EFFECT OF SCHOOL-BASED MINDFULNESS INTERVENTION ON ADOLESCENT ANXIETY

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Thesis submitted to the University of Ottawa
In partial Fulfillment of the requirements for the
Masters of Science in Health Sciences

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Abstract

This master's thesis aims to investigate the potential of school-based mindfulness programs to mitigate adolescent anxiety and perceived stress. Mindfulness and mindfulness meditation have garnered attention in recent decades for their reported positive effects on physical, emotional, and psychological well-being in adults. However, their applicability and efficacy in the adolescent population remains unclear. As adolescent mental health concerns continue to rise, it becomes imperative to address anxiety which, though a natural response to stress, can devolve into a debilitating mental health issue when it hinders daily functioning. Anxiety disorders are among the most prevalent mental health issues among youth, emphasizing the need for early interventions that equip adolescents with effective stress management tools to potentially prevent the development of serious mental health disorders.

Undertaking a systematic review, the effectiveness of school-based mindfulness programs in reducing adolescent anxiety is examined critically. By reviewing existing research and synthesising the findings through narrative analysis, this thesis offers a comprehensive overview of the outcomes of such programs. This study seeks to shed light on the extent to which mindfulness interventions can positively impact the mental-wellbeing of adolescents. The findings of this research will contribute to the growing body of knowledge regarding mindfulness-based approaches as viable tools for enhancing adolescent mental health and resiliency. This work strives to inform educational institutions, mental health professionals, and policy-makers about the

potential benefits of integrating mindfulness practices into school curricula to better support the wellbeing of young people.

Keywords: Adolescent anxiety – Perceived Stress- Mindfulness – Mindfulness Meditation – Mental Health Promotion – School-based intervention

Résumé

Ce mémoire de maîtrise vise à étudier le potentiel des programmes de pleine conscience en milieu scolaire pour atténuer l'anxiété etle stress perçu des adolescents.La pleine conscience etla méditation de pleine conscience ont attiré l'attention au cours des dernières décennies pour leurs effets positifs signalés sur le bien-être physique, émotionnel et psychologique des adultes. Cependant, leur applicabilité et leur efficacité dans la population adolescente restent floues. Alors que les problèmes de santé mentale des adolescents continuent de croître, il devient impératif de lutter contre l'anxiété qui, bien qu'elle soitune réponse naturelle au stress,peutse transformer en un problème de sa nté mentale débilitant lorsqu'elle entrave le fonctionnement quotidien. Les troubles anxieux comptent parmi les problèmes de santé mentale les plus répandus chez les jeunes, ce qui souligne la nécessité d'interventions précoces qui dotent les adolescents d'outils efficaces de gestion du stress afin de prévenir potentiellement le développement de troubles de santé mentale graves.

L’efficacité des programmes de pleine conscience en milieu scolaire pour réduire l’anxiété des adolescents est examinée de manière critique. En examinant les recherches existantes et en synthétisant les résultats par une analyse narrative, cette thèse offre un aperçu completdes résultats de tels programmes. Cette étude vise à faire la lumière sur la mesure dans laquelle les interventions de pleine conscience peuvent avoir un impact positif sur le bien-être mental des adolescents. Les résultats de cette recherche contribueront au corpus croissant de connaissances concernant les approches basées sur la pleine conscience en tant qu’outils viables pour améliorer la santé mentale et la résilience des adolescents. Ce travail vise à informer les établissements d’enseignement, les professionnels de la santé mentale et les décideurs politiques sur les avantages potentiels de l’intégration des pratiques de pleine conscience dans les programmes scolaires pour mieux soutenir le bien-être des jeunes.

Mots clés : Anxiété des adolescents – Pleine conscience – Méditation de pleine conscience – Promotion de la santé mentale – Intervention en milieu scolaire

Acknowledgements

Enormous thanks to my supervisor, Dr. Raywat Deonandan, for his guidance and willingness to take me on as his graduate student. His interest and encouragement were invaluable and kept me motivated- even through a year+ experience with Long Covid. Our meetings often ran well over our scheduled time, fed by his curiosity and creative suggestions. I consider myself enormously lucky to have worked under his tutelage. He's helped shaped my career goals, shining a light on the path ahead.

Along with Dr. Deonandan, thanks to my Thesis Advisory Committee; Dr. Anne Konkle and Dr. Karen Phillips for their support and guidance. Your time, feedback, and contributions to this project helped me from initial idea through to completion.

Thanks to the many at the Graduate Student Office with a special thanks to Stéphanie Breau-Godwin who was patient with my many questions and prompt with answers. Her assistance navigating administrative details spared me a great deal of stress and helped me through the labyrinth. The bumpiness of completing a masters degree during a global pandemic was not without repercussions, and the people who make up the School of Interdisciplinary Health Sciences helped minimize the upheaval. I'm grateful to be a graduate of this school, and proud to be University of Ottawa alumni.

To my many friends who encouraged, cajoled, and kept sight of the end goal: Thank you for your reliable kindness and support.

And to my children: William, John, Thomas, Brian and Erin. You add meaning to my days, and my love and pride in you is immeasurable.

This work was completed in the city of Ottawa, the current and traditional home of the Anishinaabe people. Acknowledging their stewardship of this unceded territory, I am a grateful beneficiary of their leadership, courage, and care. “The relationship between an object and where it belongs is not simply fortuitous, or a matter of causal forces, but it is rather intrinsic or internal, a matter of what that thing actually is” (Curry, 1998).

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Introduction

Anxiety stands as the most prevalent mental health disorder among children and adolescents (Polanczyk et al., 2015). The National Institute of Mental Health reports that 25% of adolescents aged 13 to 18 are affected by an anxiety disorder, and these rates are on a concerning upward trajectory (Danchin et al., 2019; Reisner et al., 2016). Increasing prevalence of anxiety, both non-clinical and diagnosable disorders, underscores the need for effective interventions.

Adolescents grappling with anxiety experience a myriad of unpleasant symptoms, including increased heart rate, restlessness, tension, nausea, and weakness. While these symptoms may not necessarily incapacitate daily functioning, prolonged or excessive anxiety can usher in a cascade of physiological and psychological issues, such as an increased risk of heart disease, impaired immune function, digestive problems, obsessive thoughts, and insomnia (Leonard & Abramovitch, 2019).

Beyond the realm of chronic health ailments, anxiety often sabotages adolescents' ability to establish and maintain social connections, focus on academics or work, and may even precipitate substance abuse or suicidal ideation (S. K. Singh & Gorey, 2018). Consequently, it becomes imperative to explore effective strategies to mitigate the impact of anxiety on adolescents' lives. This thesis delves into the realm of mindfulness-based interventions as a potential solution to alleviate adolescent anxiety.

Prolonged or excessive anxiety does more than just inflict immediate distressing

symptoms; it also escalates the risk of developing a full-fledged mental health disorder (Dumontheil, 2016; Leonard & Abramovitch, 2019). The adolescent years are particularly critical in terms of development. While total brain volume is attained by the end of childhood, structural, functional, emotional, and social cognition continues to mature throughout adolescence. Notably, key brain regions like the amygdala, prefrontal cortex, and hippocampal formation are particularly sensitive to stress hormones released during states of anxiety (Dumontheil, 2016).

It is within this context that mindfulness-based meditation emerges as a potentially promising intervention for anxiety management among adolescents. Mindfulness and mindfulness meditation, which have been extolled by practitioners of Buddhism and contemplative religious communities for centuries, began garnering scientific attention in the 1970s, driven primarily by the pioneering work of Jon Kabat-Zinn during his graduate studies at the Massachusetts Institute of Technology (Dunning et al., 2019; Keng et al., 2011). Interest in mindfulness has continued to burgeon as the practice shifted from a predominantly spiritual domain to a secular and evidence-based therapeutic approach.

Statistics paint a stark reality: the prevalence of anxiety among adolescents is increasing and its impact extends beyond the immediate discomfort of symptoms (V. Singh et al., 2022). Stress remains a substantial threat to both the health and educational outcomes of adolescents, who, despite facing stress levels akin to adults, often lack the coping strategies necessary for effective management (Erbe & Lohrmann, 2015). Findings indicate that contemporary students are reporting unprecedented levels of stress and worry, and 43%

of adolescents aged 13 to 17 state their stress level has increased (Reisner et al., 2016, APA, 2020). Among LGBTQ youth, 73% report experiencing anxiety (The Trevor Project, 2022). Many adolescents displaying symptoms of anxiety disorders go unnoticed and untreated, exacerbating the problem.

Moreover, anxiety rates exhibit gender disparities, with females being twice as likely as males to experience mood disorders (Reisner et al., 2016). This divergence in prevalence highlights the need for targeted interventions that consider gender as a crucial factor in anxiety management.

While anxiety is a normal response to stress, when it begins to impede daily activities, it transforms from an expected reaction into a mental health (Frank et al., 2021). The timing of intervention is of paramount importance; uncontrolled anxiety left unaddressed may develop into a clinical disorder. Many anxiety and mental health disorders manifest in childhood (Kessler et al., 2007; Solmi et al., 2022); targeting adolescents for early intervention holds the potential to thwart the development of chronic anxiety disorders, such as generalized anxiety disorder. This thesis posits that adolescence presents an opportune period to introduce tools and techniques to empower youth to manage anxiety effectively, preventing it from becoming a habitual and debilitating response.

In light of these statistics and the critical need for early intervention, this thesis aims to comprehensively review the efficacy of mindfulness-based interventions within school settings in mitigating adolescent anxiety. By exploring the impact of mindfulness on adolescents' mental health and well-being, the aim is to contribute to the growing body of

knowledge on this vital topic, fostering a healthier and more resilient generation of adolescents.

Thesis Overview and Objectives

The objective of this thesis is to assess the existing research concerning the use of school-based mindfulness interventions as a tool to manage and mitigate anxiety or perceived stress among adolescent learners and in turn promote psychological resiliency. Developing skills to cope with anxiety may help teens navigate the potentially challenging adolescent years. Additionally, these skills may serve as a safeguard against future mental health issues. Among children and adolescents, anxiety is the most prevalent mental health disorder (Polanczyk et al., 2015). The National Institute of Mental health states 25% of adolescents (13-18) are affected by an anxiety disorder, and rates continue to increase (Danchin et al., 2019; Reisner et al., 2016). Teens have limited coping strategies while experiencing rates of stress similar to those of adults (Erbe & Lohrmann, 2015).

With this in mind, this thesis aims to answer two questions:

1. Are mindfulness interventions effective in addressing adolescent anxiety in a school setting?

2. What factors influence outcomes of school-based mindfulness programs?

By exploring these questions, this research seeks to provide insights directly

relevant to educators, healthcare providers, policymakers, and parents.

Interdisciplinary Approach

Mindfulness and mental health are complex topics and a deeper understanding may be gained with an interdisciplinary lens. An examination through multiple facets allows valuable information to be surfaced. This may include the psychological, physiological, and social dimensions of adolescent mental health and specific challenges

Drawing on the expertise of psychology, neuroscience, sociology, and education alongside health sciences provides greater insight. A collaboration between disciplines can reveal the intricacies of these problems and yield more robust solutions. Additionally, considering these various factors nurtures a holistic perspective. Study from various angles, including diverse disciplines, allows for cross-pollination of both ideas and methods. The cognitive development of the adolescent brain, social dimensions relevant to teens, the institutional needs of the school system, and the necessary elements for an effective mindfulness meditation practice are all considerations when assessing the efficacy and practicality of an intervention in a real-world setting.

To inform effective policy and practice, research related to adolescent mental health must consider a range of perspectives. An interdisciplinary approach provides insights that are directly relevant to educators, healthcare providers, policymakers and parents. Recognizing that mental health promotion extends beyond the responsibility and perhaps even capacity of mental health professionals points to the importance of an integrated interdisciplinary approach to providing services and intervention.

Literature Review

Introduction

An overview of existing research provides a framework to understand mindfulness practices, anxiety, and the growing mental health challenge among youth. It also provides guidance on the benefit of early intervention and preventative measures. Additionally, this review aims to distinguish between anxiety, clinical anxiety, stress, and depression. These terms are sometimes used interchangeably but in fact have discrete meanings. Establishing the distinct meaning of terms, including their clinical and non-clinical use, is a necessary prerequisite to conceptualize both the problem and potential solutions. Operational definitions are part of best practices for valid research (Slife et al., 2016).

Anxiety

Anxiety is a subjective experience. As a response, anxiety is similar to fear. Both may be described as a feeling of apprehension that includes somatic symptoms of tension, such as shortness of breath, increased heart rate, or muscle contraction (APA Dictionary of Psychology, 2018). A notable difference is that fear is a present-oriented response to an identifiable threat, whereas anxiety is a response to an anticipated but unidentified threat. It is a future-oriented reaction to a non-specific or unknown threat. The fear response is short-acting and dissipates once the danger is no longer present. Anxiety is a generalized and long-acting response with a broad focus to an unknown threat or internal conflict.

It is important to recognize anxiety exists on a spectrum, from an unpleasant feeling to a diagnosable disorder. It may present as a normal or expected response to stress. While the immediate symptoms of anxiety may feel uncomfortable, such as increased heart rate, restlessness, tension, nausea, weakness, they do not necessarily interfere with activities of daily function. Prolonged or excessive anxiety risks progression into a mental health disorder as well as physiological issues (Dumontheil, 2016; Leonard & Abramovitch, 2019). Anxiety disorders are defined as having a focus on the emotional state of fear, worry, or apprehension (APA Dictionary of Psychology, 2018). The Diagnostic and Statistical Manual-V(DSM-V) classifies anxiety disorders as conditions characterized by excessive fear, anxiety, and related behavioral disturbances, differentiating anxiety from fear through its cognitive component—worry focused on future events (Leonard & Abramovitch, 2019, APA, 2013). A clinical diagnosis of an anxiety disorder may include generalized anxiety disorder (GAD), social anxiety, specific phobias, separation anxiety, agoraphobia, or panic disorder, among others. They vary in persistence, severity, and levels of impairment. Anxiety disorders are chronic in nature and are the most common mental health disorder (Polanczyk et al., 2015).

With a focus on events that have yet to happen or many never happen, anxiety symptoms may be unpleasant but do not necessarily impact daily function. However, prolonged or excessive anxiety may result in a variety of physiological and psychological issues. These may include increased risk of heart disease, impaired immune function, digestive issues, the need for frequent urination, obsessive thoughts, and insomnia (Leonard

& Abramovitch, 2019). It increases the likelihood of poor sleep (Tracy et al., 2021), heart disease, high blood pressure, impaired immune function, arthritis, and chronic pain (Stanton et al., 2019).

In addition to chronic health issues, anxiety may lead to difficulty establishing and maintaining social connections, focusing on school or work, and may result in substance abuse or suicidal thoughts (S. K. Singh & Gorey, 2018). Mental health issues in childhood are associated with an increased risk of poverty, increased risk of involvement with the criminal justice system, reduced levels of education, and reduced levels of employment (Jenkins et al., 2011). This suggests the economic costs that exist in addition to the personal and societal burden of anxiety that progresses to a mental health disorder. Globally, anxiety is the sixth most common cause of disability and it is estimated that by 2030, depression and anxiety will cost the world economy $16 trillion annually (Chodavadia et al., 2023). This is the predicted cost of lost productivity, but excludes the cost to already strained healthcare systems.

Adolescents and Anxiety

Adolescence is a time of critical development. It is marked by heightened emotional reactivity, growing self-awareness, and physical changes (Christie & Viner, 2005). For many young people, puberty is marked by the development of sexual characteristics, the further development of cognitive skills, and formation of their personal identity. There is growing independence and responsibility, and relationships with peers become more consequential (Klimstra et al., 2010; Lin et al., 2019). This intersection of internal physical and

psychological changes with external social changes may be a burden that potentially creates a vulnerable period for youth.

It can be a stressful time and while anxiety is a normal response to stress, feelings of worry that interfere with daily activities may become a mental health issue. Onset and symptom profile may vary, but uncontrolled anxiety can develop into a clinical disorder if left untreated (APA, 2013, Kasper, 2006). Developing tools to attend to anxiety and worry when they are still within a normal range and before progressing into a reaction that requires medical intervention is an advantageous approach. This study proposes that adolescence is an ideal time to introduce these tools, to help youth develop skills early and avoid problematic responses becoming habituated.

Anxiety disorders are the most common mental disorder and numbers are increasing. The Canadian Paediatric Society reports that while rates of anxiety were stable for decades, hovering around 4% of youth from ages 12-19, this number has grown in recent years (Canadian Paediatric Society). In 2019 19% of adolescents and 9% of children self-reported an anxiety disorder (A. Smith, 2019). A 2018 study that reported rates of professional diagnosis demonstrated 13% of youth had an anxiety disorder, a substantial increase from the 6% reported in 2011 (Wiens et al., 2020). Researchers noted the increase may the result of greater awareness of anxiety, decreased stigma related to mental health challenges, as well as a true increase in prevalence.

While mild anxiety can be a normal reaction to stress and may help focus attention, moderate to severe anxiety may interfere with activities of daily living, lead to low self-

esteem, depression, substance abuse, and suicidal ideation (S. K. Singh & Gorey, 2018). This underscores the importance of understanding anxiety as a spectrum, from routine anxiety to clinical anxiety disorders. Many studies point to the long term negative impact of anxiety (Robinson et al., 2013; Wilmer et al., 2021).

Mental health disorders and anxiety may manifest in childhood (Kessler et al., 2007; Solmi et al., 2022) with 14.5 years as peak age of onset age for a mental health disorder (Giedd et al., 2008). Targeting adolescents for early intervention holds the potential to thwart the development of chronic anxiety disorders, such as generalized anxiety disorder. While early detection and treatment are important goals of healthcare, primary strategies or interventions aimed to prevent the emergence of a disorder benefits the general population and does not require identifying particular individuals most at risk (Colizzi et al., 2020). The challenge of preventative measures is it may be difficult to demonstrate an absence of mental health challenges; illness that does not occur as a result of the intervention. Assessing a sub-clinical population may be a limitation within current research as this group may present with lower rates of anxiety pre-intervention.

Symptoms of anxiety may become severe or persistent enough to constitute psychological distress or be considered a disorder, but these states exist as normal responses to daily life. Individuals may experience anxiety without reaching the threshold of a disorder and equipping youth with tools to address psychological distress before it progresses to maladaptive behaviour or becomes part of neurological development is a compelling goal (Dray et al., 2017). Stress and anxiety may be normal reactions to certain situations but they

become maladaptive when chronic, excessive, and uncontrollable (S. K. Singh & Gorey, 2018). Understanding this range of response can promote a more compassionate and understanding attitude while also minimizing stigma. While research on adolescents and anxiety remains limited, existing studies suggest mindfulness is a promising treatment for a range of health challenges for teens (Lin et al., 2019).

Anxiety, Depression, Stress

In both common parlance and in research literature, anxiety, stress, and depression are often mentioned together. Developing clarity and specificity of terms contributes to better understanding and communication. This is necessary to ensure phenomena are being clearly described and research questions can be meaningfully answered (Bishop et al., 2004; Slife et al., 2016). In some cases, articles used in this systematic review used measurements of stress as a metric for anxiety (Campbell et al., 2019; Fung et al., 2019; Gouda et al., 2016; Kang & Kim, 2023; Kuyken et al., 2013; Luong et al., 2019). These studies used the Perceived Stress Scale and the Perceived Stress Questionnaire, both considered to have a high degree of validity (Andreou et al., 2011; Nielsen et al., 2016; Shahid et al., 2011). As a result, including perceived stress as a descriptor may capture the experience of anxiety for youth. Particularly relevant is that perceived stress is a subjective experience which arises within the individual versus objective, or environmental stress (Christensen et al., 2019). In this regard, it is much like anxiety. With this subjective element, it may be difficult to identify those at risk of excessive levels of anxiety or stress because it cannot be predicated on individual experience.

The overlap in symptoms of psychological distress that occurs in the experience of

anxiety, stress, or depression may explain why these terms are sometimes used interchangeably or as if they analogous. It also suggests the increasing discernment or clinical understanding we gain with continued research; the Diagnostic and Statistic Manual IV (DSM-IV) classified post-traumatic stress disorder (PTSD) within the disorder class *Anxiety Disorder*. The DSM-V provides a new category, *Trauma and Stressor-Related Disorders* (Pai et al., 2017), in which PTSD is now classified. This suggests a continuing refinement of understanding as definitions are amended and are diagnostic criteria more clearly outlined.

To parse some of these differences, anxiety is a generalized response to an unknown threat or internal conflict, as compared to fear which is focused on a known or external danger. Stress and anxiety are subjective experiences of perception and the terms are often used interchangeably. Anxiety can be understood as apprehensive expectation or excessive worry suggests a link to perceived stress; perceived stress is the degree to which life events are experienced as stressful, unpredictable, or uncontrollable (Wang et al., 2019). It is an individual's appraisal of how overwhelming an event or circumstance might be, potentially viewing life as unpredictable or uncontrollable. While these terms are distinct, many times they are used synonymously in both clinical and nonclinical settings. Sometimes anxiety is considered stress-related, such as a response to task performance (Kinsella et al., 2020). It may lead to psychological distress which, along with physical symptoms, may also increase the risk of anxiety or depression (Goldring & Bolger, 2021).

Stress is not the direct result of an external event but is mediated by the individual's

interpretation and response to the event (Kinsella et al., 2020). These terms have both clinical and non-clinical use. Anxiety is not synonymous with stress; it may be a particular response to stress. It may also present in the absence of external stress as an anticipatory state. The Diagnostic and Statistical Manual (DSM-5) defines anxiety as excessive worry and apprehensive expectation. Prolonged stress has been linked to anxiety (Kinsella et al., 2020), but the relationship between anxiety and stress remains illusive (Konstantopoulou et al., 2020). The relationship between subclinical stress and anxiety symptoms support targeting stress as an intervention to prevent anxiety disorders. For this reason, this systematic review includes studies that measure perceived stress along with those that assess anxiety.

A survey by Pew Research found 96% of teens noted anxiety and depression as a problem among their peers (Horowitz & Graf, 2019). Depression presents as a hypo response within the nervous system and anxiety represents a hyper state of arousal. While symptoms may overlap, this distinction is an important consideration as prevention and treatment may differ (Sherrell, 2022).

Many articles and studies mention depression and anxiety together as related conditions, reporting on both. Consider examples such as, “Global prevalence and burden of depressive and anxiety disorders in 204 territories in 2020 due to the COVID-19 pandemic,” (Santomauro et al., 2021), “Prevalence and economic burden of depression and anxiety symptoms among Singaporean adults,” (Chodavadia et al., 2023), “Brazil: World leader in anxiety and depression rates,” (Psiquiatr, 2017), or “The Netherlands study of depression and anxiety: rationale, objectives, and methods,” (Penninx et al., 2008). As the two most

prevalent psychiatric disorders, it is perhaps unsurprising that depression and anxiety are often listed in unison. Additionally, one may complicate the other (Cosci & Fava, 2021), and frequently they present as comorbidities (Noyes et al., 1980; Salcedo, 2018). They may coexist in an individual, but it is important to understand the difference between the two.

In many aspects, anxiety and depression occupy opposite poles although some symptoms may overlap, such as fatigue, negative affect, or difficulty concentrating. Anxiety is future-oriented, a hyperarousal of the nervous system and an excessive focus on threat. Depression has a bias towards the past, is a hypo-arousal of the nervous system, and excessive rumination (Epkins et al., 2013; Eysenck & Fajkowska, 2018). In the pursuit of preventative measures, imagining them as interchangeable may divert our attention from the need for interventions that target specific conditions (Salcedo, 2018). In both cases, there is a somatic experience as well as mental distress.

Brain Development

The adolescent years are a critical time for brain development. Regions of the brain such as the hippocampus, amygdala, and prefrontal cortex undergo significant neurological change during this period and are sensitive to the effects of stress hormones. Frontal cortical development continues into late adolescence and includes hormonal changes as well cortical synaptic remodelling and changes in neurotransmitter receptors and transporters (McEwen, 2005). Maturation does not occur until adulthood (Crews et al., 2007) and for this reason youth are particularly at risk to the neurological effects of anxiety and stress. Although total brain volume is reached by the end of childhood, structural,

functional, emotional, and social cognition mature throughout adolescence and the brain is not fully developed until early adulthood (Dumontheil, 2016). While structural and functional changes during puberty have been studied using techniques such as Magnetic Resonance Imaging (MRI) or Diffusion Tension Imaging (DTI), Dumontheil (2016) notes the effects of hormones on the developing adolescent brain development are not well understood.

Executive function performance is paralleled by activation of the prefrontal cortex (Niendam et al., 2012). Ongoing maturation of the prefrontal cortex through adolescent years suggests interventions or experiences that influence shape its development are critically important for future cognitive control; executive functions such as attention regulation, self-control, decision making, or working memory. These neurological changes may create a period of vulnerability associated with the onset of mental illness such as anxiety, depression, or substance abuse (Greenberg & Lippold, 2013), underscoring the teen years as a critical window for both intervention and skill development. Mindfulness meditation has been shown to assist with emotional regulation in part through its impact on the anterior cingulate cortex which is involved in the processing of emotion and conflict (Waters et al., 2015).

Furthermore, adolescence may be a particularly stressful period. Teens may experience additional academic pressure, combined with increasingly complex social relationships (Johnstone et al., 2020). It is a period of increased independence and hormonal shifts. During a time of rapidly developing neural networks, this additional stress may have a physiological impact as well as a negative impact on emotional regulation.

The adolescent years provide a critical window developmentally that may benefit from the ongoing plasticity of brain development. The amygdala, prefrontal cortex, and hippocampal formation are sensitive to stress hormones, released during states of anxiety (Dumontheil, 2016). Research suggests stress creates and inflammatory state with increased amygdala activation (Munshi et al., 2019). The amygdala is involved with emotion generation and regulation (Kral et al., 2018). Engaging emotion regulation through affect labeling has been shown to dampen the amygdala response (Kral et al., 2018; Lieberman et al., 2007). In the absence of deliberate attention, amygdala activation may be increased.

Stress may exacerbate or precede a mood disorder (McEwen, 2005), which in turn suggests adolescents may have a greater vulnerability to the effects of stress (Erbe & Lohrmann, 2015). Significant developmental changes during adolescence occur in regions of the brain that are critical in responding to stressful situations (Sheth et al., 2017). Severe and ongoing stress may cause damage to the brain. An increased likelihood of major depressive illness across the lifespan for those who experience persistent or severe stress during adolescence suggest an underlying pathophysiological process (McEwen, 2005; Sheth et al., 2017). The normal developmental changes to the adolescent brain coupled with brain remodeling caused by stress points to the importance of understanding how to mitigate the effects of stress within this population. It demonstrates the protective value of providing teens with skills to manage stress and anxiety.

Given the neurological underpinnings and the intricate relationships between hormones, stress, and brain development, adolescence offers an opportune time for

intervention. Early intervention is considered an important preventative measure. A 2019 meta-analysis using 18 studies showed a small positive effect reducing anxiety symptom scores over a 12 month period (Hugh-Jones et al., 2021). Researchers noted that there was a high risk of variability and risk of bias between studies and that a longer-term assessment was needed.

Mindfulness Meditation and Contemplative Practices

Mindfulness is an awareness cultivated by paying attention on purpose to what arises in the present moment without judgement (Kabat-Zinn, John, 2004). While mindfulness has existed as a Buddhist practice for more than two thousand years, it was formalized as an intervention to manage stress, illness, and pain in 1979 by Jon Kabat-Zinn (Dunning et al., 2019). Mindfulness is noting the present moment and what arises without judgement (Borquist-Conlon et al., 2019; Kabat-Zinn, John, 2004). It is a practice that can be learned, and proponents suggest it allows the practitioner to notice thoughts or sensations in the body without attaching meaning. It cultivates curiosity, openness, and acceptance while staying anchored in the present moment (Dunning et al., 2019). Interest in the topic has continued to grow as the practice has moved increasingly from a spiritual to a secular setting.

There are many forms of meditation. Some focus on a single word, image, or sound, or invite the practitioner to send loving thoughts to others. Mindfulness is a specific form of meditation that takes note of what arises in the body or mind without attaching to the thought or sensation (Kral et al., 2018). It is a practice of awareness and nonjudgment.

There has been an increasing interest in improving cognitive resiliency through

mindfulness as a means to address stress and emotional distress (Bishop et al., 2004). Mindfulness combines specific components: A self-regulation of attention which maintains attention on the current experience; and bringing curiosity, openness, and acceptance to the thoughts and feelings that arise in that present moment. This characterizes the potential benefit of mindfulness as a means to develop cognitive reappraisal; to recognize the subjective interpretation of an emotion or event. It also reflects the description suggested by Kabat-Zinn (2004), the building awareness which allows space between perception and response, promoting a reaction that is reflective rather than reflexive. In the face of perceived stress, mindfulness may play a mediating role. Cultivating awareness and an attitude of acceptance to what is happening in the moment, whether mentally, emotionally or physically, supports development of self-regulation of attention and in turn elaborative processing is reduced (Bishop et al., 2004). Elaborative processing creates meaning or the interpretation of thoughts, feelings, and sensations. This meaning, filtered through beliefs and expectations, is malleable.

The operational definition of mindfulness proposed by Bishop et al. (2004) illustrates how mindfulness may reshape interpretation and promote psychological resiliency. Their description of the practice includes the self-regulation of attention on the immediate experience, increasing recognition of thoughts and sensations in the present moment; and secondly maintain a particular orientation of acceptance and openness to the present moment. Examples of mindful meditation components may include an open monitoring of what arises (feelings, thoughts, sensations), focus on the breath, or a body scan. These practices invite

sustained awareness without attempting to control or analyze the experience (Kral et al., 2018).

Rates of anxiety have increased among youth in recent years (Reisner et al., 2016) while religious affiliation has decreased (Statistics Canada, 2021). According to Statistics Canada, 18% of Canadians reported having a religious affiliation but that they never or rarely engage in spiritual activities. While it is outside the scope of this study, whether there is a correlation between increasing rates of anxiety and decreasing rates of religious activity is worth examining. A contemplative aspect is part mindfulness as well as many religious traditions (Desbordes et al., 2015; Waters et al., 2015), and a contemplative practice has demonstrated health benefits (Edwards, 2014) and improved equanimity. Any religious or spiritual connotation was deliberately separated from mindfulness meditation (Stratton, 2015) to promote its acceptability in Western culture. A decrease in spiritual activities may include a decrease in contemplative practices, and with it a reduction in the individual's sense of health or wellbeing (Edwards, 2014).

Mindfulness Interventions: Previous Research

Mindfulness as a contemplative practice has been touted as an effective mediator of stress, along with other positive effects. Previous studies have noted the effectiveness of mindfulness to reduce stress and anxiety, to reduce emotional distress, and to improve coping abilities (Kinsella et al., 2020). Current literature indicates that mindfulness-based interventions might have a positive effect on adolescent medical and mental health concerns.

In recent years there has been a substantial increase in studies examining the efficacy

of mindfulness as an intervention. A review of research in 2017 noted a limited number of studies and a need to explore potential uses of mindfulness interventions (Ahmed et al., 2017). More research has been conducted assessing the impact of mindfulness, often related to health and wellness but not exclusively.

A meta-analysis of randomized controlled trials found significant positive effects in outcome categories of mindfulness, executive functioning, attention, depression, anxiety, and negative behaviours (Dunning et al., 2019). In restricting studies to those that included an active control group, researchers found benefits were reduced to mindfulness, depression, and anxiety.

A systematic review examining the effects of school-based mindfulness programs on children's anxiety found a small reduction in anxiety (Hugh-Jones et al., 2021). Using 18 studies, researchers found efficacy in reduction of anxiety scores, while also noting a high degree of bias and variability between studies. While they noted the benefit of mindfulness programs, they also suggested the need for long-term assessment to understand whether these effects persist.

Systematic reviews have also been conducted examining mindfulness interventions for children and adolescents with anxiety disorders (Borquist-Conlon et al., 2019). Analysis of the 5 studies that met researchers' criteria found interventions demonstrated moderate and positive effects, though a smaller mean effect size than for adult populations with anxiety disorders (Khoury et al., 2013). Borquist-Conlon et al. (2019) also note the relatively little evidence base and the need for more rigorous research.

A meta-analysis of mindfulness versus cognitive behaviour interventions for anxiety disorders revealed no significant difference between the two, although both provided significant clinical benefits (S. K. Singh & Gorey, 2018). Nine studies were included, and while the two interventions were equally effective in alleviating anxiety, the authors point out that mindfulness as a therapeutic intervention may be less expensive. It requires less training and less time for either the clinician or patient to integrate. This is an important consideration given the potential cost-benefit in providing care and an increasing need for mental health support.

A systematic review examining mindfulness-based interventions on children and adolescents found no statistically significant result (Ruiz-Íñiguez et al., 2020). A total of 18 studies published up to and including 2016 were found. This was contrary to previous meta-analyses that demonstrated mindfulness as an effective intervention (Kallapiran et al., 2015; Zenner et al., 2014; Zoogman et al., 2015), and Ruiz-Íñiguez et al. (2020) questioned whether this was because they had used anxiety as a dependent variable. Researchers commented on the need for more robust research and that their analysis used studies which were small and of low power, as well as the lack of uniformity across studies. This includes different implementation techniques and measurement instruments. They describe their own results as provisional.

School Setting and Early Intervention

Schools offer a strategic location to offer prevention programs or act as early intervention. They provide access to adolescents for prolonged periods at a critical point in their development and for extended part of the day (Dray et al., 2017). The school setting may overcome many of the barriers to outreach or treatment, such as cost, location, stigmatization, or transportation; barriers which in part lead to many children who are diagnosed with anxiety to not receive clinical treatment (Barrett & Pahl, 2006). Removal of these barriers may increase participation in mindfulness practices or similar interventions that promote mental wellness. Relative to a clinical setting, schools improve access (Jaycox et al., 2010) and offer existing infrastructure and resources to support resiliency and mental wellness, along with a large target population. Offering interventions within schools (Barrett & Pahl, 2006) may translate into a greater utilization rate and reduced stigma.

Integrating mindfulness interventions into school settings is a proactive approach that provides broad accessibility and minimizes stigma while supporting adolescent mental health and wellbeing. Given the large amount of time most youth spend in these institutions, schools are an appropriate setting to deliver programs that reduce anxiety and promote resiliency. A strategy of prevention in a non-clinical setting potentially benefits a much larger population versus secondary or tertiary interventions offered when mental health challenges emerge (Singh et al., 2022). Additionally, prevention measures are cost-effective (Masters et al., 2017) and along with their efficacy may provide a compelling return on investment. Primary intervention may offer both immediate and long-term reduction of financial burden on the

healthcare system.

An additional consideration is that helping teens manage anxiety has the potential to improve learning outcomes (Kinsella et al., 2020). School administrators may be interested in introducing such programs given previous research has demonstrated mindfulness improves attention, organizational skills, cognitive abilities, problem-solving, and academic performance.

Because average age of onset for mental health disorders is early adolescence, the need for early intervention is apparent (Giedd et al., 2008; Kessler et al., 2007; Solmi et al., 2022). Primary and preventative strategies may reach larger numbers for greater health benefits (Colizzi et al., 2020), and youth-focused strategies that are multi-disciplinary will be more effective. Mental health needs of teens are largely unmet, particularly when relying solely on healthcare professionals (Colizzi et al., 2020). Borquist- Conlon (2017) emphasizes the need for early intervention and additional treatment options for childhood anxiety disorders.

As a critical time for brain development and the significant changes that occur in brain regions sensitive to stress hormones, adolescents are particularly vulnerable to the neurological effects of anxiety and stress. Reaching large numbers of teens during this period of development suggests schools might be both a strategic and effective choice for preventative interventions.

Early intervention may prevent or mitigate deleterious long-term effects of anxiety, which offers many benefits. From a societal perspective, early intervention can

be cost-effective. Addressing mental health concerns before they become more severe may reduce the need for more extensive and expensive interventions later in life. Early intervention programs may build resilience which in turn may boost self-confidence and a sense of agency. This may also strengthen social skills and academic performance. Adolescents who receive support and coping strategies early on are better equipped to navigate difficulties, including anxiety and perceived stress, and adapt to challenges. Preventing more serious mental health conditions is a compelling reason to consider early intervention, as is the possibility that it supports the opportunity for youth to flourish in these developmental years.

With the potential for direct and consistent access to students, schools make an ideal setting for prevention programs (Domitrovich et al., 2010; M. T. Greenberg, 2004). Challenges in both accountability standards and scheduling needs must be considered, but given the potential for schools to provide integrated programs that act as a resource across a learner's lifespan, addressing those challenges may be worthwhile. Growing empirical evidence of the efficacy public health model of preventative measures provided in a school setting and the ensuing benefits for social-emotional and behavioral health warrants consideration of such programs (Evans et al., 2014; Hoagwood et al., 2007; Strøm et al., 2014). Schools may provide an effective means for promoting mental wellness that is integrated and cost-effective (Jenkins et al., 2011).

Methodology

This study was conducted using a systematic review to synthesize experimental studies examining the efficacy of mindfulness-based interventions offered to adolescents in a school setting and measuring the6 impact on anxiety and perceived stress. Using narrative analysis, a textual description of effects is provided. Studies were evaluated by the principal investigator and if questions as to inclusion arose, thesis supervisor Dr. Deonandan was available to adjudicate.

Due to heterogeneity of included research, a narrative analysis was used to describe the core narratives within these studies and the subjective experience (Maykel et al., 2016). While meta-analysis is considered the highest level of scientific evidence, it should not be employed by default (Lensen, 2023).

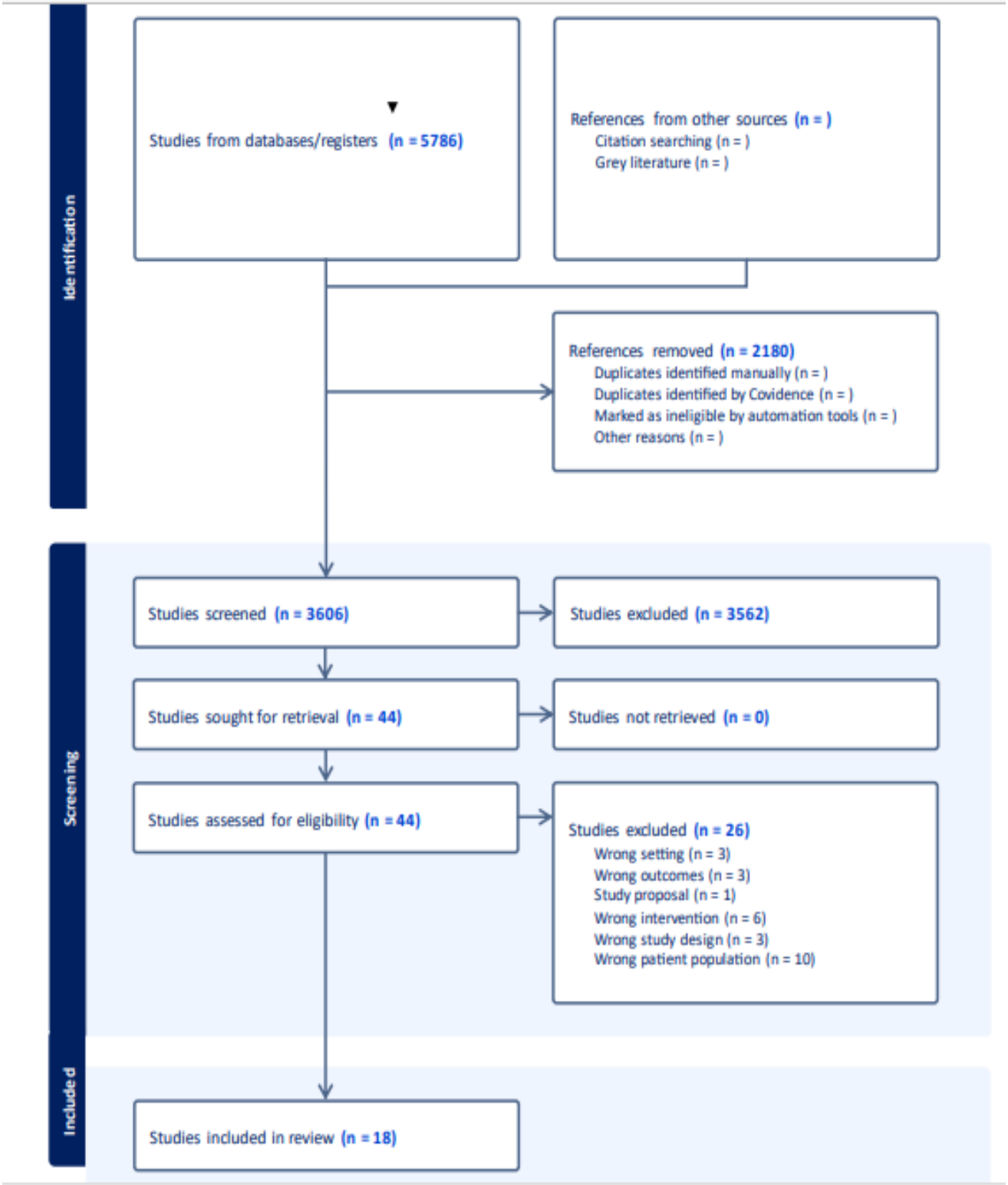
In this instance, tools of measure varied between studies. Instead, a narrative analysis offered an understanding of fidelity to the programs, students' perceptions of these interventions, and the importance of assessing adherence. This offers guidance for future research.

Search Strategy

Electronic databases were searched for all published studies of primary research that examined school-based mindfulness as an intervention for adolescent anxiety. These databases included CINAHL, Medline, Eric, Scopus, and Psychinfo. This reflects the interdisciplinary nature of the research which includes but is not limited to education, psychology, nursing, medicine. Covidence was used to screen studies and identify relevant

articles. From a pool of 5786, a total of 13 studies met inclusion/exclusion criteria. Although initial results included 18 studies, 5 of those studies were misdescribed and did not meet the parameters of this research. A complete description of search terms/Boolean operators follow.

Figure 1: Screening of Studies



Inclusion and Exclusion Criteria

Published peer-reviewed articles using primary research that assessed adolescent secondary school students between the ages of 13 to 19 for sub-clinical anxiety (sometimes described as stress) before and after a mindfulness intervention. Mindfulness-based interventions delivered within the school setting during regular school hours were additional inclusion criteria. Interventions not limited to mindfulness practices, such as mind-body practices including yoga, qigong, cognitive behavioural therapy (CBT), and other forms of meditation (i.e transcendental meditation) were excluded. Concomitant health conditions or previously diagnosed mental health issues were exclusion factors, as were interventions delivered outside the school setting. To ensure data quality dissertations and conference abstracts were also excluded.

No limits were placed on type of school other than the age restrictions of participants (adolescents). Studies might include public or private schools of any country. This was due in part to the limited number of available studies. Studies were published in English and no time constraints were applied. Little research that attempted to answer the questions posed by this review met the standard of a random controlled trial until recently; only 4 studies were published prior to 2019.

Concomitant health conditions or previously diagnosed mental health issues were exclusion factors, as were interventions delivered outside the school setting. Using these criteria, a total of 13 studies were included. Initial results returned 18 studies but 5 studies

were removed from the review when further reading revealed they did not fully meet the criteria as outlined above.

Search Terms and Boolean Operators

Adolescent

youth or teen* or juvenile* or adoles* or young adult* or student*

Anxiety

anxiety or stress or worry or anxious

Mindfulness

meditation* or mindfulness or mindbody or mind body or cognitive therapy

School

school* or learning cent* or classroom*

Quality Assessment

In all included studies, none of the participants or facilitators were blinded. As a non-pharmaceutical intervention, mindfulness interventions make a double-blind study design impractical if not impossible; at a minimum, facilitators are aware of the intervention. To assess the quality of included studies, the Checklist to Evaluate a Report of a Non-pharmacological Trial (CLEAR-NPT) was used (Boutron et al., 2005). CLEAR-NPT provides a useful checklist to evaluate research that uses a non-pharmacological intervention. The criteria are as follows: adequacy of randomization, allocation concealment, the availability of intervention details, the appropriateness of care providers' experiences, the adherence of participants, blinding of participants and care providers, blinding of outcome assessors, comparable study design, and outcome analysis methods. Common risk-of-bias checklists, such as Cochrane Collaboration's assessment tool, do not include further assessment criteria that allows further assessment when blinding is not possible. Assessments are included in the supplementary material.

Other assessment tools, such as Cochrane's Risk of Bias or Cochrane's Robins-1 Tool (2016) proved of limited use for non-pharmaceutical studies as many of the categories are not applicable to studies in which participants and facilitators are aware of the intervention.

Operational Definitions

While research has been conducted on the effects of mindfulness, many earlier studies lacked the rigor of random-control trials. Additionally, though mental health

challenges among youth are acknowledged by both educators and health care providers, operational definitions are sometimes lacking. To assess research and develop protocols to improve health outcomes, construct specificity and operational definitions are needed. Consistency in definition criteria is needed to allow for a testable theoretical prediction and validation of results (Bishop et al., 2004).

Terms such as stress, anxiety, and even depression are sometimes used interchangeably outside the clinical setting when describing the challenges of youth. However, these terms have particular and discrete meanings as noted in the literature review. The aim of this review is to better understand mindfulness interventions to reduce subclinical anxiety in youth; for this reason, care was taken to ensure researchers were assessing the same phenomenon. This means terms like stress and perceived stress are sometimes used in place of anxiety; likewise measures of test anxiety were excluded (as a response in anticipation of an event such as an exam, anxiety or stress might be both beneficial and expected and falls outside the definition of a feeling of apprehension in the absence of an identifiable threat).

COVID-19, Changing Landscapes, and Limitations

The initial approach for this thesis involved a scoping review and a qualitative study which included of a questionnaire for community members with experience in teaching mindfulness. In the earliest conception of this project, 5 studies were available that met the criteria of experimental research using quantified data and minimizing bias. Identifying knowledge gaps through a scoping review was appropriate (Munn et al., 2018). However, that number grew to 13 in the course of the review. Interest in mindfulness as an intervention and its assessment continues to increase, and the potential to conduct a systematic review and synthesise existing research became practical.

In addition to a significant increase in available research being published while undertaking this thesis, the onset of a global pandemic changed its course. While work was undertaken for both the scoping review and qualitative study, it soon became clear that the professional landscape and people's availability- even location- was changing dramatically. With search results available to answer research questions through a synthesis of available evidence, a systematic review was adopted. A sufficient number of quality studies have been conducted that may in turn inform practice or policy, as well as guide future research.

Limitations of a systematic review may include a risk of bias due to the inability to blind participants, the limited number of databases searched, and heterogenous statistical reporting.

Results- Systematic Review

Of the 13 studies included, measurements of anxiety were assessed using the following tools: the Depression, Anxiety, and Stress Scale (DASS21), the General Anxiety Disorder (GAD-7), the Hospital Anxiety and Depression Scale (HADS), the Perceived Stress Questionnaire (PSQ), and the Perceived Stress scale (PSS). The 5 studies using the Perceived Stress Scale were Campbell et al. (2019), Fung et al. (2019), Kang and Kim (2022), Kuyken et al. (2013), and Özcan (2022). Two studies used both the PSQ and HADS (Gouda et al. 2016; Luong et al. 2019). This demonstrates the sometimes-interchangeable use of "stress" for "anxiety," in current research. See Table 1 for full results.

The length of intervention varied from 6 to 12 weeks and the programs varied in times per week and length. Some included home practice in addition to the school practice. Bennett and Dorjee (2016), Gouda et al. (2016), Johnstone et al. (2020), Kang and Kim (2022), and Luong (2019) used the 8-week Mindfulness Based Stress Reduction (MBSR) program developed by Jon Kabat-Zinn (Kabat-Zinn, John, 2004). The Learning to Breathe program (L2B) is modeled on MBSR but is shorter, designed for youth, and developed to fit into the school curriculum. Frank et al. (2021) and Fung et al. (2018) used this program for their respective research studies. Mindfulness Training for Teens used by Johnson and Wade (2019, 2021) is and 8-week program developed for teens and also based on the MBSR program.

The Mindfulness is Schools Program (MiSP) was developed in the UK to fit into the school curriculum and to provide a universal intervention for youth. This was the program used by Kuyken et al. (2013). Similarly, the .b Mindfulness in Schools program was created

to accommodate school schedules and run the length of a single class lesson (35 to 60 minutes). This intervention was investigated by both Campbell et al. (2019) and Johnson et al. (2017). The Mindfulness Based Thriving Program used by Özcan (2022) is a 6-week mindfulness program developed for youth.

Initial results from 8 of the 13 studies demonstrated a reduction in anxiety and/or perceived stress following the mindfulness intervention (Campbell et al., 2019, Fung et al., 2019, Gouda et al., 2016, Johnson and Wade, 2021, Johnstone et al., 2020, Kuyken et al., 2013, Luong et al., 2019, Özcan, 2022). Bennett and Dorgee (2016) and Johnson and Wade (2019), Kang and Kim (2022) found no significant improvement, but there was a further reduction in anxiety at follow-up assessments; statistically significant changes for the latter two. Frank et al. (2021), Johnson et al. (2017) found no statistically significant improvement.

Luong et al. (2019) found an increase in perceived stress from baseline to post-intervention; however, they note the control group had a much larger increase in perceived stress in the same timeframe. Flow of participants through the studies was largely good, including follow-up measures, though Johnson and Wade (2019) experienced a significant drop in participants for post-intervention data collection. This was due to a change in semester timetables.

Table 1: Results

References	Study design and location	Study participants	Sample size (pre/post)	Frequency (of interven-tion)	Control	Duration	Relevant Outcome (measure)	Result
Bennett and Dorgee (2016)	NRS, England	Adolescent (mean age: 17.7 +/- 0.73)	IG: 12/11 CG: 13/13	MBSR 2hrs/week + daily home practice (45 min)	Standard classes	8 weeks	DASS-21	$p = 0.09$ (T2) $p = 0.07$ (T3)
Campbell et al. (2019)	NRS, USA	Adolescent (mean age: 15.96 +/- 1.17)	IG: 584 CG: 423	.b curriculum 1 session per week	Standard classes (English)	6 weeks	PSS	$p < 0.001$
Frank et al. (2021)	RCT, USA	Adolescent (mean age: 16)	IG: 122/120 CG: 112/110	Learning to breathe (L2B) 2 sessions per week	Standard classes (Health)	6 weeks	GAD-7	$p = 0.99$
Fung et al. (2018)	RCT, USA	Adolescent (mean age: 13.99 +/- 0.36)	IG: 79/70 CG: 66/49	Learning to Breath (L2B) 50 minutes per week + home practice	Wait list	12 weeks	PSS	$p < 0.001$
Gouda et al. (2016)	RCT, Germany	Adolescent (mean age: 16.2 +/- 0.51)	IG: 15 CG: 14	MBSR 2hrs/week + one full day of practice + daily home practice	Wait list	8 weeks	PSQ HADS	$p = 0.047$ $p = 0.075$
Johnson et al. (2017)	RCT, Australia	Adolescent (mean age: 13.44 +/- 0.33)	IG1: 191/148 IG2: 186/169 CG: 178/154	.b 40-60 minutes lesson/week + daily home practice	Standard classes	9 weeks	DASS-21	$p = 0.07$ (1) $p = 0.08$ (2)

Johnson and Wade (2019)	NRS, Australia	Adolescent (mean age 13.47 +/- 0.35 and 15.47 +/- 0.40)	IG1: 27/7 IG2: 44/33 CG1: 26/5 CG2: 49/39	Mindfulness Training for Teens 90 minutes/week + home practice	Standard classes	8 weeks	GAD-7	Cohen's *d:* 0.07 (4 month follow-up: 0.52)
Johnson and Wade (2021)	RCT, Australia	Adolescent (mean age 13.7 and 15.5)	IG: 217 CG: 217	Mindfulness Training for Teens 65-75 minutes/week + home practice	Standard classes	8 weeks	GAD-7	Cohen's *d:* 0.95 SD 0.84
Johnstone et al. (2020)	RCT, USA	Adolescent (mean age 15.7)	IG: 68/68 CG: 168/85 AG: 49/49	MBSR and ACT (Acceptance and Commitment Therapy)	Health Class + Active Control (Wellness for Stress Reduction)	8 weeks	DASS-21	$p < 0.01$
Kang and Kim (2022)	NRS, Republic of Korea	Adolescent (Grade 10)	IG: 94/89 CG: 93/87	K-MBSR 45 minutes/week	Standard classes (Health)	10 weeks	PSS	$p = 0.244$ (1) $p = 0.001$ (2)
Kuyken et al. (2013)	NRS, England	Adolescent (mean age 14.9 +/- 1.5)	IG: 248/242 CG: 266	MiSP (Mindfulness in Schools Programme)	Standard classes	9 weeks	PSS	$p = 0.05$ (three month follow-up: 0.03)
Luong et al. (2019)	NRS, Germany	Adolescent (mean age 16 SD 0.69)	IG: 43/35 CG: 38/38	MBSR 120 minutes/week + 6 hour intensive + home practice	Controlled waitlist	8 weeks	PSQ HADS-A	$p = 0.01$ $p = 0.005$
Özcan (2022)	RCT, Turkey	Adolescent (mean age 16.62)	IG: 8 CG: 9	Mindfulness-Based Thriving Program	No interven-tion	6 weeks	PSS	$P < 0.01$ $p < 0.05$ (two month post)

As an internal practice and a non-pharmacological intervention, it can be difficult to assess fidelity and efficacy. Additionally, a subclinical population may yield more modest results and assessments of more subjective criteria are useful in understanding participants' experience. Measures of fidelity, adherence, and acceptability of the intervention provide methods to assess and understand whether the practice is being well received and integrated**.** With the exception of Kang and Kim (2022), all studies provided an assessment of fidelity (a measure of consistency among facilitators), using coders to assess adherence to programs, qualitative interviews following interventions, and/or audio recordings that were assessed by program developers. See Table 2 for further results.

Most studies assessed participants' participation, that is whether students engaged with the intervention. This was done by using attendance as a measure, the willingness of students to recommend the program, and reports of home practice. Acceptability to participants was noted in 9 of the 13 studies, assessed via participant questionnaires, interviews, and measures of practice outside the classroom; Bennett and Dorjee (2016), Fung et al. (2019), Gouda et al. (2016), Johnson et al. (2017), Johnson and Wade (2017, 2021), Johnstone et al. (2020), Kuyken et al. (2016), and Luong et al. (2019). In two of the studies (Campbell et al., 2019; Frank et al., 2021), it was unclear whether any assessment regarding acceptability was conducted. This suggests mindfulness interventions were broadly acceptable to students.

Table 2: Fidelity/Adherence/Follow-up

Study Reference	Fidelity Assessed?	Student Adherence Assessed?	Acceptability to Participants?	Follow-up Measurement?
Bennett and Dorjee (2016)	Yes	Yes (attendance + recommendation)	Yes	Yes (3 months post)
Campbell et al. (2019)	Yes (uncertain)	Not stated	Not stated	No
Frank et al. (2021)	Yes (unsatisfactory)	Yes	Not stated	No
Fung et al. (2019)	Yes	Yes	Yes	Yes (3 months post)
Gouda et al. (2016)	Yes	Yes (attendance + interview)	Yes (interview)	Yes (4 months post)
Johnson et al. (2017)	Yes	Yes (home practice)	Yes (questionnaire)	Yes (6 and 12 months post)
Johnson and Wade (2019)	Yes	Yes	Yes	Yes (4 months post)
Johnson and Wade (2021)	Yes	Yes	Yes (feedback forms)	Yes (3 months post)
Johnstone et al. (2020)	Yes	Yes	Yes	No
Kang and Kim (2022)	Not stated	No	No	Yes (3 months post)
Kuyken et al. (2016)	Yes	Yes (attendance + at home practice)	Yes (feedback evaluation questionnaire)	Yes (4 weeks post)
Luong et al. (2019)	Yes	Yes (attendance)	Yes (interviews)	Yes (3 months post)
Özcan (2022)	Yes	Not stated	No	Yes (2 months post)

Discussion

Results highlight the potential of school-based mindfulness programs to reduce adolescent anxiety and perceived stress, with cumulative benefits emerging over time. Many studies reported increased benefits when students were assessed in months following, varying from 2 to 6-month post-intervention. Also demonstrated was that youth with higher levels of anxiety or stress experienced greater benefit more from a mindfulness instruction in the post-intervention assessment.

Subjective Experience and Adherence

Some studies attempted to measure adherence, acceptability, and/or rates of practice. As an internal state, rates of mindfulness are difficult to measure and this offered additional information, both in terms of intervention acceptability and usage. This included attendance and attrition rates, qualitative assessments, whether students would recommend the program, and mindfulness practice at home (digital devices or self-reported).

As an internal practice, the subjective experience is highly relevant. Qualitative research that examines youth's experience may offer greater insight as to adherence and acceptability. More frequent practice correlates with improved outcomes (Kuyken et al., 2013).

Adherence of participants to program is an important consideration but not always assessed. As an internal practice, researchers note it is difficult to assess students'

participation. External measures such as class attendance, home practice, or self-reported metrics are potential means to code adherence. When analysing outcomes based on adequate and inadequate practice, Frank et al. (2021) found more frequent practice was associated with improved outcomes (Frank et al., 2021).

Objective Measures and Subclinical Populations

It is unsurprising that mindfulness interventions for a subclinical population may yield small to moderate effects. Objective measures such as parent or teacher reporting may offer additional information regarding efficacy (Fung et al., 2019). Relatedly, as a universal intervention for a large population at a critical development stage, mindfulness might have a large impact on reducing future mental health challenges. The benefit of early intervention in a subclinical population may be difficult to detect immediately following an introduction of the practice, but potentially offers broad improvement in public health for future.

Effective Dosage and Universal Populations

Effective dosage remains illusive. Among 122 students, results were influenced by rates of practice (Frank et al., 2021). This suggests a mindfulness program should include structures/supports that encourage regular implementation as results may be dose dependent. While their results showed no statistical difference in perceived stress post-intervention, examination of results adding adequate home practice (at least once a month practice) did show a reduction in school performance stress. Scaffolding to support

adolescents in their practice may improve adherence, in turn increasing potential benefits. This may include reminders to practice during the school day and prompts for home practice.

Offering mindfulness training within a universal population of students rather than groups with a clinical diagnosis may make it more difficult to demonstrate efficacy. However, as a preventative measure it may result in a reduction of mental health challenges in future. Initial results may be difficult to detect in an asymptomatic population but are nevertheless encouraging for the potential to reduce risks of mental health disorders.

Setting

Schools may provide a naturalistic setting for interventions because children and youth spend so much time in these locations (Maykel et al., 2016). Mindfulness may provide adolescents with greater skillfulness to manage anxiety and worry, and act as a preventative healthcare measure. It is possible to offer the intervention broadly to adolescents in this setting which in turn may minimize stigma, and may help address the limited access to therapy for many teens.

There are, however, challenges in conducting research in schools as investigators are limited by the academic schedule. This may make retention and follow-up assessments more difficult as students' timetables change from one semester to the next.

Cumulative Effects

Several studies noted that while there was no statistical change or small to moderate change immediately following the mindfulness intervention, significant decreases to anxiety or perceived stress were found in follow-up tests (Bennett & Dorjee, 2016; Fung et al., 2019; Gouda et al., 2016; Johnson & Wade, 2019; Kang & Kim, 2023; Kuyken et al., 2013; Luong et al., 2019, Ozcan, 2020). Of the seven studies that included that included an assessment in the months following the intervention, only two studies (Johnson et al., 2017; Johnson & Wade, 2021) failed to demonstrate a further decrease in anxiety or perceived stress. This finding suggests researchers should consider including a deferred assessment for mindfulness interventions, as benefits may accumulate over time or offer a delayed effect.

Additionally, Gouda et al. (2016) and Kuyken et al. (2013) noted that follow-up testing occurred during exams which may be a time of high anxiety or perceived stress. This self-report of decreased anxiety during a stressful period suggests the benefits of mindfulness are robust in addition to accumulating over time. The intervention may require a period of internalization for full effects to be seen and may persist in spite of external events that could be expected to increase levels of anxiety.

This delayed effect demonstrated in most studies included in this review represent an important finding. Effects may not be immediately detectable but strengthen and sustain over time (Kang & Kim, 2023). This supports the view of mindfulness as a life

skill that supports the practitioner and, with consistent practice, move from state to trait.

Future Research

While quality research has increased notably in recent years, more is needed to conclusively assess the efficacy of mindfulness as an intervention for adolescent anxiety. Understanding the necessary dosage, length, delivery format or specific form of intervention, and appropriate setting would guide recommendations that promote resiliency and offer preventative practices that promote psychological wellbeing.

An extended follow-up period in future research will help determine the long-term effects of mindfulness interventions and whether there is a sustained reduction in anxiety levels. Ongoing collaboration between researchers, educators, and mental health professionals will help identify effective interventions for youth experiencing anxiety.

A greater clarity regarding anxiety and stress as interrelated concepts is needed. An understanding of the impact of stress on anxiety is necessary for the development of targeted interventions. The neurological underpinnings and the intricate relationship between hormones and adolescent brain development, which includes stress hormones requires further research.

Mindfulness allows a reflective rather than reflexive response by creating space between stimulus and response and as a subjective experience, qualitative and mixed methods to assess student experience may be recommended to better understand adherence and acceptability. Results of this systematic review indicate school-based mindfulness programs are a promising intervention to reduce adolescent anxiety and

perceived stress but more research is required.

Limitations

Limitations of this review may include a risk of bias due to the limited number of databases searched and the relatively limited number of studies available. Publication bias is also a potential limitation, and whether studies which showed no effect have been published. In assessing sub-clinical rates of anxiety among youth rather than those with a diagnosable disorder, a significant change may not be detectable which may also influence results. Differences pre- and post-intervention may be modest. Implementation with a universal population may offer long-term benefits, but demonstrating efficacy poses a challenge in an asymptomatic population. Another challenge was the sometimes interchangeable use of stress and anxiety in some studies, which may influence results.

There were potential limitations within the studies included in this review. In some instances, volunteers or school staff delivered the mindfulness intervention raising concerns about the consistency of the intervention and adherence to established protocols, thereby affecting fidelity. Several studies used a small sample size and results should be considered in this light. Heterogenous statistical reporting is an additional limitation in comparing between-studies results.

Relying on self-reported data may impact results. None of the studies used physiological measures of anxiety or stress; this may be a consideration for future researchers. Assessments by teachers or parents may be another way to assess efficacy, or measures of academic achievement.

Schools themselves may pose challenges relative to scheduling, distractions, and absenteeism. The naturalistic setting proffers advantages but institutional needs create methodological challenges. This creates a limitation both in administering a mindfulness intervention and conducting a random-control trial. In two studies the number of participants was reduced by a change in the school calendar. Long-term follow-up may also present challenges as students move to new institutions.

An added limitation is that is not possible to blind participants to the intervention which makes full experimental design unlikely. These are inevitable challenges to fieldwork but must be considered relative to the validity of data. Sometimes school staff or volunteers were employed to teach the mindfulness intervention, creating potential inconsistency in intervention or protocols, making fidelity of the intervention uncertain. Competency of instructors may have varied.

Homogeneity of population should be noted when considering results, as well that not all measures are specifically designed for adolescents. Because blinding was not possible, social pressures may affect results. Students were aware of the intervention. One research study found that students in the intervention group were sharing mindfulness practices with students in the control group outside classroom time, such as during lunch breaks.

Overall, this systematic review demonstrates encouraging results for school-based mindfulness interventions to reduce adolescent anxiety. The factors noted in the discussion may be taken into consideration for future research, both in pursuit of effective interventions that support adolescent mental health and to provide guidance for evidence-based practices.

Conclusion

In answer to the question posed by this thesis, this review demonstrates evidence for school-based mindfulness programs efficacy in reducing adolescent anxiety. Further research is needed given the limited number of studies using random-controlled trials and at times small sample sizes. Outcomes influencing school-based mindfulness programs include the length of intervention, the acceptability of the program to students, the facilitators and their competency in delivering a mindfulness intervention, and the limitations within the academic schedule for delivering such programs.

Results of this systematic review point to the cumulative effects of mindfulness interventions on adolescents' experience of perceived stress and anxiety, ultimately affecting mental well-being. While the immediate impact may not always be apparent, evidence suggests that the sustained practice of mindfulness can lead to reduced anxiety and perceived stress, potentially contributing to the development of resilience. As an intervention, results suggest mindfulness may be a protective and proactive course of action when it comes to teens and reducing anxiety. This is particularly relevant in considering mindfulness as a life skill, as a potential means to navigate life's challenges with awareness and resiliency. Study results largely demonstrated that the impact of a mindfulness practice increases; the benefits strengthening and sustaining over time. Future research should continue to explore the mechanisms underlying these cumulative effects and consider the long-term implications of mindfulness interventions for adolescent mental health. A question for investigators may be whether regular practice

moves mindfulness from state to trait.

Students with higher baseline rates of anxiety may benefit most from mindfulness programs, but as a universal intervention it may offer cost-effective and long-lasting support for mental health. The majority of studies that included follow-up assessments in addition to pre- and post-testing showed significant reduction in self-reported levels of anxiety or stress suggesting mindfulness may require time for integration and a cumulative benefit. Future studies should include delayed measurement to assess this aspect.

The adolescent years can be understood as particularly vulnerable to the impact of anxiety due to ongoing brain development. The intricate interplay between neurological changes and anxiety during this developmental phase highlight the importance of timely interventions. Anxiety not only affects immediate well-being but may contribute to long-term issues such as difficulty in establishing social connections, focusing on school or work, and even substance abuse or suicidal ideation.

When left unmanaged, anxiety not only inflicts immediate distress but also poses a substantial threat to adolescents' long-term health, academic performance, and social connections. The gender disparities in prevalence, with females being twice as likely to experience mood disorders, further emphasize the need for targeted and gender-sensitive interventions. Moreover, the intersectionality of anxiety with factors such as socioeconomic status and sexual orientation necessitates a nuanced and comprehensive

approach to intervention strategies such as mindfulness.

Cumulative Effects: Mindfulness as a Tool for Resilience

Studies point to the delayed effects of a mindfulness practice. Unlike many pharmaceutical interventions, the benefit of mindfulness accumulates over time. It may be that the practice needs to be incorporated for its effects to be known. Assessing long- term impacts will be crucial to better understanding the full effects of this intervention and researchers should include follow-up assessment rather than limiting studies to a pre- and post-test. Results of studies included in the systematic review highlight the importance of sustained practice and the potential for long-term benefits. Further research is required to understand the nuance of mindfulness interventions, including appropriate age groups, intervention content, dosage, and instructor competence. As the field continues to evolve, ongoing research will provide valuable insights into the potential of mindfulness as a tool for promoting resilience and improving the overall well-being of adolescents to address growing mental health challenges.

The Role of Schools

Schools play a crucial role in the lives of adolescents, offering strategic access to a large and diverse population of young people during a critical period of their development (Dray et al., 2017). Integrating mindfulness practices into the school setting may enhance accessibility, promote a supportive environment, and nurture both mental wellness and academic success. With existing infrastructure and resources, schools provide

an ideal setting for implementing interventions aimed at promoting mental wellness and resiliency. Moreover, by offering these interventions within schools, many common barriers to access are eliminated, potentially leading to higher utilization rates (Barrett & Pahl, 2006). As a potential setting for a universal intervention, stigma is reduced and access increased.

Addressing the Growing Mental Health Challenge Among Youth

Adolescence comes with its own set of stressors, including academic pressure, complex social relationships, hormonal shifts, and increased independence. These additional stressors, combined with ongoing brain development, particularly challenging period for emotional regulation. Recognizing these unique challenges of adolescence underscores the importance of interventions that teach stress and anxiety management skills.

School-based mindfulness programs as a universal intervention a may provide a comprehensive approach to improving adolescent mental health and serve as an effective preventative health measure. With its focus on present-moment awareness and non-judgmental acceptance, mindfulness aligns well with the goals of promoting mental wellness and resilience among youth. Further research will provide valuable insights into the effectiveness of school-based mindfulness programs as a means of reducing anxiety and improving the overall wellbeing of adolescents.

Clear definitions for anxiety and perceived stress under the umbrella of mental

health will enhance understanding of psychological/physiological responses and help target appropriate solutions. It may illustrate that stress and anxiety are normal responses to certain situations which may in turn promote self-compassion. It will assist in public health planning by recognizing the prevalence as well as impact of specific mental health issues. This clarity will provide more directly relevant insights for educators, healthcare providers, parents, and policymakers.

The interdisciplinary lens adopted in this thesis strengthens the argument for comprehensive and holistic intervention strategies. By integrating perspectives from psychology, neuroscience, sociology, and education, we might better understand the complexities of adolescent anxiety that in turn inform practical and effective solutions. Collaboration between disciplines allows for a nuanced examination of the cognitive, social, and institutional dimensions relevant to implementing mindfulness interventions in real-world school settings. The broader goal of addressing adolescent mental health aligns with mindfulness as effective school-based intervention. By exploring these questions, this research provides insights directly relevant to educators, healthcare providers, policymakers, and parents and contributes to the knowledge base to understand adolescent anxiety and to identify potential solutions as well as the influencing factors on outcomes.

The implications of this research extend beyond individual well-being, addressing the societal and public health burdens associated with untreated adolescent anxiety.

Through a careful examination and implementation of mindfulness-based interventions, we might equip youth with the necessary tools to navigate the challenges of adolescence and develop resiliency for life. Mindfulness practices do not require clinical intervention, tools, or technology, making it broadly accessible in both technique and cost. Mindfulness meditation, the practice of bringing one's attention to the present moment without judgement (Lin et al., 2019), may be taught to lay persons, such as teachers or other school staff. They in turn may guide students in the practice making it broadly available.

Anxiety remains a critical issue among adolescents with increasing prevalence and potential detrimental effects on both physical and mental health. This underscores the urgency of addressing anxiety disorders among adolescents, emphasizing the need for effective interventions. By incorporating mindfulness-based programs, educators and clinicians may cultivate a more robust and resilient generation of adolescents, arming them with essential skills to adeptly confront the complexities of their developmental journey. Application of evidence-based interventions presents a significant potential to prevent the progression of commonplace distress into enduring mental health disorders. This offers implications not only for individual welfare but also for mitigating the societal and public health consequences linked to unaddressed anxiety in adolescents.

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Checklist to Evaluate a Non-pharmacological Trial (CLEAR-NOT)

Bennett & Dorjee (2016)	Possible answers
1. Was the generation of allocation sequences adequate?	Yes; **No**; Unclear
2. Was the treatment allocation concealed?	Yes; **No**; Unclear
3. Were details of the intervention administered to each group made available?[a]	**Yes**; No; Unclear
4. Were care providers' experience or skill[b] in each arm appropriate?[c]	**Yes**; No; Unclear
5. Was participant (i.e., patients) adherence assessed quantitatively?[d]	**Yes**; No; Unclear
6. Were participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
6.1. If participants were not adequately blinded	
6.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
6.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
7. Were care providers or persons caring for the participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
7.1. If care providers were not adequately blinded	
7.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
7.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
8. Were outcome assessors adequately blinded to assess the primary outcomes?	**Yes**; No, because blinding is not feasible; No, although blinding is feasible; Unclear
8.1. If outcome assessors were not adequately blinded, were specific methods used to avoid ascertainment bias (systematic differences in outcome assessment)?[e]	Yes; No; Unclear
9. Was the follow-up schedule the same in each group?[f]	**Yes**; No; Unclear
10. Were the main outcomes analyzed according to the intention-to-treat principle?	**Yes;** No; Unclear

Campbell et al. (2019)	Possible answers
1. Was the generation of allocation sequences adequate?	Yes; No; **Unclear**
2. Was the treatment allocation concealed?	Yes; **No**; Unclear
3. Were details of the intervention administered to each group made available?[a]	**Yes**; No; Unclear
4. Were care providers' experience or skill[b] in each arm appropriate?[c]	**Yes**; No; Unclear
5. Was participant (i.e., patients) adherence assessed quantitatively?[d]	**Yes**; No; Unclear
6. Were participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
6.1. If participants were not adequately blinded	
6.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	Yes; No; **Unclear**
6.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
7. Were care providers or persons caring for the participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
7.1. If care providers were not adequately blinded	
7.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	Yes; No; **Unclear**
7.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
8. Were outcome assessors adequately blinded to assess the primary outcomes?	**Yes**; No, because blinding is not feasible; No, although blinding is feasible; Unclear
8.1. If outcome assessors were not adequately blinded, were specific methods used to avoid ascertainment bias (systematic differences in outcome assessment)?[e]	Yes; No; Unclear
9. Was the follow-up schedule the same in each group?[f]	**Yes**; No; Unclear
10. Were the main outcomes analyzed according to the intention-to-treat principle?	**Yes**; No; Unclear

Frank et al. (2021)	Possible answers
1. Was the generation of allocation sequences adequate?	**Yes**; No; Unclear
2. Was the treatment allocation concealed?	Yes; **No**; Unclear
3. Were details of the intervention administered to each group made available?[a]	**Yes**; No; Unclear
4. Were care providers' experience or skill[b] in each arm appropriate?[c]	**Yes**; No; Unclear
5. Was participant (i.e., patients) adherence assessed quantitatively?[d]	**Yes**; No; Unclear
6. Were participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
6.1. If participants were not adequately blinded	
6.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
6.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
7. Were care providers or persons caring for the participants adequately blinded?	Yes; **No, because blinding is not feasible;** No, although blinding is feasible; Unclear
7.1. If care providers were not adequately blinded	
7.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
7.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
8. Were outcome assessors adequately blinded to assess the primary outcomes?	**Yes**; No, because blinding is not feasible; No, although blinding is feasible; Unclear
8.1. If outcome assessors were not adequately blinded, were specific methods used to avoid ascertainment bias (systematic differences in outcome assessment)?[e]	Yes; No; Unclear
9. Was the follow-up schedule the same in each group?[f]	**Yes**; No; Unclear
10. Were the main outcomes analyzed according to the intention-to-treat principle?	**Yes**; No; Unclear

Fung et al. (2019)	Possible answers
1. Was the generation of allocation sequences adequate?	**Yes**; No; Unclear
2. Was the treatment allocation concealed?	Yes; **No**; Unclear
3. Were details of the intervention administered to each group made available?[a]	**Yes**; No; Unclear
4. Were care providers' experience or skill[b] in each arm appropriate?[c]	**Yes**; No; Unclear
5. Was participant (i.e., patients) adherence assessed quantitatively?[d]	**Yes;** No; Unclear
6. Were participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
6.1. If participants were not adequately blinded	
6.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
6.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
7. Were care providers or persons caring for the participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
7.1. If care providers were not adequately blinded	
7.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
7.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
8. Were outcome assessors adequately blinded to assess the primary outcomes?	**Yes**; No, because blinding is not feasible; No, although blinding is feasible; Unclear
8.1. If outcome assessors were not adequately blinded, were specific methods used to avoid ascertainment bias (systematic differences in outcome assessment)?[e]	Yes; No; Unclear
9. Was the follow-up schedule the same in each group?[f]	**Yes**; No; Unclear
10. Were the main outcomes analyzed according to the intention-to-treat principle?	**Yes**; No; Unclear

Gouda et al. (2016)	Possible answers
1. Was the generation of allocation sequences adequate?	**Yes**; No; Unclear
2. Was the treatment allocation concealed?	Yes; **No**; Unclear
3. Were details of the intervention administered to each group made available?[a]	**Yes**; No; Unclear
4. Were care providers' experience or skill[b] in each arm appropriate?[c]	**Yes**; No; Unclear
5. Was participant (i.e., patients) adherence assessed quantitatively?[d]	**Yes**; No; Unclear
6. Were participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
6.1. If participants were not adequately blinded	
6.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
6.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
7. Were care providers or persons caring for the participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
7.1. If care providers were not adequately blinded	
7.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
7.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes;** No; Unclear
8. Were outcome assessors adequately blinded to assess the primary outcomes?	**Yes**; No, because blinding is not feasible; No, although blinding is feasible; Unclear
8.1. If outcome assessors were not adequately blinded, were specific methods used to avoid ascertainment bias (systematic differences in outcome assessment)?[e]	Yes; No; Unclear
9. Was the follow-up schedule the same in each group?[f]	**Yes**; No; Unclear
10. Were the main outcomes analyzed according to the intention-to-treat principle?	**Yes;** No; Unclear

Johnson et al. (2017)	**Possible answers**
1. Was the generation of allocation sequences adequate?	**Yes**; No; Unclear
2. Was the treatment allocation concealed?	Yes; **No**; Unclear
3. Were details of the intervention administered to each group made available?[a]	**Yes**; No; Unclear
4. Were care providers' experience or skill[b] in each arm appropriate?[c]	**Yes**; No; Unclear
5. Was participant (i.e., patients) adherence assessed quantitatively?[d]	**Yes**; No; Unclear
6. Were participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
6.1. If participants were not adequately blinded	
6.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
6.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
7. Were care providers or persons caring for the participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
7.1. If care providers were not adequately blinded	
7.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
7.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
8. Were outcome assessors adequately blinded to assess the primary outcomes?	**Yes**; No, because blinding is not feasible**;** No, although blinding is feasible; Unclear
8.1. If outcome assessors were not adequately blinded, were specific methods used to avoid ascertainment bias (systematic differences in outcome assessment)?[e]	Yes; No; Unclear
9. Was the follow-up schedule the same in each group?[f]	**Yes**; No; Unclear
10. Were the main outcomes analyzed according to the intention-to-treat principle?	**Yes**; No; Unclear

Johnson & Wade (2019)	Possible answers
1. Was the generation of allocation sequences adequate?	**Yes**; No; Unclear
2. Was the treatment allocation concealed?	Yes; **No**; Unclear
3. Were details of the intervention administered to each group made available?[a]	**Yes**; No; Unclear
4. Were care providers' experience or skill[b] in each arm appropriate?[c]	**Yes**; No; Unclear
5. Was participant (i.e., patients) adherence assessed quantitatively?[d]	**Yes**; No; Unclear
6. Were participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
6.1. If participants were not adequately blinded	
6.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
6.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
7. Were care providers or persons caring for the participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
7.1. If care providers were not adequately blinded	
7.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
7.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	Yes; **No**; Unclear
8. Were outcome assessors adequately blinded to assess the primary outcomes?	**Yes**; No, because blinding is not feasible; No, although blinding is feasible; Unclear
8.1. If outcome assessors were not adequately blinded, were specific methods used to avoid ascertainment bias (systematic differences in outcome assessment)?[e]	Yes; No; Unclear
9. Was the follow-up schedule the same in each group?[f]	**Yes**; No; Unclear
10. Were the main outcomes analyzed according to the intention-to-treat principle?	**Yes**; No; Unclear

Johnson & Wade (2021)	Possible answers
1. Was the generation of allocation sequences adequate?	**Yes**; No; Unclear
2. Was the treatment allocation concealed?	Yes; **No**; Unclear
3. Were details of the intervention administered to each group made available?[a]	**Yes;** No; Unclear
4. Were care providers' experience or skill[b] in each arm appropriate?[c]	**Yes**; No; Unclear
5. Was participant (i.e., patients) adherence assessed quantitatively?[d]	**Yes**; No; Unclear
6. Were participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
6.1. If participants were not adequately blinded	
6.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
6.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
7. Were care providers or persons caring for the participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
7.1. If care providers were not adequately blinded	
7.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
7.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
8. Were outcome assessors adequately blinded to assess the primary outcomes?	**Yes**; No, because blinding is not feasible; No, although blinding is feasible; Unclear
8.1. If outcome assessors were not adequately blinded, were specific methods used to avoid ascertainment bias (systematic differences in outcome assessment)?[e]	Yes; No; Unclear
9. Was the follow-up schedule the same in each group?[f]	**Yes**; No; Unclear
10. Were the main outcomes analyzed according to the intention-to-treat principle?	**Yes**; No; Unclear

Johnstone et al. (2020)	Possible answers
1. Was the generation of allocation sequences adequate?	**Yes**; No; Unclear
2. Was the treatment allocation concealed?	Yes; **No**; Unclear
3. Were details of the intervention administered to each group made available?[a]	**Yes**; No; Unclear
4. Were care providers' experience or skill[b] in each arm appropriate?[c]	**Yes**; No; Unclear
5. Was participant (i.e., patients) adherence assessed quantitatively?[d]	**Yes**; No; Unclear
6. Were participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
6.1. If participants were not adequately blinded	
6.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
6.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
7. Were care providers or persons caring for the participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
7.1. If care providers were not adequately blinded	
7.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
7.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
8. Were outcome assessors adequately blinded to assess the primary outcomes?	**Yes**; No, because blinding is not feasible; No, although blinding is feasible; Unclear
8.1. If outcome assessors were not adequately blinded, were specific methods used to avoid ascertainment bias (systematic differences in outcome assessment)?[e]	Yes; No; Unclear
9. Was the follow-up schedule the same in each group?[f]	**Yes;** No; Unclear
10. Were the main outcomes analyzed according to the intention-to-treat principle?	**Yes**; No; Unclear

Kang & Kim (2022)	Possible answers
1. Was the generation of allocation sequences adequate?	Yes; No; **Unclear**
2. Was the treatment allocation concealed?	Yes; **No**; Unclear
3. Were details of the intervention administered to each group made available?[a]	**Yes**; No; Unclear
4. Were care providers' experience or skill[b] in each arm appropriate?[c]	**Yes**; No; Unclear
5. Was participant (i.e., patients) adherence assessed quantitatively?[d]	**Yes**; No; Unclear
6. Were participants adequately blinded?	Yes; **No, because blinding is not feasible;** No, although blinding is feasible; Unclear
6.1. If participants were not adequately blinded	
6.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
6.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
7. Were care providers or persons caring for the participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
7.1. If care providers were not adequately blinded	
7.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
7.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
8. Were outcome assessors adequately blinded to assess the primary outcomes?	**Yes;** No, because blinding is not feasible; No, although blinding is feasible; Unclear
8.1. If outcome assessors were not adequately blinded, were specific methods used to avoid ascertainment bias (systematic differences in outcome assessment)?[e]	Yes; No; Unclear
9. Was the follow-up schedule the same in each group?[f]	**Yes**; No; Unclear
10. Were the main outcomes analyzed according to the intention-to-treat principle?	**Yes;** No; Unclear

Kuyken et al. (2013)	Possible answers
1. Was the generation of allocation sequences adequate?	**Yes**; No; Unclear
2. Was the treatment allocation concealed?	Yes; **No**; Unclear
3. Were details of the intervention administered to each group made available?[a]	**Yes**; No; Unclear
4. Were care providers' experience or skill[b] in each arm appropriate?[c]	**Yes**; No; Unclear
5. Was participant (i.e., patients) adherence assessed quantitatively?[d]	**Yes**; No; Unclear
6. Were participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
6.1. If participants were not adequately blinded	
6.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
6.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
7. Were care providers or persons caring for the participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
7.1. If care providers were not adequately blinded	
7.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
7.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
8. Were outcome assessors adequately blinded to assess the primary outcomes?	**Yes**; No, because blinding is not feasible; No, although blinding is feasible; Unclear
8.1. If outcome assessors were not adequately blinded, were specific methods used to avoid ascertainment bias (systematic differences in outcome assessment)?[e]	Yes; No; Unclear
9. Was the follow-up schedule the same in each group?[f]	**Yes;** No; Unclear
10. Were the main outcomes analyzed according to the intention-to-treat principle?	**Yes**; No; Unclear

Luong et al. (2019)	Possible answers
1. Was the generation of allocation sequences adequate?	**Yes**; No; Unclear
2. Was the treatment allocation concealed?	Yes; **No**; Unclear
3. Were details of the intervention administered to each group made available?[a]	**Yes**; No; Unclear
4. Were care providers' experience or skill[b] in each arm appropriate?[c]	**Yes**; No; Unclear
5. Was participant (i.e., patients) adherence assessed quantitatively?[d]	**Yes**; No; Unclear
6. Were participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
6.1. If participants were not adequately blinded	
6.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
6.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	Yes; **No**; Unclear
7. Were care providers or persons caring for the participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
7.1. If care providers were not adequately blinded	
7.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
7.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	Yes; **No**; Unclear
8. Were outcome assessors adequately blinded to assess the primary outcomes?	**Yes**; No, because blinding is not feasible; No, although blinding is feasible; Unclear
8.1. If outcome assessors were not adequately blinded, were specific methods used to avoid ascertainment bias (systematic differences in outcome assessment)?[e]	Yes; No; Unclear
9. Was the follow-up schedule the same in each group?[f]	**Yes**; No; Unclear
10. Were the main outcomes analyzed according to the intention-to-treat principle?	Yes; **No**; Unclear

Özcan (2019)	Possible answers
1. Was the generation of allocation sequences adequate?	**Yes**; No; Unclear
2. Was the treatment allocation concealed?	Yes; **No**; Unclear
3. Were details of the intervention administered to each group made available?[a]	**Yes**; No; Unclear
4. Were care providers' experience or skill[b] in each arm appropriate?[c]	**Yes**; No; Unclear
5. Was participant (i.e., patients) adherence assessed quantitatively?[d]	**Yes**; No; Unclear
6. Were participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
6.1. If participants were not adequately blinded	
6.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
6.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	Yes; **No**; Unclear
7. Were care providers or persons caring for the participants adequately blinded?	Yes; **No, because blinding is not feasible**; No, although blinding is feasible; Unclear
7.1. If care providers were not adequately blinded	
7.1.1. Were all other treatments and care (i.e., cointerventions) the same in each randomized group?	**Yes**; No; Unclear
7.1.2. Were withdrawals and lost to follow-up the same in each randomized group?	**Yes**; No; Unclear
8. Were outcome assessors adequately blinded to assess the primary outcomes?	Yes; No, because blinding is not feasible; No, although blinding is feasible; **Unclear**
8.1. If outcome assessors were not adequately blinded, were specific methods used to avoid ascertainment bias (systematic differences in outcome assessment)?[e]	Yes; No; Unclear
9. Was the follow-up schedule the same in each group?[f]	**Yes**; No; Unclear
10. Were the main outcomes analyzed according to the intention-to-treat principle?	**Yes**; No; Unclear