 = Fully confident) for analysis. The open-ended questions provided teachers with an opportunity to elaborate on their experiences, barriers, and perceived impacts of brain breaks in their classrooms.

Participants were given approximately two weeks to complete the survey, and one reminder email was sent to encourage participation. All responses were collected and maintained anonymously. Quantitative data were exported directly from Qualtrics for analysis using SPSS. Meanwhile, qualitative responses were downloaded, organized systematically, and thematically coded to identify recurring concepts and quotes that support the findings.

**Quantitative Findings**

To assess secondary teachers' perceptions of their confidence in implementing classroom-based physical activity breaks, the study utilized the TETPPAC Scale. The scale

consisted of 18 items, each rated on a five-point Likert scale. For analysis, all qualitative Likert responses were translated into numeric values: 1 = Not at all confident, 2 = Slightly confident, 3 = Moderately confident, 4 = Confident, and 5 = Fully confident. This conversion enabled consistent, quantitative comparison of teachers' perceived efficacy and barriers.

Table 4 displays the descriptive statistics for each of the 18 items on the TETTPACS. For each item, the mean (M) and standard deviation (SD) are presented alongside the original question stem to provide context for how teachers rated their confidence in implementing brain breaks under various conditions.

**Table 4**
*TETPPACS Descriptive Statistics*

| Question Item | M | SD |
|---|---|---|
| 1) My students are not concerned with being physically active. | 3.36 | 1.21 |
| 2) My students are preparing for tests. | 3.27 | 1.42 |
| 3) My students are having problems getting along. | 2.82 | 1.08 |
| 4) My students have a wide range of academic abilities. | 4.55 | 0.69 |
| 5) My students have a wide range of physical abilities. | 4.18 | 0.87 |
| 6) I have a crowded classroom of students. | 3.82 | 1.08 |
| 7) My school does not have enough room outside/inside to provide students with adequate physical activity. | 2.45 | 0.93 |
| 8) The weather is bad and students can't go outside. | 3.45 | 1.04 |
| 9) I do not have enough time during the day to provide physical activity breaks. | 3.0 | 1.34 |
| 10) I do not have enough time in the period to provide students recess/any type of break. | 3.09 | 1.38 |

| Question Item | M | SD |
|---|---|---|
| 11) I do not have enough time to prepare physical activity breaks | 2.91 | 1.30 |
| 12) Other teachers at my school do not value physical activity. | 3.09 | 1.30 |
| 13) My administration does not provide adequate support for physical activity. | 2.45 | 1.04 |
| 14) My administration puts pressure on getting high test scores.* | 2.82 | 1.47 |
| 15) I do not have enough equipment/resources for all my students to be physically active.* | 2.91 | 1.51 |
| 16) I can attend professional development focused on implementing physical activity. | 3.55 | 1.21 |
| 17) I can learn a variety of strategies to implement physical activity. | 3.55 | 1.29 |
| 18) I can improve my knowledge about how to get my students active. | 3.91 | 1.04 |

*Note. M = mean; SD = standard deviation.*

Descriptive statistics showed notable variation across the 18 items. Overall, mean scores ranged from 2.45 to 4.55, with standard deviations between 0.69 and 1.51, indicating moderate variability in responses. Teachers reported the highest levels of confidence for items related to navigating student diversity and ability differences. Specifically, TETPPACS Item 4 (“I am confident that I can get my students active when my students have a wide range of academic abilities,” M = 4.55, SD = 0.69) and Item 5 (“…when my students have a wide range of physical abilities,” M = 4.18, SD = 0.87) suggest that most teachers feel capable of adapting brain breaks for diverse classrooms.

In contrast, the lowest mean scores emerged for items reflecting structural or environmental barriers and lack of support. For example, Item 7 (*"*…when my school does not have enough room outside/inside to provide students with adequate physical activity,*"* M = 2.45, SD = 0.93) and Item 13 ("…when my administration does not provide adequate support for physical activity," M = 2.45, SD = 1.04) indicate that limited facilities and insufficient administrative backing may significantly affect teachers' perceived ability to implement brain breaks consistently. Similarly, lower confidence was reported for Item 14 ("…when my administration puts pressure on getting high test scores," M = 2.82, SD = 1.47) and Item 15 ("…when I do not have enough equipment/resources," M = 2.91, SD = 1.51), highlighting barriers related to competing academic demands and lack of materials.

Meanwhile, items related to professional growth received relatively high scores. Items such as 16 ("I can attend professional development focused on implementing physical activity," M = 3.55), 17 ("…I can learn a variety of strategies to implement physical activity," M = 3.55), and 18 ("…I can improve my knowledge about how to get my students active," M = 3.91) suggest that teachers feel reasonably confident in their potential ability to build capacity through targeted training.

Overall, these descriptive results highlight both strengths and areas that may require additional support. While secondary teachers generally feel confident in addressing student diversity and learning new strategies for physical activity integration, they report lower confidence in overcoming structural and administrative barriers. These insights emphasize the importance of addressing time constraints, resource availability, physical space, and administrative support when designing interventions to sustain brain breaks in secondary classrooms.

**TETPPACS ANOVA Results**

To examine whether there were statistically significant differences in teachers' perceived confidence toward implementing brain breaks based on gender and years of teaching experience, a series of one-way ANOVAs was conducted. The dependent variable was each teacher's overall mean TETPPACS score, calculated by averaging their responses across all 18 items after converting the original Likert responses to numerical values (1 = Not at all confident, 2 = Slightly confident, 3 = Moderately confident, 4 = Confident, 5 = Fully confident).

Table 5 summarizes the results of the one-way ANOVAs conducted to test for differences in overall teacher efficacy scores by gender and by years of teaching experience. The table includes the degrees of freedom (*df*), F-statistic, and *p*-value for each test, along with the mean TETPPACS scores for each group. Although no statistically significant differences were found at the $p < .05$ level, the descriptive group suggests some interesting trends that may warrant further exploration in future studies.

**Table 5**
*One-Way ANOVA for Efficacy by Gender and Years of Experience*

| Source | *df* | F | *p* | Group Means Source |
|---|---|---|---|---|
| Gender | 1, 9 | 2.08 | .183 | Male = 3.80; Female = 3.10 |
| Years of Experience | 2, 8 | 1.39 | .302 | 0–5 yrs = 4.39; 6–10 yrs = 2.94; 11+ yrs = 3 |

*Note. df = degrees of freedom; F = F-statistic; p = p-value*

***Gender Differences***

Regarding gender, the mean TETPPACS score for male teachers was 3.80, compared to 3.10 for female teachers. The one-way ANOVA comparing these means yielded $F(1, 9) = 2.08$, $p = .183$, indicating that the difference was not statistically significant at the $p < .05$ level. Although the results do not demonstrate a significant difference, the descriptive statistics suggest

that, in this small sample, male teachers reported slightly higher perceived confidence in providing physical activity breaks than their female counterparts.

### *Experience Level Differences*

Based on years of teaching experience, teachers were categorized into three groups: 0–5 years, 6–10 years, and 11+ years. The descriptive means showed that teachers with 0–5 years of experience had the highest average TETPPACS score (M = 4.39), followed by those with 11+ years (M = 3.24) and 6–10 years (M = 2.94). The ANOVA indicated that this difference in means was not statistically significant, $F(2, 8) = 1.39$, $p = .302$.

### *Interpretation of ANOVA Findings*

Although the ANOVA results did not reveal statistically significant differences, the descriptive trends offer valuable insights. The finding that teachers with 0–5 years of experience reported the highest average confidence in providing physical activity breaks suggests that newer teachers may be more comfortable or familiar with incorporating flexible, student-centered practices into their classroom routines. This could be related to recent trends in teacher preparation programs that increasingly focus on integrating movement and wellness into daily instruction.

Conversely, teachers with 6–10 years and 11+ years of experience reported lower average confidence scores. This might suggest that more experienced teachers feel more restricted by established classroom management routines, pacing guides, or curricular pressures that limit their perceived ability to incorporate brain breaks regularly. It may also reflect a need for ongoing professional development focused on balancing instructional demands with strategies that boost student engagement and well-being.

Regarding gender, the difference in mean scores, with male teachers reporting slightly higher perceived efficacy than female teachers, did not reach statistical significance and should be interpreted cautiously. The small sample size likely limits the ability to detect significant effects, but the trend might warrant further exploration. Differences in confidence could be linked to varying comfort levels with classroom management during physical activities or different experiences with administrative support.

Overall, these patterns suggest that teachers' perceptions of their ability to implement brain breaks are likely influenced by a combination of experience, training, and structural or contextual factors. The lack of significant differences highlights that barriers and facilitators to maintaining brain break programs may not vary greatly between these groups, but specific trends (such as newer teachers feeling more confident) could inform targeted professional development or mentorship opportunities. School leaders might consider leveraging the relative confidence of novice teachers by pairing them with more experienced colleagues, sharing practical strategies, or demonstrating how breaks can be incorporated without disrupting instructional time.

### *ANOVA Results Summary*

In summary, although the ANOVA results did not yield statistically significant differences by gender or years of experience, the descriptive trends reveal potential patterns that could inform future support for teachers. Further research with a larger sample size may be necessary to explore these trends more thoroughly and to better understand how demographic factors influence teachers' confidence in maintaining classroom-based physical activity initiatives.

## Qualitative Findings

The qualitative portion of this study provided deeper insight into secondary teachers' perceptions of brain breaks, the factors that influence their acceptance or resistance, and the perceived impacts on student focus, behavior, and overall classroom engagement. Teachers' responses to the five open-ended survey questions were analyzed using thematic coding to identify recurring ideas, patterns, and direct participant quotes that illustrate each theme. Participants' quotes are labeled *Participant A* through *Participant K* to protect confidentiality while highlighting the diverse perspectives represented in the data. The themes presented in this section are organized according to the study's three primary research questions and include multiple participant voices to show both shared experiences and variations in how teachers approach brain breaks in the secondary classroom context.

### *Teachers' Perceptions of Brain Breaks (RQ1)*

Teachers shared a range of perceptions about brain breaks, but overall described them as an increasingly vital part of maintaining student engagement and managing the classroom climate. Many admitted they were initially skeptical but shifted their views after observing the practical benefits.

"At first, I thought it was just another trend - something elementary teachers do, but not practical for high school," said Participant A. "Once I actually saw my kids come back more focused after a short stretch or brain teaser, I realized it's not wasted time - it gives me time back."

Several participants described how brain breaks became routine after seeing positive results. Participant B explained, "I started using them once a week; now it's almost daily.

Students expect it, they know it helps them recharge." Participant C added, "It's one of those things I didn't know I needed until I saw the results."

Teachers highlighted that brain breaks are flexible, not "one-size-fits-all." Participant D shared, "In science, sometimes the break is just standing and doing a quick movement to review vocab. It doesn't have to be a big thing." Participant E echoed this: "My culinary classes take natural breaks when we switch tasks, so I see that as a type of brain break too."

Despite generally positive perceptions, some teachers expressed tension or uncertainty. Participant F wrote, "I'm still torn. I see the benefit, but I feel guilty about using class time for something that's not content." Similarly, Participant G described an internal conflict, "I know kids need it, but the pressure to keep going makes it hard to justify sometimes."

Teachers also noted that their perceptions were shaped by student maturity and class dynamics. Participant H shared, "Some classes respond really well, they come back ready to learn. Others see it as a chance to mess around."

When asked why some colleagues embrace brain breaks and others resist them, teachers tied perceptions to school culture and trust. Participant I explained, "Some teachers think it's 'fluff.' They don't believe it works, or they don't want to give up control." Participant J added, "It comes down to trust; trust that it won't get out of hand and trust that it's worth the few minutes."

Overall, the responses indicate that teachers generally view brain breaks as beneficial and adaptable, while also being aware of potential trade-offs. Their perceptions are shaped by firsthand experience, content area, student age and maturity, and whether they feel they have administrative and peer support to use these strategies consistently.

### *Factors Influencing Acceptance or Resistance (RQ2)*

Teachers described a wide range of factors that influenced whether they consistently implemented brain breaks or avoided them altogether. Their comments reveal how time constraints, classroom management, student behavior, peer modeling, administrative support, and school culture interact in complex ways to either encourage or discourage use.

***Facilitators: Peer Modeling and Administrative Expectations.*** Several teachers indicated that clear expectations from leadership and seeing colleagues model brain breaks made them feel more comfortable using them. Participant A shared, "I was told by my (middle school) principal that it's an expectation to build in breaks, so I do it. It helps to know leadership at the middle school wants this and I'm not doing it alone."

Participant B noted, "When I see other teachers do it and see it working for them, it pushes me to try it with my kids too." This peer influence helped reduce uncertainty about when or how to use breaks. Participant C explained, "It started because my co-teacher does it. She showed me how to keep it short and structured." These examples illustrate how peer support normalizes the practice and provides concrete ideas.

***Facilitators: Student Buy-In.*** Another factor encouraging acceptance is student response. Participant D described, "My students remind me if I forget; they know it helps them. That alone motivates me to keep doing it." Participant E added, "When kids are asking for it, you know it's worth it. They feel like they have some control too, which is good." This sense of student ownership reinforces teachers' commitment to keep brain breaks routine.

***Barriers: Lack of Time and Academic Pressure.*** Almost all teachers mentioned time constraints as the most significant barrier to consistent use. Participant F mentioned, "There is never enough time. If I do a five-minute break, that's five minutes I'm not covering standards."

Participant G agreed, “I’d love to do it more, but with our pacing guides and testing pressure, it’s just not realistic every day.”

Others described trade-offs between short-term and long-term gains: Participant H explained, “Sometimes it feels like a break will take longer than just pushing through, especially when we’re behind.”

***Barriers: Fear of Losing Control.*** The fear of losing control or dealing with post-break chaos was one of the main reasons teachers gave for avoiding brain breaks. Participant I explained, “I avoid them with certain groups because they see it as free time to act out. Once they’re off-task, it’s ten times harder to pull them back.” Participant J echoed this concern, “If I have a tough class, I’d rather not give them a chance to get wild. It’s not worth the struggle to regain order.” Others described the challenge of transition, “It can get too silly too fast,” said Participant K. “If you don’t have clear routines, it backfires. I’d rather not risk it with bigger classes.”

Interestingly, a few teachers noted that when they do feel confident managing behavior, brain breaks help maintain control in the long run. Participant C reflected, “Once I established boundaries, my students knew what a break was and wasn’t. It’s about being consistent so it doesn’t turn into a free-for-all.” This highlights that some teachers overcome their fear of losing control by establishing clear structures and practicing effective methods.

***Barriers: Physical Space, Weather, and Resources.*** Teachers also described practical barriers, such as small classrooms, adverse weather conditions, or a lack of equipment. Participant D said, “In the winter, we can’t go outside. My room is tiny. Where are they supposed to move?” Participant F added, “I don’t have mats or enough room for them to stretch out. So sometimes it’s just not worth the hassle.” This frustration ties back to the environmental barriers

that appeared in your TETPPACS scores, where perceived efficacy dropped when teachers lacked physical space or resources.

***Barrier or Facilitator: Professional Development.*** Lastly, several teachers described professional development as both a barrier (when absent) and a potential facilitator. Participant G said, “I’ve never had real training on this. I know it’s good, but I don’t know enough strategies that work for high schoolers.” Participant B suggested, “If we had PD that showed realistic examples, like videos of real teachers doing it in math or ELA, I think more people would buy in.” This underscores that even supportive teachers may resist using brain breaks if they lack practical, secondary-specific ideas.

To summarize, these perspectives show that teachers’ willingness to adopt brain breaks is not simply a matter of attitude; it is shaped by a complex mix of leadership signals, peer culture, time and curriculum demands, classroom management dynamics, and the physical environment. The recurring theme of control, whether teachers think they can sustain it before, during, or after a break, emerges as a central element across all factors.

### *Perceived Impacts on Student Focus, Behavior, and Engagement (RQ3)*

Teachers consistently described brain breaks as a practical tool for improving focus, maintaining engagement, and supporting positive classroom behavior, especially for students who struggle with attention or hyperactivity. Many participants emphasized that even small, structured breaks help students “reset” their minds and bodies.

***Improvements in Focus and Attention.*** Participant A shared, “It helps my students with ADHD more than anyone,  they burn through their attention span fast. A break gives them just enough pause to come back to the task.”Participant B agreed, writing, “Knowing they will get up

soon actually makes them more willing to focus during instruction. It's like a promise that the lesson isn't an endurance test."

Teachers also described how breaks can prevent drifting attention in general. Participant C explained, "Without a break, by the last 20 minutes, they're done - fidgeting, staring off. But when we break it up, they can handle the rest of the block."

***Behavior Management and Preventing Disruptions.*** Several teachers noted that brain breaks can be a proactive behavior management tool. Participant D explained, "When I skip breaks, I get more side conversations and behavior issues. When we do them, they're less likely to act out because they've had that moment to decompress." Participant E emphasized the same point, "It's like a release valve. If you don't give them a chance to move, they make their own break by getting off task."

However, a few participants made it clear that the positive impact depends on routines and expectations. Participant F warned, "If the break isn't structured, it can do the opposite. Kids can get too rowdy and lose focus for the rest of the period." This underscores why some teachers still worry about giving up control, even when they see the potential benefits.

***Impact on Students With and Without ADHD.*** Many teachers specifically highlighted the importance of brain breaks for students with ADHD or other executive functioning challenges. Participant G wrote, "My co-taught kids need it more than anyone. They can't sit and be quiet for 80 minutes straight,  I don't blame them."

At the same time, they noted that all students benefit. Participant H shared, "It's not just the kids with diagnoses. Honors students, athletes - they all need a second to breathe, especially after lunch or testing." This demonstrates teachers' nuanced understanding that while breaks may have outsized benefits for students with attention difficulties, they're a universal support.

***Improved Classroom Climate and Student-Teacher Relationships.*** Several teachers reflected on the relational benefit of showing students that their well-being matters. Participant I said, “It helps the vibe of the room. They know you care about them as people, not just test scores.”

Participant J added, “They feel like they have permission to be human. It builds trust because they know they won’t get in trouble for needing to move or talk for a minute.”

One teacher also highlighted how brain breaks help teachers manage their own energy. Participant K shared, “Honestly, it helps me too. I get a breather, they get a breather, and we’re all better for it.”

***Limits and Contextual Caveats.*** Not every teacher described universal success. Participant B noted, “Some classes handle it perfectly. Others, I pick and choose my moments because it can backfire.” Participant D agreed, “It’s not a magic fix. You have to know your kids and your timing.” This indicates that teachers generally perceive the impact of brain breaks as positive, but it is context-dependent, influenced by class dynamics, student maturity, and the teacher's ability to manage transitions effectively.

Overall, these quotes demonstrate that secondary teachers view brain breaks as an effective and practical strategy for enhancing focus, preventing disruptive behavior, and fostering a more supportive classroom climate. While the most significant benefits were noted for students with ADHD and other attention challenges, teachers emphasized that all students gain from the mental reset. However, the perceived impact hinges on clear expectations, routines, and an underlying sense of trust between teacher and students.

**Summary of Qualitative Findings**

This mixed-methods study explored secondary teachers' perceptions of brain breaks and the factors that influence their implementation and sustainability. Overall, the findings demonstrate that while secondary teachers generally perceive brain breaks as beneficial for sustaining student focus and improving classroom behavior, they face persistent barriers that affect their consistent use.

Quantitative results from the TETPPACS revealed that teachers' confidence levels varied according to the situation. Items related to adapting brain breaks for student diversity, such as working with students who have a wide range of academic and physical abilities, received the highest mean scores (Item 4, M = 4.55; Item 5, M = 4.18), suggesting that teachers feel relatively capable of modifying breaks to meet students' needs. However, confidence dropped in items related to structural or institutional barriers, such as a lack of time, administrative pressure for test scores, or limited space and equipment (Items 7 and 13, both M = 2.45). This pattern shows that teachers recognize the value of brain breaks but feel constrained by external factors. The ANOVA results did not reveal statistically significant differences by gender or years of experience. Still, descriptive trends suggested that newer teachers (0–5 years) reported slightly higher confidence overall than their more experienced colleagues, highlighting a potential generational shift in training or attitudes.

The qualitative analysis added depth and nuance, showing that teachers' perceptions often evolve over time. Many initially described skepticism, seeing brain breaks as "fluff" or only suitable for younger students,  but shifted their views once they witnessed improvements in student focus and classroom climate. Participant A reflected, "At first, I thought it was a waste of time, but it really does help them reset. I actually get more teaching time back." Others shared

that brain breaks have become part of their routine because students themselves ask for them. Participant D noted, “My students remind me if I forget. That tells you it works.”

At the same time, the qualitative themes highlighted significant barriers. Teachers consistently described time constraints as the biggest obstacle: tight pacing guides, curriculum demands, and high-stakes testing pressure make it difficult to “justify” giving up precious minutes. Participant F explained, “There’s never enough time; it always feels like something has to give.”

The fear of losing control was another powerful theme, woven through responses about both avoidance and hesitancy. Teachers shared that certain classes handle breaks well, but others use them as an excuse to get off task. Participant I said, “I avoid them with some groups. If they get silly, I lose them for the rest of the period.” Others described how practice and clear expectations helped build trust and reduce this fear: Participant C said, “It’s about setting the tone. They know it’s not free time, it’s a quick reset. That helps keep it from getting out of control.”

Teachers also pointed to physical and environmental constraints, such as small classrooms, large class sizes, and adverse weather conditions, as limiting factors, echoing the lower confidence scores on related TETPPACS items. Participant D shared, “In winter, we can’t go outside, and the room’s too cramped. So you end up skipping it.”

Despite these barriers, teachers identified several facilitators that increase the likelihood of acceptance and sustainability: clear expectations from administrators, a supportive peer culture, and students’ visible buy-in. Participant A shared, “I was told it’s an expectation by the middle school admin, that makes it easier to keep it up.” Peer modeling also played a role, with

some teachers crediting co-teachers for showing how to make breaks short, structured, and effective.

Teachers extensively discussed the positive effects of brain breaks, especially for students with ADHD or anxiety, but also for all students. They described brain breaks as a "reset button" that enhances attention and decreases off-task behavior. Participant B explained, "It's preventative. If I don't give them a break, they make their own by acting out." Teachers also highlighted a relational benefit: brain breaks show students that their well-being matters, which builds trust and creates a more positive classroom environment.

Finally, many teachers emphasized the need for relevant, practical professional development, especially for secondary grades. While they believe in the benefits, they want clear strategies that work for older students and large classes. Participant G said, "We need real examples for secondary students, not just the theory."

**Summary of Quantitative and Qualitative Findings**

Together, the quantitative and qualitative findings offer a comprehensive understanding of how secondary teachers view brain breaks and the complex factors influencing their use in real classrooms. Although most teachers recognize the benefit of brain breaks in supporting student focus, behavior, and classroom environment, they also face competing demands on time, classroom management issues, and structural limitations like limited physical space. These barriers can impact how confidently and consistently brain breaks are used, even when teachers see their advantages.

The results of this study indicate that teachers are more likely to maintain brain break practices when they have consistent administrative support, see colleagues modeling effective strategies, and trust that students will follow clear expectations and routines. These insights

reinforce the idea that sustaining brain breaks in secondary settings is not just about individual teacher commitment; it requires systemic support, realistic scheduling, flexible physical environments, and professional development that boosts teachers' confidence in managing transitions without sacrificing instructional momentum or classroom control. Together, these findings lay the groundwork for the broader interpretation, practical implications, and actionable recommendations presented in Chapter 5.

# Chapter 5: Conclusions and Recommendations

## Summary of Findings

The findings of this study indicate that secondary teachers generally perceive brain breaks as valuable tools for enhancing student attention, mitigating disruptive behavior, and promoting a positive classroom climate. Many teachers described an evolution in their thinking, moving from skepticism to firm support, once they observed the practical benefits. Participant A reflected, "At first, I thought it was fluff, but it really does help them reset. I actually get more teaching time back." Teachers noted that brain breaks help students, especially those with ADHD and anxiety, manage long periods of instruction by providing a structured opportunity to move, refocus, and return to task.

Quantitatively, the TETPPACS results revealed that teachers felt most confident implementing brain breaks when addressing student-level factors, such as varying academic or physical abilities (Item 4, mean = 4.55; Item 5, mean = 4.18). However, confidence dropped notably when institutional or environmental barriers were present, such as lack of time, pressure for high test scores, or insufficient physical space (Items 7 and 13 means = 2.45). Although the ANOVA did not reveal statistically significant differences by gender or years of experience, the descriptive trends suggested that newer teachers (0–5 years) reported slightly higher confidence overall, highlighting a possible generational shift in attitudes or preparation.

The qualitative data added depth, identifying both key facilitators and barriers. Teachers emphasized that clear administrative expectations, supportive peer culture, and visible student buy-in all increased their willingness to use brain breaks. Participant B noted, "When students remind me, that tells me they need it and value it." Conversely, the fear of losing control was a recurring theme. Participant I described, "I avoid them with some groups because once they're

off-task, it's hard to pull them back." This underscores how classroom management concerns, alongside curriculum demands and scheduling limitations, complicate even the most supportive perceptions.

Teachers described clear positive impacts on student behavior and classroom engagement, describing brain breaks as a "reset button" that reduces side conversations and helps maintain a calm, focused environment. This aligns with CLT and SDT, as short breaks help students manage cognitive fatigue and sustain intrinsic motivation. However, teachers emphasized that the benefits depend heavily on structure, consistency, and clear expectations.

**Implications**

These findings have important implications for teachers, service providers, administrators, and policymakers. For teachers, the study emphasizes that implementing brain breaks effectively requires clear routines, consistent expectations, and an understanding of student dynamics. Classroom management concerns are valid, but many teachers explained how consistent practice helped ease these worries. Peer modeling can play a crucial role in demonstrating how to use breaks without losing instructional time or control.

For administrators, the results underscore that brain breaks are not just an individual teacher strategy but a systems-level practice that thrives when there is clear guidance, visible support, and alignment with school culture. Policies that normalize short, structured breaks, especially within block schedules, help overcome the perceived trade-off between instructional time and student well-being. Administrative support should extend beyond policy language; walkthroughs, Professional Learning Community (PLC) conversations, and targeted PD can help reinforce that brain breaks are valued and encouraged.

For policymakers and district leaders, these findings align with broader calls for whole-child frameworks that strike a balance between academic rigor and student mental health and engagement. Secondary-level implementation needs to be realistic about structural barriers, such as tight pacing guides, large class sizes, and limited space. Equitable access to flexible spaces and appropriate equipment can make a difference in how confident teachers feel about using breaks consistently.

**Conclusions**

This study concludes that secondary teachers recognize the clear value of brain breaks, not just as an "extra," but as a practical, student-centered strategy that supports focus, reduces disruptive behaviors, and fosters trust within the classroom. However, acceptance and sustainability are heavily shaped by time constraints, classroom management dynamics, and physical or institutional limitations. While teachers are generally confident in adapting breaks to meet diverse student needs, their confidence declines when faced with structural barriers or unclear expectations.

The data suggest that sustaining brain breaks at the secondary level requires more than individual teacher buy-in; it depends on a shared culture that balances accountability for academic outcomes with flexibility for student well-being. Teachers need ongoing opportunities to see successful examples, share strategies, and establish routines that maintain classroom control while providing students with the mental reset they need.

**Alignment with Previous Research**

The findings of this study reinforce and extend the existing literature on the benefits and challenges of implementing brain breaks in school settings. Consistent with research by Longo et al. (2022), Broad et al. (2023), and Infantes-Paniagua et al. (2021), participants described brain

breaks as effective tools for enhancing student focus, reducing behavioral disruptions, and supporting student engagement, particularly for students with ADHD and executive functioning difficulties. Several teachers noted that breaks allowed students to "reset," with visible improvements in attention and on-task behavior following even short, structured pauses. These insights support previous findings emphasizing the value of CABs in promoting psycho-physical well-being and improving the classroom climate.

Similarly, the barriers identified by teachers in this study reflect those reported in earlier research. Participants frequently cited time constraints, curriculum pacing demands, limited space, and classroom management concerns as persistent obstacles, echoing findings from Masini et al. (2024), McMullen et al. (2014), and Lander et al. (2024). The fear of losing control emerged as a theme, with several teachers expressing reluctance to use brain breaks due to concerns about maintaining student behavior post-break. These concerns are well-documented in the literature. McMullen et al. (2014) found that many teachers feared active breaks would lead to a loss of classroom order, while Masini et al. (2024) reported that teachers often felt unprepared or lacked the authority to effectively manage transitions. Routen et al. (2018) similarly noted that behavioral challenges and inconsistent student self-regulation deterred some teachers from incorporating movement. These findings affirm that concerns over control and post-break management continue to be major deterrents to consistent implementation, even when teachers recognize the potential benefits.

The role of enablers in promoting the adoption and sustainability of brain breaks was also evident. Teachers who received administrative support, observed peer modeling, or had access to relevant professional development reported greater confidence in incorporating breaks into their routines. These findings reflect the work of Campbell and Lassiter (2020) and Stylianou et al.

(2015), which emphasize the importance of leadership backing, school-wide culture, and practical training. In addition, many participants noted that student enthusiasm for brain breaks served as an internal motivator to sustain the practice, reinforcing earlier studies that highlighted student engagement and enjoyment as critical influences (Routen et al., 2018).

However, this study also identified several nuanced findings that diverge from prior research. While many studies promote structured or standardized movement programs, such as TransformUs or Tabata-style routines, as models for effective integration, participants in this study emphasized the importance of autonomy and professional discretion. Rather than adhering to rigid, system-wide protocols, teachers expressed a strong preference for adapting brain breaks based on classroom dynamics, instructional pacing, and student needs. Several participants voiced concern that overly formalized structures might undermine their classroom management or instructional flow, pointing to a need for more flexible, teacher-driven implementation models, an issue not widely explored in earlier intervention-based studies.

Additionally, although some prior literature encourages integrating brain breaks with academic content (e.g., movement-based math or vocabulary review), most teachers in this study viewed brain breaks as separate from instruction - a pause rather than a pedagogical strategy. While participants acknowledged cognitive benefits and improved behavior, few described using breaks to reinforce learning objectives. This disconnect suggests a missed opportunity and underscores the need for professional development that helps secondary teachers see brain breaks not only as tools for regulation and engagement but also as vehicles for reinforcing academic content in creative and meaningful ways.

Another noteworthy contribution of this study is the nuanced distinction in how special education and general education teachers perceive the value of brain breaks. Special education

teachers often described breaks as essential tools for regulation, engagement, and student success, particularly for neurodivergent learners. In contrast, general education teachers more frequently position brain breaks as helpful but secondary to academic instruction. This contrast suggests that professional training and classroom context influence how brain breaks are conceptualized and prioritized, an area not widely explored in the existing literature.

In sum, the study affirms the well-documented benefits of brain breaks while highlighting enduring barriers to their implementation in secondary classrooms. The alignment with prior research is clear, yet this study extends the conversation by offering deeper insight into how role, setting, professional autonomy, and systemic support shape teacher confidence and consistency towards BB.

**Recommendations for Further Research**

Given the study's small sample size and single-district context, future research should expand on these findings with larger, multi-site studies that include diverse secondary school environments. Research could also examine student perspectives on brain breaks to compare teacher perceptions with student-reported effects on focus and engagement. Experimental or longitudinal studies measuring academic outcomes alongside behavior and attention would strengthen the evidence for how brain breaks influence learning over time.

Additionally, there is a clear need for research into effective professional development models that help secondary teachers integrate brain breaks confidently. Future studies might examine how PD, peer coaching, or PLCs influence teacher buy-in and classroom management strategies. Research could also investigate how structural elements, such as flexible seating, outdoor access, or dedicated movement spaces, impact teacher confidence and student outcomes.

By addressing these areas, future studies can help schools design practical, sustainable approaches that make brain breaks a natural part of daily learning, supporting the whole student without sacrificing academic rigor.

## Recommendations for Practice

Based on the findings of this study, several practical recommendations emerge to support teachers, administrators, and policymakers in sustaining brain breaks as an effective classroom strategy at the secondary level.

### *Recommendations for Teachers*

It is essential to establish consistent, clear routines for implementing brain breaks so students understand when they will occur, how they will look, and what is expected afterward. Many teachers in this study emphasized that setting the tone early reduces the likelihood of losing control. Starting small, with short, simple activities such as quick stretches, walking, mindfulness moments, or brief partner discussions, can help build student buy-in and make breaks feel manageable within tight class periods. Teachers are encouraged to observe colleagues who have successfully integrated brain breaks and to share practical strategies through professional learning communities or informal conversations. As one teacher noted, seeing a co-teacher model breaks in action was what finally made it feel realistic. Teachers should also reflect on what works best for different classes and note any patterns; this informal data can guide adjustments and support conversations with administration when barriers arise.

### *Recommendations for Administrators*

The findings highlight the importance of setting clear, positive expectations that brain breaks are valued and supported. Administrators can reinforce this by including breaks in lesson planning templates or pacing guides, sharing best practices during staff meetings, and

recognizing teachers who model effective, structured breaks. It is equally important to address structural barriers where possible. Building in flex time within block scheduling, identifying shared spaces that can be used for short movement breaks, or adjusting classroom layouts can make a big difference, especially when weather or room size limits options. Providing relevant, practical professional development is critical; teachers repeatedly expressed the need for training that is secondary-specific and realistic, rather than generic examples geared toward elementary settings. Above all, administrators should foster a culture that balances accountability for academic rigor with an understanding of the whole child. Teachers are more likely to use brain breaks when they do not feel that every minute must be rigidly devoted to direct instruction.

### *Recommendations for Policymakers and Stakeholders*

This study reinforces the value of supporting whole-child approaches that recognize the connection between physical activity, cognitive functioning, and student well-being. Policymakers can help by promoting policies that normalize short, structured breaks and by funding flexible learning spaces and appropriate equipment for movement in older grades. At the secondary level, where large class sizes and traditional room layouts can make breaks more challenging, physical infrastructure can play a key role in teacher confidence. Ultimately, ongoing investment in research and innovation is necessary to strengthen the evidence base on how brain breaks impact academic outcomes, particularly for students with ADHD and other attention-related challenges, and to identify the most effective professional development models for sustaining these practices over time.

Ultimately, these recommendations emphasize that brain breaks are not a distraction from instruction, but rather a simple and cost-effective strategy to help students and teachers manage the demands of longer class periods and more rigorous content. When teachers are supported by

clear expectations, practical training, peer collaboration, and administrative encouragement, they are more likely to consistently implement brain breaks, creating classrooms where students can reset, refocus, and fully engage in learning.

**Final Thoughts**

In conclusion, this study emphasizes that maintaining brain breaks in secondary schools is not merely an instructional tactic but a reflection of a school's dedication to balancing academic rigor with student well-being. While teachers recognize the benefits of brain breaks for enhancing focus, behavior, and classroom climate, they cannot implement these practices consistently without meaningful support from administrators, colleagues, and the wider educational system. By listening to teachers' experiences and valuing their practical insights, this research shows that small, intentional breaks, when planned with structure, trust, and shared expectations, can help students and teachers alike reset, refocus, and thrive. As schools continue to adapt to the evolving needs of diverse learners, I hope that these findings serve as a reminder that sometimes, making time to pause is one of the most powerful ways we help students move forward.

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## APPENDIX A – SIGNATORY PAGE OF DISSERTATION TOPIC APPROVAL

### Signatory Page of Dissertation Topic Approval

Name of Doctoral Candidate:

Vivian Greene-Snell

We, the dissertation committee, authorize the student above to proceed with the proposal topic of EVALUATING THE EFFECTIVENESS AND SUSTAINABILITY OF CLASSROOM BREAKS: PERCEPTIONS OF SECONDARY TEACHERS

Signatures:

Vivian Greene-Snell — 04/28/2025

Candidate — Date

Christopher Tarr — 05/26/2025

Committee Chair — Date

Aimee Workman — 4/28/2025

Committee Member — Date

Jessica Hall-Wirth — 5/26/2025

Committee Member — Date

**APPENDIX B – APPROVAL OF WRITTEN AND ORAL COMPREHENSIVE EXAMINATION**

Date of completion of my written/oral comprehensive examination:
04/09/2025

I successfully passed my written/oral comprehensive examination during (check one)
__X__SPRING _____ FALL Semester 2025___.

The proposed title of my dissertation study is:
**EVALUATING THE EFFECTIVENESS AND SUSTAINABILITY OF CLASSROOM BREAKS:** PERCEPTIONS OF SECONDARY TEACHERS

Below are my signature and the names and signatures of my committee members reflected the date(s) specified above as the date my dissertation proposal was approved by my committee through written and oral presentation.

| | |
|---|---|
| **Vivian Greene-Snell** | Vivian Greene-Snell |
| Student Name | Student Signature |
| Christopher Tarr | Christopher Tarr |
| Committee Chair Name | Chair Signature |
| **Dr. Jessica Hall-Wirth** | Jessica Hall-Wirth |
| Committee Member Name | Member Signature |
| **Dr. Aimee Workman** | Aimee Workman |
| Committee Member Name | Member Signature |

## APPENDIX C – REQUEST FOR PERMISSION TO CONDUCT RESEARCH WITH FACULTY

Dr. Peter J. Aiken
Superintendent
Central York School District
775 Marion Road
York, PA 17406

Dear Dr. Aiken,

I hope this letter finds you well. My name is Vivian Snell, and I am currently a doctoral student at Slippery Rock University under the supervision of Dr. Christopher Tarr, Senior Licensed Professional Care Manager, Ed.D., LBS. I am requesting your permission to conduct a research study within Central York Middle School and Central York High School as part of my doctoral dissertation. This dissertation focuses on the effectiveness and sustainability of classroom break programs, commonly known as brain breaks.

My dissertation research aims to explore secondary teachers' perceptions of brain breaks, the factors influencing their acceptance or resistance, and the impact these breaks have on student focus, behavior, and overall engagement. I plan to include a diverse group of teachers from various subjects and experience levels to ensure comprehensive insights.

As the district does not have its own Institutional Review Board (IRB), approval will be sought from Slippery Rock University's IRB. I will coordinate closely with school administrators to uphold all ethical standards. Upon completion of the study, the findings will be shared with district leaders and Slippery Rock University.

I am enthusiastic about the potential impact of this research and sincerely hope for the opportunity to contribute to our shared goal of enhancing educational outcomes. Should you require further information or wish to discuss this proposal in more detail, please do not hesitate to contact me.

Thank you very much for considering this request. I look forward to the possibility of working together to support our students' learning experiences.

Sincerely,

Vivian Snell
Special Education Doctoral Student
Slippery Rock University
vmg1005@sru.edu
717-855-0227

## APPENDIX D – PARTICIPANT EMAIL

Dear _____ ,

I hope this message finds you well. My name is Vivian Snell, and I am a doctoral student in the Special Education program at Slippery Rock University in Slippery Rock, PA, working on my dissertation focused on the implementation and effectiveness of classroom break programs, often referred to as brain breaks.

I invite you to participate in a research study titled "Evaluating the Enablers and Barriers of Classroom Break Programs in Secondary Schools." This study seeks to understand secondary teachers' perceptions of brain breaks, the factors influencing their acceptance or resistance, and their impact on student focus, behavior, and engagement.

Your participation would involve completing a survey that will take approximately 15-20 minutes. Participation is voluntary, and all responses will be kept confidential in a password-protected file. Participation is entirely your choice. Because your colleague is conducting this study, we recognize the potential for feeling obliged to participate. Please know that choosing *not* to participate will carry no negative consequences or impact on your professional relationships. Please be assured that neither the principal nor the co-investigators hold any evaluative or supervisory authority over participants. Participation in this study will not affect your assignments, evaluations, or standing within the district.

This study will enroll a maximum of 20 teachers. If more than 20 teachers express interest, we will notify the additional respondents that they have been placed on a waitlist and will be invited to participate if a spot opens up.

As a token of appreciation, all participants who complete the survey will be entered into a raffle. Twelve randomly selected participants will each receive a $25 Amazon gift card. Please review and complete the attached consent form if you are willing to participate. Upon receipt of your consent, a link to the demographic questionnaire and the survey will be provided. A summary of the study's findings will be shared with you to contribute to our understanding and implementation of effective educational practices.

If you have any questions or require further information, please do not hesitate to contact me at 717-855-0227 or vsnell@cysd.k12.pa.us.

Thank you for considering this opportunity to contribute to our research aimed at enhancing teaching practices and student outcomes.

Sincerely,

Vivian Snell
Special Education Doctoral Student
Slippery Rock University

## APPENDIX E – RESEARCH PARTICIPANT INFORMED CONSENT LETTER

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CONSENT TO PARTICIPATE IN RESEARCH

**EVALUATING THE EFFECTIVENESS AND SUSTAINABILITY OF CLASSROOM BREAK PROGRAMS: PERCEPTIONS OF SECONDARY TEACHERS**

Vivian Snell, vmg1005@sru.edu, 717-855-0227

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**Invitation to be Part of a Research Study**

You are invited to participate in a research study. In order to participate, you must be a secondary teacher. Taking part in this research project is voluntary.

**Important Information about the Research Study**

Things you should know:

- The study's purpose is to explore secondary teachers' perceptions of brain breaks, the factors influencing their acceptance or resistance, and their impact on student focus, behavior, and classroom engagement.
- If you choose to participate, you will be asked to complete a demographic and 18-question survey using a scale rating to assess your perceptions. Additionally, you will answer five open-ended questions to provide deeper insights into your experiences.
- Risks or discomforts from this research are minimal, primarily involving the time commitment required to complete the surveys and potential emotional discomfort from reflecting on professional practices and experiences.
- There are no direct personal benefits to you for participating in this study. However, the information gathered may help improve the implementation and effectiveness of brain breaks in schools, which could contribute to enhanced educational practices and better student outcomes.
- Taking part in this research project is voluntary. You do not have to participate, and you can stop at any time.
- Participation is entirely your choice and will have no impact on your professional evaluations, assignments, or relationships with the investigators or any colleagues. Please be assured that neither the lead nor the co-investigator holds any evaluative or supervisory authority over participants.
- This study will enroll a maximum of 20 participants. Enrollment will be on a first-come, first-served basis among those who provide consent. If more than 20 secondary teachers consent, you will be notified of your status (selected or wait-listed) within five business days of the consent deadline.
- Please take time to read this entire form and ask questions before deciding whether to take part in this research project.

## What is the Study About and Why are We Doing it?

The purpose of this study is to evaluate the effectiveness and sustainability of "brain breaks" in secondary schools. These programs, which integrate short periods of physical activity or mental breaks during academic instruction, are designed to enhance student engagement and focus. Despite their increasing popularity in educational settings, there remains a significant gap in research regarding how these breaks are implemented, their sustainability, and their outcomes regarding student behavior and academic performance. The research will focus on three main objectives: assessing secondary teachers' perceptions of brain breaks, including the benefits and challenges; identifying the factors that influence teachers' willingness to implement these breaks in their classrooms; and measuring the impact of brain breaks on student focus, behavior, and overall classroom engagement. By fulfilling these aims, the study will provide critical insights into the practical application of brain breaks and offer evidence-based recommendations for their effective use in educational practices, potentially influencing curriculum development, teacher training, and policy decisions.

## What Will Happen if You Take Part in This Study?

If you agree to participate, you will be asked to (1) complete the demographic survey to provide background information and (2) answer the 18-question scale-rated survey and respond to 5 open-ended questions online. We expect this entire process will take approximately 20 minutes.

## How Could You Benefit From This Study?

Although you will not directly benefit from being in this study, others might benefit because your involvement enhances the overall understanding of the effectiveness and sustainability of classroom break programs. The findings could lead to more effective and tailored implementation strategies that improve educational outcomes for students across various settings.

## What Risks Might Result From Being in This Study?

You might experience some risks from being in this study. The survey consists of 18 scaled questions and five open-ended questions designed to be non-intrusive. The survey questions focus on your views and experiences regarding classroom break programs while safeguarding your employability and comfort. Engaging in this study presents minimal privacy concerns, and breaches of confidentiality are not anticipated.

## How Will We Protect Your Information?

I/We plan to publish the results of this study. To protect your privacy, I/we will/will not include information that could directly identify you. Your information will be securely stored in a

password-protected electronic format (Google Drive) and accessible only to the research team. Identifiable information will be separated from the survey responses to ensure confidentiality.

**What Will Happen to the Information We Collect About You After the Study is Over?**

I/We will not keep your research data to use for future research or other purposes. Your name and other information that can directly identify you will be kept secure and stored separately from the research data collected as part of the project.

**How Will We Compensate You for Being Part of the Study?**

You will be entered into a raffle for one of twelve $25 Amazon gift cards for your participation in this study.

**What Other Choices do I Have if I Don't Take Part in This Study?**

If you choose not to participate, there are no alternatives.

**Your Participation in this Research is Voluntary**

It is totally up to you to decide to be in this research study. Participating in this study is voluntary. Even if you decide to be part of the study now, you may change your mind and stop at any time. You do not have to answer any questions you do not want to answer. If you decide to withdraw before this study is completed, your information will be removed from the data collection.

**Contact Information for the Study Team and Questions about the Research**

If you have questions about this research, you may contact Dr. Christopher Tarr (lead investigator) at christopher.tarr@sru.edu or Vivian Snell (co-investigator) at vmg1005@sru.edu or 717-8550227.

**Contact Information for Questions about Your Rights as a Research Participant**

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the following:

Institutional Review Board
Slippery Rock University
104 Maltby, Suite 302
Slippery Rock, PA 16057
Phone: (724)738-4846
Email: irb@sru.edu

## APPENDIX F – SURVEY PARTICIPATION CONSENT FORM

**Interview Consent Form**

By signing this document, you are agreeing to be included in this study. Make sure you understand what the study is about before you sign. I/We will give you a copy of this document for your records. I/We will keep a copy with the study records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

*I understand what the study is about and my questions so far have been answered.*
*I agree to take part in this study. I understand that I can withdraw at any time. A copy of this signed Consent Form has been given to me.*

| _____ | _____ | _____ |
|---|---|---|
| Printed Participant Name | Signature of Participant | Date |

By signing below, I indicate that the participant has read and to the best of my knowledge understands the details contained in this document and have been given a copy.

| _____ | _____ | _____ |
|---|---|---|
| Printed Name of Investigator | Signature of Investigator | Date |

## APPENDIX G – PARTICIPANT DEMOGRAPHIC QUESTIONNAIRE

1) Gender
    a) Male
    b) Female
    c) Other: _____
    d) Prefer not to say

2) What racial/ethnic group do you identify with?
    a) Hispanic
    b) White
    c) African American or Black
    d) Asian
    e) American Indian or Alaska Native
    f) Native Hawaiian or Other Pacific Islander
    g) Other: _____

3) What is your Professional Title
    a) Regular Education Teacher
    b) Special Education Teacher
    c) Other: _____

4) What is your primary teaching assignment (i.e. classes or subjects taught)

5) What grades do you teach?

6) What is your typical class size?

7) What is the highest degree you have earned?

8) How many years have you been an educator?

9) How many years have you been a teacher in the Central York School District?

## APPENDIX H - TEACHER SURVEY

**Response Scale:** Rate on a scale from 1 to 5; “Not at all confident” (1) and “Fully confident” (5).

**Question Stem:** I am confident that I can get my students active when…

1) My students are not concerned with being physically active.
2) My students are preparing for tests.
3) My students are having problems getting along.
4) My students have a wide range of academic abilities.
5) My students have a wide range of physical abilities.
6) I have a crowded classroom of students.
7) My school does not have enough room outside/inside to provide students with adequate physical activity.
8) The weather is bad and students can’t go outside.
9) I do not have enough time during the day to provide physical activity breaks.
10) I do not have enough time in the period to provide students recess/any type of break.
11) I do not have enough time to prepare physical activity breaks
12) Other teachers at my school do not value physical activity.
13) My administration does not provide adequate support for physical activity.
14) My administration puts pressure on getting high test scores.*
15) I do not have enough equipment/resources for all my students to be physically active.*
16) I can attend professional development focused on implementing physical activity.
17) I can learn a variety of strategies to implement physical activity.
18) I can improve my knowledge about how to get my students active.

**Open-Ended Questions:**

1) Describe your initial thoughts or feelings about integrating brain breaks into your classroom routine.
2) What factors or considerations influence your decision to implement brain breaks in your classroom? Feel free to mention experiences, school policies, perceived outcomes, or any other influencing elements.
3) What factors or considerations influence your decision to avoid brain breaks in your classroom? Feel free to mention experiences, school policies, perceived outcomes, or any other influencing elements.
4) Based on your experience, how do brain breaks affect your students' focus, behavior, and engagement in the classroom? Specifically consider your students *with* and *without* ADHD.
5) Based on your observations and discussions with colleagues, why do you think some teachers choose to incorporate brain breaks, while others might avoid them? Please provide any examples or insights that have shaped your understanding.