# Mindfulness for students: Effectiveness, accessibility, and mechanisms of change

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**Abstract**

Given educational institutions' key role in supporting students' mental health and coping capacity and the high stress reported by adolescents and young adults, mindfulness instruction is increasingly being implemented in schools. Mindfulness involves purposefully focusing awareness on the present moment with non-judgmental observation of the experience. It can be experienced as a state (i.e., present moment experience) or a disposition (i.e., general tendency to be mindful), and research suggests mindfulness practice can increase dispositional mindfulness. Furthermore, dispositional mindfulness is conceptualized to comprise five facets (acting with awareness, non-judgment of inner thoughts and feelings, non-reactivity to inner experience, describing experiences, and observing) that differentially predict outcomes in adults, with potentially similar evidence with youth. However, although reviews suggest mindfulness practice with youth shows promise, there is a paucity of research investigating the factors and mechanisms underlying potential benefits of mindfulness practice and dispositional mindfulness for students. It is becoming increasingly evident that the enthusiasm for mindfulness programs in schools has outpaced the evidence base and further research is needed to understand how mindfulness functions and its effectiveness for students. Thus, this dissertation comprises three manuscripts that contribute to the literature on mindfulness use with students at different educational levels by deepening our understanding of *what works* to effectively teach mindfulness to students, *who* it can be effective for, and *how* it functions to impact students. The first two studies investigated *what works* and *for whom*. Specifically, Study 1 consisted of a meta-analysis of 46 studies using a randomized controlled design to implement a mindfulness program for students. Findings revealed mindfulness programs were effective at increasing students' dispositional mindfulness and school adjustment outcomes, particularly for

adolescents, when delivered by outside facilitators with previous mindfulness experience, and when using an adaptation of an existing program. Building on Study 1, Study 2 used a randomised controlled experimental design with adolescents ($N$ = 122; 73% female participants; $M$age =15.36, $SD$ = 0.94) to parse out the distinct acceptability and effectiveness of two types of mindfulness strategies typically taught simultaneously in mindfulness programs: formal mindfulness (e.g., structured practice over an allotted period of time) and informal mindfulness (unstructured and brief practice integrated within daily activities). Results indicated adolescents who practiced informal strategies over 4 weeks were more likely to report intending to continue practicing than those who used formal mindfulness. They also reported increased dispositional mindfulness, which in turn explained concurrent benefits for stress, anxiety, depression, negative affect, school stress, and classroom attentional control. Finally, Study 3 investigated *for whom* and *how* mindfulness works. Findings from 651 adolescents (61.4% female participants*; M*age = 15.23; $SD$ = 0.47) demonstrated the merits of facets of dispositional mindfulness such that acting with awareness, describe, and non-reactivity predicted lower stress through adolescents' capacity to focus and shift attention. Some of these relationships were moderated by gender, with boys' ability to describe predicting better attention focusing while acting with awareness predicted increased attention shifting. Overall, findings from this dissertation suggest mindfulness instruction *can* be effective for students if it is accessible, implemented with a nuanced understanding of contextual factors, and increases different components of students' dispositional mindfulness. Each study in this dissertation offers a unique contribution to both our theoretical and applied understanding of the role of mindfulness instruction in educational settings.

**Résumé**

Compte tenu du rôle clé des établissements scolaire dans le soutien de la santé mentale et du niveau de stress élevé signalé par les adolescents et jeunes adultes, l'enseignement de la pleine conscience est de plus en plus utilisé dans les écoles. La pleine conscience consiste à délibérément porter attention au moment présent avec une observation sans jugement. Ceci est soit sous forme d'état (i.e., expérience du moment présent) ou de disposition (i.e., une tendance générale à ressentir la pleine conscience), et la recherche suggère que la pratique de la pleine conscience peut augmenter la pleine conscience dispositionnelle. Cette dernière est conceptualisée comme comprenant cinq facettes (agir avec conscience, non-jugements, non-réactivité, description des expériences, et observation) qui prédisent différemment les résultats chez les adultes et potentiellement chez les jeunes. Cependant, il est de plus en plus évident que l'enthousiasme pour les programmes de pleine conscience dans les écoles a dépassé la recherche et que plus d'études sont nécessaire pour comprendre le fonctionnement et l'efficacité de la pleine conscience pour les élèves. Ainsi, cette thèse comprend 3 études qui contribuent à la littérature sur l'utilisation de la pleine conscience avec des étudiants à différents niveaux en approfondissant notre compréhension de (a) *ce qui fonctionne* pour enseigner efficacement la pleine conscience, (b) *pour qui* l'enseignement peut être efficace et (c) *comment l'enseignement fonctionne* pour avoir un impact. Les deux premières études ont examiné ce qui fonctionne et pour qui. L'étude 1 est une méta-analyse de 46 études contrôlées randomisées instaurant des programmes de pleine conscience pour étudiants. Les résultats révèlent que ces programmes augmentent la pleine conscience dispositionnelle ainsi que l'adaptation scolaire, en particulier pour les adolescents, lorsqu'ils sont dispensés par des animateurs externes ayant une expérience antérieure de la pleine conscience et lorsqu'une adaptation d'un programme existant est utilisée.

L'étude 2 a utilisé un plan expérimental randomisée contrôlée avec des adolescents (*N* = 122; 73 % de filles; *Mâge* = 15,36, *É-T* = 0,94) pour analyser l'acceptabilité et l'efficacité de deux types de stratégies de pleine conscience généralement enseignés simultanément: pleine conscience formelle (e.g., pratique structurée sur une période de temps impartie) et pleine conscience informelle (e.g., pratique non structurée et brève intégrée aux activités quotidiennes). Les résultats ont indiqué que les adolescents dans le groupe informel étaient plus susceptibles de déclarer avoir l'intention de continuer à pratiquer que ceux qui étaient dans le groupe formel. Ils ont aussi signalé une augmentation de leur pleine conscience dispositionnelle, ce qui expliquait à son tour les avantages concomitants pour le stress, l'anxiété, la dépression, l'affect négatif, le stress scolaire, et le contrôle attentionnel en classe. Enfin, l'étude 3 a étudié pour qui et comment fonctionne la pleine conscience. Les résultats de 651 adolescents (61,4 % de filles ; *Mâge* = 15,23 ; *É-T*= 0,47) ont démontré les mérites des facettes de la pleine conscience dispositionnelle. Spécifiquement, le fait d'agir avec conscience, de décrire les expériences, et la non-réactivité prédisaient une réduction du stress grâce à la capacité des adolescents à se concentrer et déplacer l'attention, et certaines de ces relations étaient modérées par le sexe. Dans l'ensemble, les résultats de cette thèse suggèrent que l'enseignement de la pleine conscience peut être efficace pour les étudiants s'il est accessible, mis en œuvre avec une compréhension nuancée des facteurs contextuels et augmente les différentes facettes de la pleine conscience dispositionnelle des étudiants. Chaque étude de cette thèse offre une contribution unique à notre compréhension théorique et appliquée du rôle de l'enseignement de la pleine conscience dans les contextes éducatifs.

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Attending McGill University has been a childhood dream of mine and, as I embark on this new chapter of my life, I think I will always look back on these years at McGill as some of the most defining years of my life, where I learned to be an adult, develop professional skills, live through breakups and relationships, and successfully navigate the ups and downs and secret passageways of undergraduate and graduate school.

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In closing, pursuing a PhD has been a huge accomplishment for me and, as I reflect on this journey and all of you who have helped me along this path, I am humbled and moved by all of your support. Thank you all so much!

## Contribution to Original Knowledge

This dissertation provides a significant, distinct, and timely contribution to our current understanding of how mindfulness instruction can successfully be implemented in schools to promote student coping and overall functioning. Namely, Study 1 is the first meta-analysis to investigate the potential impact of mindfulness-based programs using a rigorous randomized controlled study design on students' school adjustment and dispositional mindfulness outcomes while considering individual differences (e.g., educational level) as well as study and program characteristics. Additionally, Study 2 is the first attempt to parse out the distinct benefits of formal (e.g., structured meditation for an allotted time period) versus informal (e.g., brief, unstructured activities usually integrated withing daily life) mindfulness practice over a 4-week period in adolescents, using a randomized controlled study design. Finally, Study 3 provides a unique theoretical contribution in investigating how adolescents' stress is impacted through a complex interplay between dispositional mindfulness facets, aspects of attentional control, and adolescents' gender. Overall, this dissertation research demonstrates that mindfulness instruction in schools *can* be effective if it impacts students' dispositional mindfulness and if it is offered in ways that are accessible and engaging to students, while taking into account individual differences (e.g., gender) and instruction characteristics (e.g., type of strategies taught). This dissertation offers recommendations for future research and the implementation of mindfulness practice in educational settings.

## Contribution of Authors

While the three manuscripts in this dissertation are written in collaboration with co-authors, I am the first author on each manuscript. As first author, I conceptualised each study (study design and methodology, research questions, data anlytic plan), led the data collection as project coordinator, led on data analyses, and wrote each manuscript as well as this dissertation.

My PhD supervisor, Dr. Nancy Heath, is a co-author on each manuscript given her collaboration and mentorship during the entirety of the research process including conceptualisation, data collection, data analyses, interpretation of findings, as well as providing extensive feedback on the manuscripts. Dr. Bassam Khoury is also a co-author on Study 1 given his contributions to the conceptualisation of the study, data extraction process, interpretation of findings, and feedback on the written manuscript. Dr. Elana Bloom served as a co-author on Studies 2 and 3 due to her involvement in the data collection process and her editorial feedback on the manuscript drafts during the publication proves. Finally, fellow DAIR team members Ms. Isabel Sadowski (Study 1), Ms. Stephanie Zito (Studies 1 and 2), and Ms. Laurianne Bastien (Study 2) served as co-authors assisting with literature reviews, data collection, data visualisation, and editing.

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## Introduction

Adolescents and young adults are reporting high levels of stress and mental health difficulties (e.g., American Psychological Association, 2018; Findlay & Arim, 2020; Guariguet, 2021), which in turn can lead to negative consequences such as academic difficulties, school dissatisfaction and risk for dropout, unhealthy coping, and poorer overall adjustment (e.g., Agnafors et al., 2021; American College Health Association, 2016; Dupéré et al., 2015; Goodman et al., 2017; O'Connell et al., 2009; Patton et al., 2016; Ramler et al., 2016; Ribeiro et al., 2018; World Health Organisation (WHO) & United Nations Children's Fund (UNICEF), 2021). Given the limited resources in educational settings (e.g., Froese-Germain & Riel, 2012), developing effective and accessible ways to support students in developing their coping capacity is critical (e.g., Patton et al., 2016; WHO & UNICEF, 2021).

One of the ways educational institutions have been attempting to help students cope with experienced stress is by integrating mindfulness training programs into the curriculum or through outreach services (e.g., Roeser et al., 2022; Schonert-Reichl & Roeser, 2016; Weare & Bethune, 2022). Mindfulness involves purposefully focusing awareness on the present moment, with non-judgmental and non-reactive acceptance of thoughts and feelings (Kabat-Zinn, 2003). It can either be experienced as a state (i.e., present moment) or a dispositional trait (i.e., an individual's general tendency to be mindful over time). Additionally, it has been shown that mindfulness practice, which largely seeks to elicit more frequent state mindfulness, can, in turn, significantly increase dispositional mindfulness over time and thus result in associated benefits (e.g., Gu et al., 2015; Khoury et al., 2013; Khoury et al., 2015; Verhaeghen, 2021; Visted et al., 2015). There is also growing research supporting the importance of using a more nuanced assessment of the components which make up dispositional mindfulness to better understand its relationship with

mental health and well-being outcomes as a multi-faceted construct (e.g., Baer, 2019; Baer et al. 2006).

However, while there has been substantial research on the effectiveness of mindfulness training in promoting greater well-being in adults (e.g., Khoury et al., 2013), there is less research focusing on understanding the mechanisms underlying the benefits of mindfulness training and a general lack of research with adolescents specifically (e.g., Bluth et al., 2017; Davidson & Kaszniak, 2015; Roeser & Pinela, 2014). This is unfortunate given that adolescence has been suggested as a window of opportunity in which mindfulness practice may be particularly beneficial due to the rapid neuroplasticity adolescents are experiencing in terms of cognitive, emotional, and self-regulatory developmental changes (e.g., Lyons & DeLange, 2016; Patton et al., 2016; Potts et al., 2021; Tottenham & Galvan, 2017).

Despite this lack of rigorous mindfulness research in adolescence, mindfulness programs based on adult models are being delivered to adolescents and have been deemed "probably efficacious" in reducing stress and increasing well-being (e.g., Black, 2015); however, (1) these programs tend to be lengthy and require many resources to implement in classrooms and (2) research using rigorous experimental designs is lacking. Additionally, there has been a tendency to focus on teaching mindfulness using universal approaches to target broad community samples of students (e.g., Stuart et al., 2017). However, recent evidence is emerging to suggest that mindfulness instruction may not be effective using universal approaches (e.g., Montero-Marin, 2022). Rather, to develop efficient programs requiring minimal educational resources, elucidating which aspects of mindfulness have the greatest impact on adolescents is important (e.g., Greenberg & Harris, 2012). Thus, we need to refine our understanding of the contextual factors influencing how mindfulness instruction works, the means through which it can be

effective, and how it can be made accessible to ensure students engage with and use the practices taught. Additionally, more research is needed to better understand how students' individual differences, such as potential gender differences, may affect the impact of mindfulness practice or of dispositional mindfulness.

Thus, the overall goal of this dissertation research is to investigate the complex factors that contribute to the potential effectiveness and accessibility of mindfulness instruction for students. In accordance with McGill University's guidelines for doctoral dissertations, this manuscript-style dissertation consists of an introduction, a literature review (Chapter 1), three separate manuscripts which all contribute to the overall objective (Chapters 2-4), and an overall discussion of key takeaways, implications, limitations, and future directions (Chapter 5). While every effort has been made to ensure there is no duplication, there is some unavoidable repetition and overlap in the content of the literature reviews across Chapters 1-4 due to (a) this dissertation format and (b) the common overall focus on the use of mindfulness for students.

Chapter 1 presents a summative review of the literature on what works and what does not work regarding the use of mindfulness instruction with students as well as a discussion of the theoretical frameworks which inform this dissertation research. The next three chapters each present one of the three manuscripts included in this dissertation research. Additional information pertaining to study design (e.g., consent forms, measures used in each study) is included in the appendices at the end of this dissertation (see List of Appendices).

In Study 1 (Chapter 2), a systematic review and meta-analysis was conducted on rigorously designed studies implementing a mindfulness-based program for students to evaluate the effectiveness of mindfulness instruction on students' dispositional mindfulness and school adjustment outcomes. Furthermore, Study 1 sought to examine the impact of potential contextual

(e.g., type of facilitator, type of program) and individual (e.g., students' educational level) factors on the effectiveness of mindfulness instruction for students.

Using a randomized experimental design, Study 2 (Chapter 3) compared two different types of mindfulness practices (i.e., formal vs. informal) to parse out their distinct effectiveness and acceptability when taught to adolescents, given that adolescence may be a specific window of opportunity for mindfulness instruction to students. Additionally, Study 2 sought to further investigate the role of dispositional mindfulness as a potential key mechanism of action for mindfulness practice's effectiveness for adolescents.

Furthermore, Study 3 (Chapter 4) sought to extend findings from the previous two studies by further investigating the complex relationship between two key mechanisms of action in mindfulness research: namely, changes in dispositional mindfulness and attentional control. Additionally, Study 3 examined the potential influence of individual differences (e.g., gender differences) on the relationship between these mechanisms of action.

Finally, Chapter 5 presents a discussion of the overall findings from this dissertation research, along with key takeaways and implications for future research and school-based mindfulness instruction implementation. A Social Sciences and Humanities Research Council (SSHRC) Insight Development grant awarded to Drs. Heath and Bloom partially funded this dissertation research. Additionally, the author's research was fully supported by a SSHRC CGS Bombardier doctoral scholarship and a McGill University Tomlinson fellowship, as well as partially supported by a Fonds de recherche du Québec – Société et Culture doctoral fellowship. All research is consistent with Canada's Tri-Council ethical guidelines and approved by McGill University's Research Ethics Board (see Appendix A) as well as school boards as appropriate.

# Chapter 1: Review of the Literature

The main objective of this dissertation research was to better understand the factors underlying the potential benefits of mindfulness' use with students. The following review of the literature will first provide a brief overview of the current context and the need for mental health support in educational settings, followed by a discussion of the theoretical frameworks informing the dissertation studies, and a discussion of the potential role of mindfulness instruction and dispositional mindfulness in schools. Conceptualisations of mindfulness and the benefits of mindfulness instruction in schools will then be reviewed. Finally, discussion will center on what we know so far about the use of mindfulness for students, what works and does not work, and where the gaps in our knowledge lie. Specifically, the discussion will highlight the importance of tailoring mindfulness so that it is both effective and accessible and gaining a more complex understanding of the mechanisms by which mindfulness can impact students will be highlighted. This chapter will conclude with the specific objectives of the three dissertation studies.

## Current Context

Psychological distress is prevalent in students, both in adolescence and young adulthood, and can result in adverse consequences including difficulties with academic performance, increased dissatisfaction with school, risk for dropout, unhealthy coping, and poorer overall adjustment (e.g., Agnafors et al., 2021; American College Health Association, 2016; Dupéré et al., 2015; Goodman et al., 2017; O'Connell et al., 2009; Pascoe et al., 2020; Patton et al., 2016; Ramler et al., 2016; Ribeiro et al., 2018; World Health Organisation (WHO) & United Nations Children's Fund (UNICEF), 2021). For instance, a stress survey conducted by the American Psychological Association (2018) revealed 91% of adolescents and young adults (15-21) reported experiencing stress in the past month, compared to 74% of adults in general. Similarly,

a recent report by Statistics Canada showed that adolescents and young adults were the least likely to report having excellent or very good mental health compared to both adults 31-46 years old or 47 and older (Guariguet, 2021). Furthermore, a report by Statistics Canada indicated that the mental health of adolescents and young adults (15-24 years of age) had declined sharply since the start of the COVID-19 pandemic, going from 62% reporting excellent to very good mental health in 2018 to 42% in 2020 (Findlay & Arim, 2020).

It is therefore critical to help students develop healthy coping skills in adolescence and to better understand how to provide accessible and effective support to students while considering individual differences in instructional needs. In alignment with recommendations by the Mental Health Commission of Canada and World Health Organization, educational settings have a key preventative role in building students' coping capacity and academic success (e.g., Cuijpers et al., 2019; Mental Health Commission of Canada, 2020; WHO & UNICEF, 2021). Indeed, schools are ideal settings to reach students given the significant amount of time students spend in them as well as the significant impact schools have in shaping students' cognitive, emotional, and social development (e.g., Eccles & Roeser, 2011; Pascoe et al., 2020). Educators and school support staff are thus often uniquely positioned to support students in a timely way (e.g., Patton et al., 2016; WHO & UNICEF, 2021).

Over the past few decades, mindfulness-based training is one of the ways in which educational institutions have been attempting to promote students' well-being and optimal functioning (e.g., Schonert-Reichl & Roeser, 2016). However, as will be discussed in greater depth below, while findings regarding the use of mindfulness in educational contexts is thus far generally promising, there is still much research needed on how mindfulness works and how it can be used effectively specifically with students (e.g., Black, 2015; Kuyken et al., 2022; Weare

& Bethune, 2021). Furthermore, despite the real potential for impactful change, it is crucial to ensure that (a) the efforts being made are effective, efficient, and helpful, and (b) beyond offering opportunities to students, that students have the ability and resources to actually use these opportunities (e.g., Patton et al., 2016). Thus, it is critical to better understand how to provide accessible and effective support to students.

## Theoretical Framework

Given its focus on human development and building coping capacity using mindfulness-based approaches, the present dissertation research is informed by an intersectionality of theoretical frameworks drawn from student well-being, developmental, and mindfulness research, which are discussed in more detail below.

**Student Well-being.** As discussed in the earlier section, there is currently a need to enhance students' coping capacity and well-being in educational settings. According to strengths-based resiliency theory, positive and healthy development can be influenced by contextual, social, and individual factors (i.e., promotive factors), which can be defined as either being intra-individual *assets* (e.g., mindfulness) or external *resources* (e.g., skills-based support programs; Zimmerman, 2013). In line with this approach, the dual continua of mental health theory suggests that mental health difficulties/illness and mental health/well-being are not diametrically opposed (e.g., Keyes, 2005; Peter et al. 2011). Rather, it is possible to experience varying degrees of mental health difficulties while still also maintaining good mental health or well-being.

Therefore, to promote healthy development, it is critical to not focus exclusively on reducing symptoms of mental illness or distress but also to use a strengths-based approach to build individual assets and resilience. Stallman's Health Theory of Coping (2020) further

contributes to our understanding of healthy development by proposing a model of healthy coping whereby the previous conceptualisation of coping as being either adaptive or maladaptive is redefined. Stallman's model proposes that all coping strategies are considered adaptive and effective to reduce acute distress or negative emotions in the moment; however, coping becomes unhealthy when it leads to adverse, unwanted, and unintended consequences (physical, psychological, or social). This model is also hierarchical in that it suggests that individuals seek to cope by moving progressively from low-intensity to high-intensity coping strategies. For example, individuals experiencing stress or distress may start with lower intensity healthy coping strategies like mindfulness practice and progressively transition to higher intensity strategies like seeking professional support if the need persists. Should healthy coping strategies be deemed unavailable or ineffective, they may transition to using unhealthy coping strategies again ranging from low harm ones (e.g., self-criticism) to higher harm ones (e.g., self-injury, suicidality). Thus, the Health Theory of Coping (2020) emphasises the need to use a preventative approach and build individuals' ability to cope using healthy coping strategies especially when they are still experiencing low intensity stress or distress. Additionally, Stallman's Health Theory of Coping (2020) highlights the need to target transdiagnostic mechanisms of distress or mental health difficulties and identifies emotion dysregulation as a key transdiagnostic contributor to unhealthy coping.

**Developmental approaches.** Adolescence and young adulthood are both critical developmental periods to ensuring healthy functioning and wellbeing in later adulthood (e.g., Patton et al., 2016). Although adolescence has historically been viewed as one of the healthiest developmental periods, there is growing recognition of the need to provide mental health support to adolescents specifically (e.g., Patton et al., 2016; WHO & UNICEF, 2021).

Adolescence merits particular attention given that it is an important period in terms of unique cognitive, social, and emotional developmental changes as well as brain neuroplasticity (e.g., Lyons & DeLange, 2016; Potts et al., 2021; Tottenham & Galván, 2017). While early adolescence (10-14 years) is a period typically characterised by poor self-regulation, increased risky behaviours, and lack of forward thinking, late adolescence (15-19 years) is marked by rapid developmental changes in self-regulation and executive function capacity (e.g., see review by Patton et al., 2016; Thillay et al., 2015). Thus, adolescence has been identified as a particular window of opportunity to teach skills that may help shape higher-level cognitive and emotional functions such as self-regulation, attentional control, and emotion regulation (e.g., Roeser & Pinela, 2014; Siegel, 2006; WHO & UNICEF, 2021).

Furthermore, adolescents may be particularly vulnerable to stress exposure (e.g., see reviews by Andersen & Teicher, 2008; Tottenham & Galván, 2016). Research has also shown that stress in adolescence is associated with increased dissatisfaction with school, risk for school dropout, poorer overall adjustment, and difficulties with academic performance (e.g., Friedlander et al., 2007; Ramler et al., 2016; Walburg, 2014). Exposure to stress in adolescence may also have a lasting impact that persists into adulthood and can be detrimental to well-being and overall functioning while also increasing risk for disorders such as depression (e.g., Center on the Developing Child at Harvard University, 2016; Chaby, Zhang, & Liberzon, 2017). Finally, research shows that adolescence provides a window of opportunity to undo or mitigate negative effects from early life stress, thus interrupting potentially detrimental developmental trajectories (e.g., DePasquale et al., 2019). Therefore, it is critical to offer support in adolescence to build students' capacity for healthy coping and lay a foundation for health and well-being as adolescents prepare to transition to adulthood.

**Mindfulness frameworks – bringing it all together.** As discussed above, the use of mindfulness, defined as intentionally paying attention to moment-by-moment experience with nonjudgmental acceptance of thoughts, feelings, or sensations, has been gaining popularity in schools over the past decade (e.g., Greenberg & Harris, 2012; Roeser et al., 2022; Schonert-Reichl & Roeser, 2016). Mindfulness instruction, albeit not a panacea, holds particular promise for students given that, as will be discussed below, several theoretical frameworks suggest it may address both the particular socio-cultural mental health difficulties (e.g., stress, distress, and emotion regulation difficulties) as well as the unique developmental difficulties (e.g., difficulties with sustained attention and emotion regulation) faced by students, and adolescents specifically.

A commonly shared theory of change for mindfulness-based programs' effectiveness is that the more an individual engages in mindfulness practice, the greater their tendency to be mindful on a day-to-day basis (i.e., dispositional mindfulness) which in turn leads to a variety of psychological, educational, social, and health benefits (e.g., Baer et al., 2011; Kabat-Zinn, 2013; Khoury et al., 2013; Roeser et al., 2022; Siegel, 2006). Indeed, recent meta-analyses of mindfulness-based programs implemented with adults demonstrate that dispositional mindfulness explains the effect of mindfulness practice on outcomes (e.g.,Visted et al., 2015; Verhaeghen, 2021).

Furthermore, the theoretical framework proposed by Hölzel and colleagues' (2011) suggests that two of the key mechanisms through which mindfulness practice may be beneficial is through its impact on individuals' capacity to regulate both their emotions and their attention. In terms of the former, there is extensive research demonstrating the emotional regulatory benefits associated with both mindfulness practice and dispositional mindfulness (e.g., see reviews by Chambers et al., 2009; Wheeler et al., 2017). As discussed above, the Health Theory

of Coping proposes a transdiagnostic approach to coping through targeting emotion regulation difficulties, which underlie a host of mental health difficulties including anxiety and depression (e.g., Sloan et al., 2017; Stallman, 2020). Thus, consistent with Stallman's model, the use of mindfulness practice, given its benefits in terms of increasing emotion regulation skills, is characterized as a low intensity coping strategy that may be foundational to building students' coping capacity (Stallman, 2020). Indeed, it has long been thought that one of the reasons mindfulness practice may be beneficial for such a wide variety of emotional, cognitive, physical, and social outcomes is through its emphasis on teaching transtherapeutic processes (e.g., see a review by Greeson et al., 2014).

While the relationship between mindfulness and emotion regulation capacity has already been well-established, there is still much left to understand in the inter-relationships between mindfulness and attention regulation. Hasenkamp and colleagues (2012) proposed a theoretical model which suggests mindful awareness and attention regulation are closely linked within mindfulness practice in a continuous loop, with the participant focusing their attention on the object of attention (e.g., the breath), before being distracted by a bout of mind wandering, becoming aware of their drifting thoughts, and shifting attention back to focusing. Indeed, a recent meta-analysis revealed that MBPs with adults significantly increased participants' attention, and that this occurred through increased dispositional mindfulness (Verhaeghen, 2021). However, it remains unclear how changes or differences in attention may impact participants' well-being as a result of mindfulness practice or as a result of their dispositional mindfulness levels (Verhaeghen, 2021).

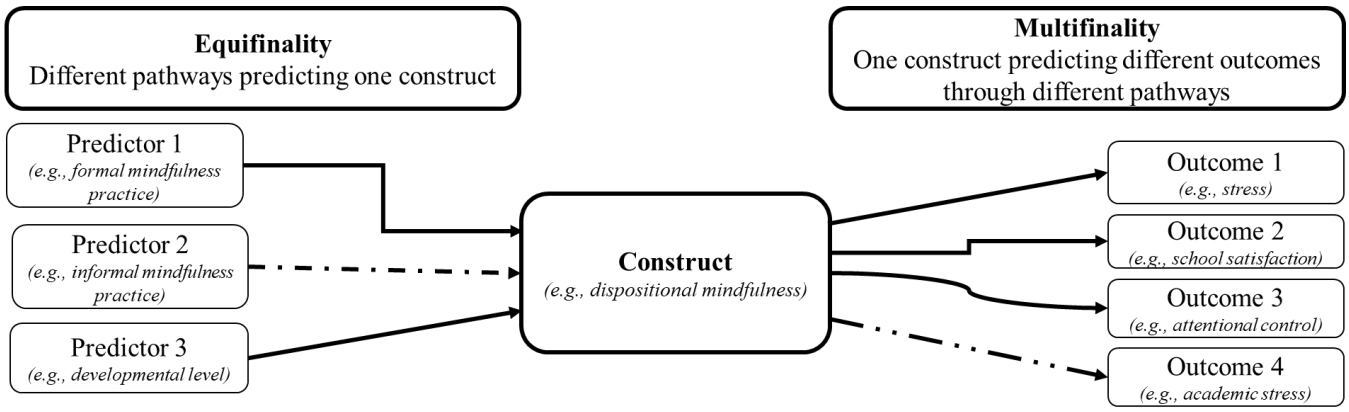
Finally, drawing from general systems theory and developmental psychopathology frameworks, the concepts of *equifinality* (i.e., different trajectories leading to a similar outcome)

and *multifinality* (i.e., a single starting point can lead to multiple outcomes) also served to inform the foundational approach to this dissertation (see reviews by Cicchetti & Rogosch, 1996; Holmbeck et al., 2006). These two concepts are not mutually exclusive and are particularly important to modern developmental research in understanding the different trajectories or pathways through which the lives of children and adolescents can be impacted. Importantly, a more nuanced and complex understanding of development stems in part from a shift towards recognising the multiple ways in which particular outcomes can occur and the different trajectories that can stem from similar sources, particularly when interacting with risk and protective factors (e.g., Cicchetti & Rogosch, 1996).

In applying this lens to mindfulness research, the principle of equifinality suggests that dispositional mindfulness can be increased through various means of mindfulness instruction. Additionally, the concept of multifinality suggests that increased dispositional mindfulness could, in turn, have an impact on a variety of outcomes through potentially different mechanisms of action, as discussed above. Therefore, there is a need to better understand (a) how different types of mindfulness instruction can be adapted based on individual differences (e.g., gender differences) to efficiently target dispositional mindfulness and desired outcomes; (b) the mechanisms through which dispositional mindfulness can impact student outcomes; and (c) what outcomes are influenced through mindfulness practice (see Figure 1).

**Figure 1**

*Simplified Illustration of the Principles of Equifinality and Multifinality Applied to Mindfulness Research*



## Why Mindfulness?

**Conceptualising mindfulness.** Mindfulness meditation is a form of meditation originating from ancient Buddhist practices that has been secularized in Western approaches over the past few decades and is now well-established across a variety of fields including medicine, education, and psychology (e.g., Kabat-Zinn, 2003; Bodhi, 2011; Dunne, 2015; Gethin, 2015; Hart et al., 2013; Khoury, et al., 2017). Within both the Buddhist and secularized Western approach, conceptualisations of mindfulness have varied greatly (for in-depth reviews see for example Bodhi, 2011; Dunne, 2015; Gethin, 2015; Hart et al., 2013; Khoury, et al., 2017).

One of the most commonly used definitions of mindfulness in research and practice was put forth by Jon Kabat-Zinn (1994) as mindfulness being the act of intentionally paying attention to moment-by-moment experience with nonjudgmental acceptance of whatever thoughts, feelings, and sensations that may arise. Other definitions include mindfulness as consisting of self-regulation of attention combined with an open-minded and accepting orientation towards the present moment (Bishop et al., 2004). A different approach to secularized Western mindfulness can also be found in Ellen Langer's definition of mindfulness as being a conscious and open-minded awareness of whatever external experiences are occurring in the present moment while actively and creatively engaging in this experience (e.g., Langer, 2005).

Importantly, these approaches have conceptual similarities for example in their underlying support of the importance of building the mind-body connection (e.g., Khoury et al., 2017). However, a key distinction between these approaches is the exclusive focus on being aware of and engaging with external experiences in Langer's definition whereas Kabat-Zinn's definition encompasses both external (e.g., sensations) and internal (e.g., thoughts) stimuli that arise within the present moment experience (Hart et al., 2013).

Arguably one of the most influential approaches in current research and practice (e.g., Khoury et al., 2017), Kabat-Zinn's approach will be used in this dissertation research. Within this approach, as detailed below, mindfulness can be conceptualised as either a construct (i.e., individual characteristic or outcome) or as a skill developed through the act of practicing mindfulness strategies (e.g., Goleman & Davidson, 2017; Roeser et al., 2022).

**Mindfulness – momentary experience & individual characteristic, and process.** Research on mindfulness as a construct makes an important distinction between state and dispositional mindfulness. Specifically, mindfulness can either be a momentary experience, for instance immediately following a mindfulness-based program, induction, or activity (i.e., state mindfulness), or it can be an individual characteristic that is part of one's disposition (i.e., dispositional mindfulness), in which case it can be described as an individual's general tendency to be mindful on a daily basis (e.g., Brown & Ryan, 2003).

Furthermore, another distinction is made between whether dispositional mindfulness is assessed as a unitary construct (i.e., global dispositional mindfulness score) or broken down into individual components. Given the many conceptual definitions of dispositional mindfulness, it is unsurprising that a variety of mindfulness measures exist, each assessing the construct in slightly different ways (e.g., Baer, 2019; Quaglia et al., 2015). Although a focus on present moment awareness is a core component of each, the measures vary in terms of whether dispositional mindfulness is assessed uni-dimensionally (e.g., *Mindful Attention and Awareness Scale;* Brown & Ryan, 2003) or as a multi-faceted construct (e.g., *Five Facet Mindfulness Questionnaire;* FFMQ; Baer et al., 2006). Indeed, there has been a shift over the past decade towards a more nuanced multi-faceted conceptualisation of dispositional mindfulness (e.g., Baer, 2019; Quaglia et al., 2015). One of the currently most commonly investigated and validated multi-faceted

models of dispositional mindfulness, consists of five interacting facets of dispositional mindfulness: acting with awareness, non-judgment of inner thoughts and feelings, non-reactivity to inner experience, describing experiences, and observing (Baer et al., 2006).

**Mindfulness as a process.** Beyond state and dispositional mindfulness as constructs, mindfulness can also be conceptualised as a process whereby mindfulness-based activities are practiced to induce states of mindfulness. Importantly, mindfulness as a process is dynamically interrelated with mindfulness as constructs. Specifically, research suggests that mindfulness practice, which induces repeated states of mindfulness, can significantly increase dispositional mindfulness over time (e.g., Khoury et al., 2013; Kiken et al., 2015; Siegel et al., 2016; Visted et al., 2014). In order to teach mindfulness practice, a multitude of interventions or programs incorporating mindfulness strategies have been developed for use with adults in medical or mental health settings, including Mindfulness-Based Cognitive Therapy (MBCT; Segal et al., 2002), Dialectical Behavior Therapy (DBT; Linehan, 1993), and Acceptance and Commitment Therapy (ACT; Hayes et al., 1999). However, one of the most commonly used mindfulness-based interventions is the Mindfulness-Based Stress Reduction (MBSR) program established by Jon Kabat-Zinn in the 1970s at Harvard University's Stress Reduction Clinic (Kabat-Zinn, 2013).

MBSR is an 8-week program in which a trained instructor leads weekly group sessions while participants are encouraged to engage in daily individual practice and an all-day retreat around the 6$^{th}$ week. During the weekly group sessions, participants are taught about and have the opportunity to discuss mindfulness and its benefits, as well as challenges associated with practice.

Participants are also taught to use both formal and informal mindfulness activities. Formal mindfulness is conceptualized as structured activities in which mindfulness is practiced within an allotted period of time. For instance, in MBSR, participants are asked to commit to 45 minutes of daily practice for 8 weeks using one of three types of formal mindfulness practices: sitting meditation (awareness of the breath, bodily sensations, feelings, and thoughts), body scan (physical awareness of parts of the body and the body as a whole), and/or mindful yoga. On the other hand, informal mindfulness can be defined as the unstructured, brief, and spontaneous practice of mindfulness in daily activities (e.g., being aware of the feel of water while showering or doing dishes, of wind on the face while walking, of the feeling of tension in the body before a confrontation) and participants are encouraged to engage in as much informal practice as possible (e.g., Crane et al., 2017). Formal and informal mindfulness practice are typically taught simultaneously in traditional mindfulness-based programs both for adults and adolescents (e.g., Broderick et al., 2009; Kabat-Zinn, 2013), with the expectation that by regularly practicing formal mindfulness, participants will be able to more naturally and frequently engage in informal mindfulness in their everyday life (e.g., Goodman et al., 2015).

**Benefits of mindfulness for adults.** Overall, research shows mindfulness-based programs are effective in increasing dispositional mindfulness in a sustainable way (e.g., Dunning et al., 2022; Khoury et al., 2013; Verhaeghen, 2021; Visted et al., 2015). Meta-analyses and systematic reviews of mindfulness-based programs with adults have also demonstrated overall effectiveness especially in terms of coping with psychological distress, anxiety, or depression and increasing attention (e.g., Fjorback et al., 2011; Khoury et al., 2013; Verhaeghen, 2021; Halladay et al., 2019).

Furthermore, dispositional mindfulness in adults has been associated with reduced perceived stress, anxiety, depression, emotional reactivity, rumination and catastrophizing as well as with greater adaptive functioning and well-being (e.g., Bergin & Pakenham, 2016; Bergomi, Ströhle, Michalak, Funke, & Berking, 2013; Brown, Ryan, & Creswell., 2007; Cash & Whittingham, 2010; Feldman et al., 2016; Hanley et al., 2015; Kadziolka et al., 2016; Keng et al., 2011; Tomlinson et al., 2018). Indeed, research is increasingly highlighting the role of dispositional mindfulness as a potential beneficial mechanism of action in mindfulness-based programs whereby the benefits participants report may be explained by concurrent increases in dispositional mindfulness (e.g., Davidson & Kaszniak, 2015; Roeser et al., 2022; Siegel, 2006; Siegel et al., 2016; Visted et al., 2015).

**Benefits of mindfulness for youth.** Interestingly, although there has been extensive research on the outcomes associated both with dispositional mindfulness and mindfulness-based interventions in adults, the state of empirical research with adolescents is still much more limited and inconsistent (e.g., Black, 2015; Bluth, et al., 2017; Greenberg & Harris, 2012; Roeser et al., 2022; Schonert-Reichl & Roeser, 2016; Schutt & Felver, 2021; Singh & Singh Joy, 2021; Tomlinson et al., 2018). Overall, meta-analytic findings suggest that mindfulness-based programs for youth may be effective in targeting students' mental health (e.g., stress, anxiety, depression) and cognitive outcomes (e.g., attention, impulsivity), and may be promising for educational outcomes (e.g., academic performance, school adjustment) (e.g., Carsley et al., 2018; Dunning et al., 2022; Halladay et al., 2019; Klingbeil et al., 2017; Maynard et al., 2017; Zenner et al., 2014; Zoogman et al., 2015). However, as will be discussed below, there is great heterogeneity in the types of mindfulness-programs being offered and more methodologically rigorous empirical research is needed to advance the field beyond feasibility and acceptability

studies (e.g., Greenberg & Harris, 2012; Emerson et al., 2020; Felver et al., 2016; Gould et al., 2016; Palacios et al., 2022; Roeser et al., 2022; Tudor et al., 2022; Van Dam et al., 2018).

**Mindfulness in Educational Settings -What do we know so far?**

Over the past decade, educational institutions have been attempting to promote student wellness and academic success through mindfulness skills-training as a universal preventative approach given it is easily accessible, low-cost, suitable across developmental levels, and has the potential to impact a variety of mental health, well-being, cognitive, and educational outcomes (e.g., Bender et al., 2018; Carsley et al., 2018; Maynard et al., 2017; Roeser et al., 2022; Semple et al., 2017; Stuart et al., 2017; Tudor et al., 2022; WHO & UNICEF, 2021).

However, recent evidence suggests that mindfulness instruction for students might not be well-suited to be taught using a manualised universal approach. A recently published study by the MYRIAD team revealed that a mandatory mindfulness program implemented across 84 schools with over 8000 early adolescents in the UK did not have a significant impact on adolescent outcomes (Montero-Marin et al., 2022). This study is the largest randomised controlled trial of mindfulness-based programs for students thus far and, given the recent enthusiasm for mindfulness instruction in schools and the lack of significant findings in this particular study, it has received a significant amount of interest through academic social media channels and blogs as well as news coverage (e.g., Hunt, 2022).

Most importantly, despite the lack of a significant impact on student outcomes, this study highlights the need to provide mindfulness instruction that is well adapted and accessible to students rather than using a mandatory, one-size-fits-all approach (e.g., Weare & Ormston, 2022). Results of the MYRIAD project indicated that the way mindfulness is taught matters; for example, educators who had higher levels of competency in mindfulness instruction were better

able to promote student engagement, which in turn also led to effectiveness on student outcomes. This is particularly important given that participants' lack of engagement with mindfulness practice can influence mindfulness-based programs' effectiveness (e.g., Emerson et al., 2020; Frank et al., 2021; Montero-Marin et al., 2022; Rosenkranz et al., 2019).

It has also been suggested that perhaps students' developmental stage had an impact on the mindfulness instruction's effectiveness in the MYRIAD project, given that participants were early adolescents whose more limited metacognitive and self-regulation skills may have made engagement with the curriculum more difficult (e.g., Montero-Marin, 2022; Weare & Ormston, 2022). Indeed, a recent meta-analysis of mindfulness-based programs for students showed that mental health outcomes were improved both immediately post-intervention and at follow-up only in late adolescence, thus suggesting the need for further adaptations during other developmental periods (Carsley et al., 2018). Although most mindfulness-based programs for children and adolescents are adapted from existing adult programs (e.g., MBSR), the developmental adaptations tend to consist of shortening session length, reducing daily practice times, or adapting the language used to teach mindfulness (e.g., Black, 2015; Singh & Singh Joy, 2021; Zoogman et al., 2015).

There has also increasingly been a call for further research taking student individual differences into consideration to ensure mindfulness instruction in schools is effective and accessible (e.g., Davidson & Kasniak, 2015; Bluth et al, 2017; Carsley et al., 2018; Kuyken et al., 2022). For instance, it has been suggested that mindfulness-based programs may be differentially effective based on participants' gender, with female participants tending to respond more positively to interventions in both adults (de Vibe et al., 2013; Rojiani et al., 2017) and adolescents (e.g., Bluth et al., 2017; Carsley et al., 2015; Kang et al., 2018). However, a review

of gender differences in mindfulness-based interventions for substance use disorders indicated that although some quasi-experimental and case studies reported gender differences with women benefitting more, a randomized control trial with adults reported no differences (Katz & Toner, 2013).

Unfortunately, there seems to be a lack of reported analyses based on gender in studies using mindfulness-based interventions, which may mask non-significant findings, and small samples sizes or lack of power may also be an issue in detecting gender differences (e.g., Bluth et al., 2017; Carsley et al., 2018; Katz & Toner, 2013). Findings on gender differences are also mixed for dispositional mindfulness, with some studies finding no gender differences in adults (e.g., Mettler et al., 2017; Palmer & Rodger, 2009; Soysa & Wilcomb, 2015) while other studies with adolescents indicate male participants report higher dispositional mindfulness (e.g., Marks et al., 2010; Royuela-Colomer & Calvete, 2017).

Finally, there are also indications that there are still significant barriers to student engagement in mindfulness-based programs for youth, which tend to focus heavily on teaching adapted formal mindfulness activities. There is growing evidence that formal mindfulness practice may not be as accessible as informal mindfulness activities, which tend to be much briefer and integrated within daily activities. For example, adolescents report having difficulties in finding a suitable time and place to practice formal mindfulness activities on a daily basis (e.g., Kerrigan et al., 2011). Research also shows that most adolescent students do not engage in the recommended home mindfulness practice or intend to continue using strategies following program implementation, despite generally reporting finding the mindfulness-based instruction acceptable (e.g., Montero-Marin et al., 2022; Quach et al., 2017; Tudor et al., 2022; Weare & Ormston, 2022). Indeed, even adult participants report challenges in practicing formal

mindfulness, with reports of difficulties in staying awake, focusing attention, or making time to practice (e.g., Birtwell et al., 2019). Thus, these types of difficulties may be particularly challenging for children and adolescents because their capacity for attention and self-regulation is still undergoing development (e.g., Patton et al., 2016; Thillay et al., 2015). Thus, there is a need to better understand how to make mindfulness instruction more accessible to youth.

As mentioned above, it may be that informal mindfulness activities may be more accessible and engaging, specifically for children and adolescents, since they are very brief, require less attention and are more inherently integrated within daily activities, (e.g., Crane et al., 2017; Ribeiro, 2020; Shankland et al., 2021). A few studies with adults show the potential for distinct benefits between formal and informal mindfulness practice in general population adult samples (e.g., Dobkin & Zhao, 2011; Hanley et al., 2015; Hindman et al., 2015; Shankland et al., 2021). Additionally, a recent systematic review of the few studies conducted on informal mindfulness using primarily adult, general population samples concluded that informal mindfulness activities may be more accessible and acceptable for populations with difficulties in attention or emotion regulation (Ribeiro, 2020). However, there is a lack of empirical research in this area, particularly within younger developmental periods and it is still unclear which aspects of mindfulness training (i.e., formal or informal practice) are most efficient.

Beyond better understanding the effectiveness and accessibility of mindfulness instruction, there is also a need to further investigate the mechanisms of action underlying how mindfulness functions for students. As presented earlier in the theoretical frameworks and explored further below, two of the key potential mechanisms of change as a result of mindfulness practice are through (a) increased dispositional mindfulness and (b) better attention regulation capacity (e.g., Goleman & Davidson, 2017; Hölzel et al., 2011; Roeser et al., 2022).

To have a more complex understanding of how dispositional mindfulness operates and its impact on psychological and educational outcomes, it is important to take into account the different ways it can be operationalized. As noted above, over the past decade, mindfulness research has increasingly transitioned from a unidimensional to a more complex, multi-faceted conceptualisation of dispositional mindfulness, particularly for adults (e.g., Baer, 2019). Unsurprisingly, the state of research on dispositional mindfulness as a multi-faceted construct is much more limited in adolescence; however, this is an area that is rapidly developing (e.g., Bender et al., 2022; Pallozzi et al., 2017; Potts et al., 2021).

Indeed, a better understanding of how the different components of dispositional mindfulness contribute to student outcomes is necessary given that previous research with adults and adolescents shows these facets are interrelated yet also distinct (e.g., Baer et al., 2006; Cortazar & Calvete, 2019; Royela-Colomer & Calvete, 2016; Tomlinson et al., 2018). Therefore, we need to investigate how these inter-relationships function to clarify which facets to target using mindfulness instruction to potentially impact different outcomes and maximise use of limited resources in schools.

In addition to there being benefits through increased dispositional mindfulness, another possible mechanism of action explaining benefits from mindfulness practice is through increases in the ability to control one's attention (e.g., Hasenkamp et al., 2012; Hölzel et al., 2011; Roeser et al., 2022; Siegel, 2007; Verhaeghen, 2021). This may be particularly beneficial for students and mindfulness-based program implementation in schools given the benefits of increased attention on educational outcomes such as academic performance (e.g., Du Rocher, 2020; Gagné et al., 2016; MacDonald et al., 2020; Weare, 2019). While research with adults shows that both mindfulness practice and dispositional mindfulness can impact attention, it is still unclear

whether these changes in attention are related with other benefits associated with mindfulness practice (e.g., Verhaeghen, 2021).

**Principal Aims of the Dissertation Research**

In summary, given the high levels of stress reported in adolescence and young adulthood, it is important to support students' coping capacity. One of the ways educational settings have been attempting to do this is by implementing mindfulness-based programs to support students. Unfortunately, it has become clear over the past decade that the enthusiasm for implementing mindfulness-based programs in schools has moved beyond the evidence base. Indeed, there is a growing indication that, to be effective and accessible, mindfulness instruction needs to be adapted to the context in which it is being delivered as well as to students' needs to promote student engagement (e.g., Dunning et al., 2022; Kuyken et al., 2022).

Additionally, as discussed in the theoretical frameworks above, further research is needed to elucidate the role of dispositional mindfulness as a potential key mechanism of change. Some of the key areas regarding more investigation include (a) how mindfulness instruction can be adapted to the needs of different populations to effectively increase dispositional mindfulness and (b) in turn, the ways in which dispositional mindfulness can effect change through different mechanisms and types of outcomes (see Figure 1). Therefore, there has been a call for further research to investigate (a) which elements of mindfulness instruction can be most effective and accessible for students and (b) the mechanisms by which dispositional mindfulness can influence student outcomes (Bamber & Schneider, 2016; Black, 2015; Greenberg & Harris, 2012; Perry-Parrish, Copeland-Linder, Webb, & Sibinga, 2016; Schonert-Reichl & Roeser, 2016).

The overall objective of this dissertation research was to better understand the role of mindfulness instruction for students by investigating *what works*, *for whom, and how it works*.

There is a need to move towards a more nuanced approach to mindfulness instruction for students, in which mindfulness instruction can be effective for a wide variety of youth, but only if taught in ways that are adapted for and accessible to students.

The first two studies of this dissertation focused on investigating *what works and for whom*. Specifically, the main objective of Study 1 was to evaluate the effectiveness of rigorously designed mindfulness-based programs for students in terms of teaching what they set out to teach (i.e., dispositional mindfulness) and teaching outcomes beyond mental health and well-being (i.e., educational outcomes). Additionally, the goal was to determine what additional contextual (e.g., type of facilitator, type of program) and individual (e.g., educational level, gender) implementation factors influence the effectiveness of these programs.

Building on findings from Study 1, Study 2 investigated how mindfulness instruction for youth can be delivered in a way that they enjoy (i.e., acceptability) and that works for them (i.e., effectiveness). Using a randomised controlled experimental design, Study 2 parsed out the acceptability and effectiveness of formal and informal mindfulness practice for adolescent students specifically, given theoretical and research evidence that adolescence may be a particular window of opportunity for the influence of mindfulness instruction (e.g., Roeser & Pinela, 2014; Siegel, 2007; WHO & UNICEF, 2021). Finally, the impact on dispositional mindfulness is theorised to be one of the key mechanisms of action through which mindfulness-based programs are effective (e.g., Kabat-Zinn, 2013; Roeser et al., 2022; Siegel, 2006). Thus, the third objective sought to examine whether dispositional mindfulness could explain potential differences over time on mental health, well-being, and educational outcomes between adolescents who practiced the different types of mindfulness versus those in the comparison group.

Finally, the third study of this dissertation focused on investigating *for whom* and *how* – in other words, the mechanisms through which mindfulness has an impact on adolescents based on individual differences. Specifically, the main objective was to assess (a) the relative merits of the different facets of dispositional mindfulness and (b) whether adolescents' ability to focus and shift their attention influenced the relationship between different facets of dispositional mindfulness on adolescents' perceived general and academic stress. Additionally, the goal was to investigate the impact of potential gender differences on these relationships.

Overall, this dissertation research will offer a more nuanced understanding of the contextual factors influencing the effectiveness of mindfulness-based programs with students (Study 1), and the relative merits of different elements of mindfulness instruction (i.e., formal and informal; Study 2) as well as of the mechanisms through which mindfulness may be effective for students (Study 3). Each study in this dissertation offers a unique contribution to both our theoretical and applied understanding of the role of mindfulness instruction in educational settings.

**Chapter 2:** Study 1

# Mindfulness-Based Programs and School Adjustment: A Systematic Review and Meta-Analysis

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**Abstract**

Mindfulness-based programs (MBPs) are increasingly used in educational institutions to enhance students' mental health and resilience. However, reviews of the literature suggest this use may have outpaced the evidence base and further research is needed to better understand the mechanisms underlying these programs' effectiveness and which outcomes are being affected. The purpose of this meta-analysis was to investigate the strength of MBPs' effects on school adjustment and mindfulness outcomes while also considering the potential influence of study and program characteristics, including the role of comparison groups, students' educational level, the type of program being used, and the facilitator's training and previous mindfulness experience. Following a systematic review of five databases, 46 studies using a randomized controlled design with students from preschool to undergraduate levels were selected. At post-program, the effect of MBPs compared to control groups was (a) small for overall school adjustment outcomes, academic performance, and impulsivity; (b) small to moderate for attention; and (c) moderate for mindfulness. No differences emerged for interpersonal skills, school functioning, or student behaviour. The effects of MBPs on overall school adjustment and mindfulness differed based on students' educational level and the type of program being delivered. Moreover, only MBPs delivered by outside facilitators with previous experience of mindfulness had significant effects on either school adjustment or mindfulness. This meta-analysis provides promising evidence of the effectiveness of MBPs in educational contexts to improve students' school adjustment outcomes beyond typically assessed psychological benefits, even when using randomized controlled designs.

*Keywords:* mindfulness, meta-analysis, program, education, students

# Mindfulness-Based Programs and School Adjustment: A Systematic Review and Meta-Analysis

## Introduction

### Mindfulness-Based Programs

Although originating from ancient Buddhist practices, secularised mindfulness has gained increasing popularity within Western psychology, medicine, and education (Kabat-Zinn, 2003; Williams et al., 2007). Mindfulness is commonly defined as intentionally paying attention with a nonjudgmental acceptance of thoughts, feelings, and sensations (Kabat-Zinn, 2013) and can be characterized as both a general tendency to be mindful (i.e., dispositional mindfulness) or a state of moment-by-moment mindfulness (i.e., state mindfulness; e.g., Davidson & Kaszniak, 2015). Interestingly, both dispositional and state mindfulness can be taught by repeated practice of mindfulness activities, for example through the development of mindfulness-based programs (MBPs). Indeed, research over the past decades has shown that mindfulness practice can induce state mindfulness and is associated with stable increases in dispositional mindfulness over time (e.g., Carmody & Baer, 2008; Khoury et al., 2013; Kiken et al. 2015).

Furthermore, findings from systematic reviews and meta-analyses have offered substantive evidence of psychological benefits (e.g., decreased anxiety, depression, stress) associated with MBPs for adults (e.g., Fjorback et al., 2011; Khoury et al., 2013). Although the mechanisms of change are still being investigated, MBPs for adults may result in increased cognitive flexibility, decreased rumination, or increased self-compassion (e.g., Gu et al., 2016; Lee & Orsillo, 2014; Svendsen et al., 2016). Although promising, the state of mindfulness research with children and adolescents is less well-established (e.g., Black, 2015; Carsley et al., 2018; Zenner et al., 2014; Zoogman et al., 2015). Despite a multitude of programs targeting

younger populations, the majority are adapted from existing MBPs for adults by modifying elements in developmentally appropriate ways, such as shortening sessions or reducing daily practice times (e.g., Black, 2015; Zoogman et al., 2015). However, despite evidence for effectiveness of MBPs with adults, additional evidence is needed to demonstrate the effectiveness of these adaptations with children, adolescents, and young adults given distinct differences across developmental stages in terms of cognitive, emotional, and social functioning (e.g., Black, 2015; Davidson & Kasniak, 2015; Lyons & DeLange, 2016; Maynard et al., 2017). Indeed, reviews suggest the research evidence may still be too limited to support this proliferation of MBPs for youth; thus, further research is needed to better understand the mechanisms underlying these programs' effectiveness and which outcomes are being affected (Greenberg & Harris, 2012; Schonert-Reichl & Roeser, 2016; Semple et al., 2017).

**Mindfulness-Based Programs in Education**

Over the past decades, educational settings have recognized the need to promote the development of interpersonal, self-awareness, and self-regulation skills as well as academic performance (Collaborative for Academic, Social, and Emotional Learning, 2013). Consistent with this approach, MBPs have increasingly been used in educational institutions to enhance students' mental health and resilience (Carsley et al., 2018; Halladay et al. 2019).

One of the advantages to the implementation of MBPs in educational settings is their potential benefits as a universal whole school approach that can provide opportunities to reach students broadly, while focusing on skill-building and reducing the potential for stigmatization of students who could benefit most from learning mindfulness strategies (e.g., Bender et al., 2018; Semple et al., 2017; Stuart et al., 2017). Furthermore, MBPs use a strengths-based approach that

can provide opportunities to build positive psychology skills in students across academic levels rather than focusing on targeting psychopathology (Stuart et al., 2017).

However, there is a great diversity of programs being offered for students across educational levels and a lack of research investigating which aspects of these programs are most effective or whether these effects differ based on program or participant characteristics. For instance, the great variability between programs (e.g., in the approach and techniques taught, program length, delivery methods), combined with limited research using mainly small sample sizes or weaker designs, makes it difficult to ascertain the short or long-term effectiveness of these programs with students (Semple et al., 2017). In recognition of the early state of the field as well as the high acceptability and feasibility of these school-based programs, there is a need for rigorous research actively comparing MBPs against one another using strong methodology, such as randomized controlled designs, to better understand the programs' impacts on a variety of quantitative and qualitative outcomes.

Similarly, there is a need for a more comprehensive understanding of the (a) effects of implementing MBPs with students, (b) active components on these programs, and (c) best models of training delivery for specific populations (see reviews by Felver et al, 2016, and Schonert-Reichl & Roeser, 2016). Overall, findings from multiple meta-analyses examining MBPs with youth or young adults consistently show that MBPs are effective on psychological outcomes (Carsley et al., 2018; Dunning et al., 2019; Halladay et al., 2019; Klingbeil et al., 2017; Maynard et al., 2017; Zenner et al., 2014; Zoogman et al., 2015). However, there are mixed findings regarding the effectiveness on a broader array of outcomes including academic achievement, school functioning, externalizing problems, and social behaviours (e.g., Dunning et al., 2019; Klingbeil et al., 2017; Maynard et al., 2017). Given the limited number of studies

available at the time, these mixed findings may be due to the fact that the meta-analyses conducted to date have included a wide variety of studies utilizing various controlled and pre-post research designs and differing clinical and community samples (e.g., Carsley et al., 2018; Klingbeil et al., 2017; Zenner et al., 2014).

Altogether, these studies present a comprehensive overview of the literature up until late 2017 on MBPs with children and adolescents specifically, each building on previous literature and contributing to a broader understanding by attempting to take into consideration the influence of different factors, such as the methodology used or specific aspects of the programs, on the effect of MBPs on outcomes assessed. Importantly, however, these meta-analyses acknowledge significant limitations and have identified key areas in the field of mindfulness research that require further study as the body of research continues to grow.

**Methodological Considerations**

Several reviews examining MBPs have highlighted the need for more research using stronger experimental designs that use comparison groups and randomization to better understand the true effects of MBPs while minimizing the risk of sampling bias or placebo effects (e.g., Black, 2015; Dunning et al., 2019; Greenberg & Harris, 2012; Felver et al., 2016; Zenner et al., 2014). Furthermore, there is a need to differentiate between types of comparison groups given that certain control conditions, such as business-as-usual or wait-list conditions, do not provide any active programs to participants during the intervention phase and fail to control for non-mindfulness specific aspects of MBPs that could be impacting outcomes, such as the effect of being part of a group (e.g., Davidson & Kaszniak, 2015). Although Klingbeil and colleagues (2017) analyzed the effects of MBPs separately within studies using a controlled design and within those using a noncontrolled design, they did not further break down their

analyses to examine comparison groups (e.g., active comparisons, waitlist control, business-as-usual). Similarly, Dunning and colleagues (2019) analyzed the effect of MBPs within studies using a randomized controlled design with an active comparison group but did not compare studies using other types of comparison groups. Meanwhile, due to a limited number of studies included, other meta-analyses were unable to investigate potential effects of specific groupings of comparison conditions (e.g., Carsley et al., 2018).

**Developmental Period**

Another study design characteristic that may potentially influence the effect of MBPs is the developmental period of the participants (e.g., Schonert-Reichl & Roeser, 2016). For instance, although most meta-analyses on mindfulness-based programs conducted analyses on the entire range of ages for children and adolescents, Carsley and colleagues (2018) investigated the effect of school-based MBPs during specific developmental periods. Results revealed a significant effect of MBPs at both post-intervention and follow-up in late adolescence but only at post-intervention for middle childhood, which suggests that further adaptations may be required for MBPs targeting younger age groups. Given that students are developing cognitive, emotional, and social skills across developmental stages, consideration of developmental differences are particularly important since they may impact students' understanding of and ability to use some of the more abstract and complex components of mindfulness practice (e.g., metacognitive aspects, sustained attention), the assessment measures used, or the mindfulness practices taught (e.g., Greenberg & Harris, 2012; Potts et al., 2021).

**Intervention Characteristics**

In terms of intervention characteristics, MBPs can be categorized as (a) manualized programs, (b) researcher-designed programs or activities, or (c) singular activities taught to

participants (e.g., Bender et al., 2018). Given that these types may vary widely in terms of length, activities taught, and method of delivery, amongst other factors, it may be important to take this into account when evaluating the impact of MBPs. In fact, Zoogman and colleagues (2015) found no significant differences between the types of programs being delivered; however, they were only able to include a small number of studies, including those that confounded clinical and non-clinical samples, as well as both controlled and non-controlled designs. When exclusively investigating school-based MBPs for non-clinical samples, Carsley and colleagues' (2018) meta-analysis found that although existing manualized programs only had significant effects at post-intervention, researcher-designed combinations of mindfulness activities or yoga-based mindfulness activities had significant effects both at post-intervention and follow-up. They interpreted these findings as potentially being due to the more stringent training required for delivery of existing manualized programs that may be more difficult to achieve in a school-based setting. However, the discrepant findings between these two meta-analyses highlight the need to look more closely at the impact of MBPs within specific subgroups in studies employing similar designs to minimize confounds.

**Facilitator Type and Personal Practice**

Another important program characteristic to consider is the intervention facilitator, both in terms of their training and personal practice of mindfulness given that leading researchers in the field have stressed the importance of having an established personal practice when teaching mindfulness strategies to novices (e.g., Kabat-Zinn, 2003). For instance, when implementing MBPs in educational contexts, it may be more feasible to achieve sustainable change by training classroom educators to teach mindfulness to their students and incorporate it into their classroom (Zenner et al., 2014). Carsley and colleagues (2018) compared school-based MBPs delivered by

classroom teachers to those delivered by outside facilitators and found that, at follow-up, MBPs delivered by classroom teachers had a significant effect on mental health outcomes but not mindfulness, whereas the opposite pattern was found for MBPs delivered by outside facilitators. Meanwhile, Zoogman and colleagues (2015) compared the effect of facilitators who had previous experience with mindfulness with those who were trained to deliver the intervention and did not find a significant moderation on the effect of MBPs.

**Broader Diversity of Outcomes**

Finally, most MBPs in educational settings have typically been implemented as mental health programs and have therefore focused on assessing psychological outcomes (e.g., Bender et al., 2018). However, there is a need for a broader investigation of outcomes associated with MBPs (Black, 2015; Greenberg & Harris, 2012; Klingbeil et al., 2017; Maynard et al., 2017). For instance, although Klingbeil and colleagues (2017) investigated the effect of MBPs on a broad array of outcome domains beyond psychological outcomes, a limitation of their meta-analysis was the low number of identified studies assessing non-psychological outcome domains.

Given the increasing use of MBPs in educational contexts, there is a need to further investigate how these programs may impact specific valued educational outcomes (e.g., Bender et al., 2018). For instance, a commonly used definition of school adjustment is that it encompasses academic performance, students' desire and competence to act in prosocial and socially responsible ways in the classroom (e.g., complying with classroom rules, classroom attention, cooperation with peers), and positive interpersonal relationships with teachers and peers (e.g., Wentzel, 2013). Importantly, researchers have found that, for students across educational levels, dispositional mindfulness has been associated with different outcomes related to school adjustment, such as reduced test anxiety, problem behaviours, and risk for school

dropout and increased adjustment, attention skills, interpersonal skills, and academic performance (e.g., Carsley & Heath, 2019; Flook et al., 2010; Mettler et al., 2017; Napoli et al., 2005; Semple et al., 2005). Although this research is promising, there is a need for a more systematic and evidence-based understanding of which educational outcomes are effectively targeted through MBPs using a randomized control design.

Despite the potential of MBPs as a universal school-wide preventative approach, the implementation of these programs in educational contexts has not been without challenges regarding buy-in from policymakers, school administrators, and educators who are dealing with the pressures of managing large student bodies with limited resources and a heavy curriculum demand and who may see the addition of MBPs as an unnecessary add-on to their workload (e.g., Schoenert-Reichl & Roeser, 2016; Meiklejohn et al., 2012). Therefore, clarifying the relationship between MBPs and valued educational outcomes, such as academic performance or student behaviour, may be an important step in facilitating the implementation of evidence-based MBPs in educational contexts to best meet students' needs while also maximizing the use of limited resources in terms of staff, money, and time (Felver et al., 2016; Meiklejohn et al., 2012).

**Research Objectives**

In summary, there is scattered evidence of the potential effectiveness of MBPs on various educational outcomes related to school adjustment (e.g., academic performance, attention, impulsivity, interpersonal skills, school functioning, student behavior; see review on school adjustment by Wentzel, 2013). Therefore, a meta-analysis of studies using a randomized controlled design is needed to have a global understanding of the impact of MBPs with non-clinical samples of students across educational levels, while also considering various aspects of research or program design. Specific research questions and objectives were as follows:

(1) What is the strength of the effect of MBPs on school adjustment outcomes overall and individually?

(2) Within MBPs that target school adjustment outcomes, what is the strength of the effect of MBPs on mindfulness outcomes?

(3) Do the following aspects of MBPs have an impact on school adjustment and mindfulness outcomes: (a) the type of comparison group used within a randomized controlled design, (b) students' educational level (e.g., preschool, elementary), (c) the type of MBP used (e.g., existing manualized curriculum, researcher-designed), and (d) the type of facilitator (teacher vs. outside facilitator), as well as their previous experience with mindfulness?

## Method

### Protocol

This review was conducted following PRISMA guidelines (see Appendix A).

### Eligibility Criteria

The primary criteria for inclusion in this meta-analysis were as follows. Articles published in English peer-reviewed journals were considered for inclusion; therefore, books, book chapters, and conference papers were excluded. Dissertations were excluded given the overlap with published peer-reviewed articles. Furthermore, study participants had to be part of the education system, from a non-specialized population (e.g., excluding students with clinical diagnoses or incarcerated students), and within the target developmental periods (childhood, adolescence, and young adulthood). To maintain consistency across studies, young adults in higher education were restricted to undergraduate students.

Studies were also excluded if they were qualitative or if mindfulness was only assessed using self-report measures (i.e., dispositional mindfulness) as opposed to being taught and practiced through an intervention. Furthermore, to minimize confounds with other potentially active components of programs, studies were only included if mindfulness was the primary component of the program being delivered. For example, studies using Dialectical Behaviour Therapy (Linehan, 2013), Acceptance and Commitment Therapy (Hayes et al., 1999), or Tai Chi, in which mindfulness is only one amongst several active components, were excluded. Finally, to address some of the limitations in mindfulness research identified in previous meta-analyses (Black, 2015; Greenberg & Harris, 2012), studies were only considered for inclusion in the current meta-analysis if using a randomized controlled design and assessing outcomes related to school adjustment.

**Information Sources**

A systematic search for articles focusing on MBPs with children, adolescents, and young adults was conducted in April 2019 in the following electronic databases selected based on previous meta-analyses focusing on outcomes related to mindfulness: PsycINFO, ERIC, Social Work Abstracts, Social Services Abstracts, and Scopus.

**Search**

Across databases, the keywords used in the search were “mindfulness” and “child*”, “adolescent*”, “young adult*”, “emerging adult*”, or “student*”. No limitations were set on the search parameters (including year of publication) to identify as many potential studies as possible.

**Study Selection**

Once the search was finalized within all databases, the study selection process was conducted in two stages (see Figure 1). Abstracts were first screened to ensure a fit with the eligibility criteria. Articles that were deemed a potential match were then reviewed in-depth and data were extracted if all inclusion and exclusion criteria were met. All studies were reviewed by the first author, with repeated discussion and consultation with the second author and last author, who have published extensively in this area (i.e., meta-analyses and mindfulness research). If studies did not report data from which effect sizes could be extracted, the first author of the article under consideration was contacted to obtain this information. Based on this approach, 18 studies were excluded given that authors did not respond or were unable to provide further information. As presented in Figure 1, a total of 46 studies were selected for inclusion in the meta-analysis.

**Data Collection Process and Data Items**

The data extraction from selected articles included sample characteristics (e.g., sample size, mean age, gender distribution), study characteristics (e.g., types of conditions, participants per condition, study design, means and standard deviations for each outcome) and intervention characteristics (e.g., type of intervention, facilitator, and length of intervention).

**Summary Measures**

All analyses were performed using the Comprehensive Meta-Analysis software version 3.0 (Borenstein et al., 2014). To conduct the analyses, standardized mean differences (Hedges' *g*) were computed.

**Synthesis of Results**

Means and standard deviations were used to compute a standardised effect size (Hedges' *g*) for each outcome and subgroup. Hedges' *g* was selected as the computed effect size given it provides a more unbiased estimate of the effect size parameter than *d* when using smaller samples (Borenstein et al., 2014). Furthermore, given that the purpose of this meta-analysis was to generalize these findings to a larger population of comparable studies, a random-effects model was used in all the analyses (Borenstein et al., 2014). Heterogeneity was assessed using a variety of methods. The *Q* statistic and its associated degrees of freedom and *p*-value were used to assess whether to reject or fail to reject the null hypothesis that the true effect size in all the studies was identical. The $I^2$ statistic was used to determine what proportion of the observed variance in the effect size was due to variation in true effects as opposed to sampling error. Finally, a prediction interval was calculated to estimate the distribution range of the true effect size of the population of studies comparable to those included in the meta-analysis.

**Risk of Bias in Individual Studies**

The risk of bias within individual studies was independently assessed by two raters who were trained according to the principles of *The Cochrane Handbook for Systematic Reviews of Interventions* (Higgins et al., 2011). After an independent assessment of each study, the raters met to settle discrepancies and reach agreement in their risk of bias ratings. If discrepancies were present, the raters met with the first and last authors to come to a consensus. Types of bias included (a) *selection bias*, which is comprised of two elements consisting of random sequence generation (e.g., whether the allocation sequence allows comparable groups) and allocation concealment (e.g., if participants and investigators could not foresee assignment); (b) *performance bias*, which concerns effective blinding of participants and personnel; (c) *detection*

*bias*, which concerns blinding of outcome assessors; (d) *attrition bias*, which consists of whether the handling of incomplete outcome data was complete and unlikely to have produced bias; I *reporting bias* (e.g., Was the reporting of outcomes thorough and non-selective?); and (f) *other bias*, which consists of any other source of bias (e.g., conflict of interest, source of funding). In all cases, an answer "Yes" indicates a low risk of bias, an answer "No" indicates high risk of bias, and an answer "Unclear" indicates an uncertain risk of bias. Each study was rated on each of the sources of risk of bias using the above criteria.

### Risk of Publication Bias

When conducting a meta-analysis, a common concern is publication bias, which is when the analyses overestimate the true effect sizes given that (a) statistically significant effect sizes tend to be larger than non-statistically significant ones and (b) studies that report statistically significant effect sizes may be more likely to be published. As discussed in the results below, publication bias was assessed using a funnel plot as well as Duval and Tweedie's Trim and Fill method.

## Results

### Study Selection

Using the search criteria outlined earlier, a total of 7157 publications were identified. Details regarding the study selection process to obtain the final 46 studies included in this meta-analysis are provided in Figure 1.

### Study Characteristics

Table 1 presents the characteristics for each of the 46 studies included in these analyses. Thirty studies were conducted between 2010–2017, and an additional 16 studies were conducted following October 2017, which was the latest inclusion date from the most recently published

meta-analysis on MBPs (see Dunning et al., 2019). Furthermore, studies were conducted globally; of the 46 included studies, 56.52% were from the United States; 6.52% each from Canada and the UK; 4.35% each from China, Spain, India, or New Zealand; and 2.17% each from Australia, Italy, Norway, Taiwan, Israel, and Germany.

**Risk of Bias Within Studies**

Figure 2 presents the frequency of each level of risk (Low, Unclear, High) for each of the domains assessed. As can be seen in Figure 2, the majority of studies had ratings of "Unclear" across most of the risk of bias categories including for selection bias, detection bias, and reporting bias. In terms of attrition bias, studies were primarily rated as being either "low risk" or "unclear". Finally, the majority of studies were rated as being at "high risk" of performance bias.

**Synthesis of Results**

Table 2 presents the effect sizes (Hedges' *g*) and associated significance test and heterogeneity statistics for pre-post and pre-follow-up differences between MBPs and control groups. Table 3 presents the results for the analyses when comparing MBPs to specific types of comparison groups. Given the small number of studies that assessed outcomes at follow-up, analyses were only conducted on overall school adjustment outcomes and mindfulness outcomes; no subgroup or moderator analyses were conducted. The studies in these analyses were used to make inferences to a broader population of comparable studies on MBPs; therefore, a random-effects model was used for each analysis.

***Overall School Adjustment Outcomes***

When investigating the effectiveness of MBPs as compared to control groups on school adjustment outcomes, results revealed a significant small effect size pre-post ($n = 46$; Hedges' $g = 0.19$, 95% CI [0.10, 0.27], $p < .001$) but this was no longer significant at follow-up ($n = 7$;

Hedges' $g$ = 0.08, 95% CI [-0.05, 0.21], $p$ = .21. In terms of heterogeneity, the null hypothesis that the true effect size was identical in all the studies at post-intervention was rejected, $Q$ = 111.39(45), $p$ < .001. The $I^2$ statistic was 59.6 at post-intervention, which indicated that 59.6% of the variance in observed effects was due to true variance rather than sampling error. Finally, the 95% prediction interval was -0.24 to 0.62 at post-intervention, which indicated that, in the universe of populations to which these results are being generalized, the true effect size would fall within this range 95% of the time. Given that the mean effect size at post-intervention was 0.19, MBPs had a small impact on overall school adjustment outcomes post-intervention; however, there is a wide dispersion of effects around this mean, with some studies reporting greater benefits in the comparison groups given the negative lower limit of the prediction interval. At follow-up, we failed to reject the null hypothesis that all included studies shared an identical effect size, $Q$ = 3.17(6), $p$ = .79. However, it could still be assumed that the effect sizes varied slightly although this variation would be minimal (Borenstein, 2019).

***Specific School Adjustment Outcomes***

Results from subgroup analyses on the specific school adjustment outcomes revealed that as compared to control groups, MBPs had a significant small post-intervention effect on academic performance ($n$ = 9; Hedges' $g$ = 0.19, 95% CI [0.00, 0.38], $p$ = .05) and impulsivity ($n$ = 12; Hedges' $g$ = 0.19, 95% CI [0.03, 0.35], $p$ = .02) and a small to moderate effect on attention ($n$ = 16; Hedges' $g$ = .31, 95% CI [0.17, 0.46], $p$ < .001). However, no significant effects were found for interpersonal skills, school functioning, or student behaviour. Due to a lack of studies assessing outcomes at follow-up, no analyses were conducted to assess the effect of MBPs on specific school adjustment outcomes at follow-up. The heterogeneity statistics are presented in

Table 2; based on the prediction intervals, moderate dispersion of the effects around the mean could be observed.

***Mindfulness Outcomes***

Of the 46 studies in this meta-analysis, only 19 (i.e., 41 %) studies assessed mindfulness as an outcome of the MBP at post-intervention and only three studies assessed mindfulness as an outcome of the MBP at follow-up. Results of the effect of MBPs on mindfulness outcomes compared to control groups demonstrated a moderate significant effect at post (Hedges' $g = 0.5$, 95% CI [0.25, 0.74], $p < .001$) and a small to moderate effect at follow-up (Hedges' $g = 0.32$, 95% CI [0.07, 0.57], $p = .01$). However, based on the prediction intervals, wide dispersion around the mean effect size could potentially be observed in the universe of studies being generalized to; therefore, the impact of MBPs on mindfulness outcomes as compared to a control group could be moderate to strong.

***Comparison Groups***

One of the objectives of this meta-analysis was also to investigate the effectiveness of MBPs as compared to different types of control groups within a randomized controlled design. When comparing to business-as-usual control groups, MBPs were significantly more effective in terms of overall school adjustment ($n = 37$; Hedges' $g = 0.23$, 95% CI [0.13, 0.33], $p < .001$) and mindfulness outcomes ($n = 13$, Hedges' $g = 0.61$, 95% CI [0.3, 0.92], $p < .001$). In terms of specific school adjustment outcomes, MBPs were significantly more effective than business-as-usual control groups only for academic performance ($n = 8$; Hedges' $g = 0.23$, 95% CI [0.08, 0.38], $p = .003$) and attention skills ($n = 11$, Hedges' $g = 0.36$, 95% CI [0.17, 0.55], $p < .001$). As indicated in Table 3, MBPs were not significantly different than active control groups on any outcomes included in this meta-analysis.

### *Education Level*

When examining whether students' educational level had an impact on the effectiveness of MBPs as compared to a control group post-intervention, results were as follows. For students at the preschool level, MBPs had no significant effect on overall school adjustment outcomes ($n$ = 3) and none of the studies included in this meta-analysis assessed mindfulness outcomes within this age group (see Table 2). For students at the elementary level, although MBPs had no significant effect on overall school adjustment ($n$ = 15), they resulted in a significant increase in mindfulness ($n$ = 4, Hedges' $g$ = 0.53, 95% CI [0, 1.05], $p$ = .05). For students in middle or high school, MBPs had a significant effect both on overall school adjustment outcomes ($n$ = 11; Hedges' $g$ = 0.22, 95% CI [0.03, 0.41], $p$ = .03) and mindfulness outcomes ($n$ = 5, Hedges' $g$ = 0.96, 95% CI [0.48, 1.45], $p$ < .001). Finally, for students at the undergraduate level, MBPs had a significant effect on overall school adjustment outcomes ($n$ = 17; Hedges' $g$ = 0.26, 95% CI [0.11, 0.41], $p$ = .001) but not on mindfulness outcomes ($n$ = 10).

### *Type of Intervention*

When examining whether the different types of intervention influenced the effect of MBPs post-intervention, studies using an existing mindfulness program (e.g., *Mindfulness in Schools Program* (also known as .b), or *MindUp*) had a significant effect on overall school adjustment outcomes ($n$ = 13; Hedges' $g$ = 0.22, 95% CI [0.06, 0.38], $p$ = .01) but not on mindfulness outcomes ($n$ = 6; see Table 2). Meanwhile, in studies that specifically reported using an adaptation of an existing program, there was aa significant effect both on overall school adjustment ($n$ = 18; Hedges' $g$ = 0.16, 95% CI [0.02, 0.31], $p$ = .03) and mindfulness outcomes ($n$ = 8; Hedges' $g$ = 0.41, 95% CI [0, 0.81], $p$ = .05). Studies using researcher-designed programs had no significant effect on overall school adjustment outcomes ($n$ = 12) but did have a

significant effect on mindfulness outcomes ($n$ = 4; Hedges' $g$ = 0.93, 95% CI [0.35, 1.50], $p$ = .002). Finally, studies using only one mindfulness activity had no significant effect on either overall school adjustment ($n$ = 3) or mindfulness outcomes ($n$ = 1).

### *Facilitator*

The influence of the type of facilitator and their previous experience with mindfulness on MBPs' effect post-intervention was also investigated. Interestingly, outside facilitators with previous experience were the only facilitators who had a significant effect on either overall school adjustment ($n$ = 17; Hedges' $g$ = 0.27, 95% CI [0.12, 0.42], $p$ = .001) or mindfulness outcomes ($n$ = 6; Hedges' $g$ = 0.82, 95% CI [0.32, 1.32], $p$ = .001) when delivering MBPs. As reported in Table 2, no significant effects were found for outside facilitators with no previous experience, classroom teachers with or without previous experience, programs using only audio recordings, or studies where the facilitator was not specified.

## Publication Bias

Visual inspection of the funnel plot suggests a symmetrical distribution of studies around the overall mean effect (see Figure 3). When asymmetry is present in the funnel plot, Duval and Tweedie's Trim and Fill method trims the asymmetric studies using an iterative procedure to estimate the unbiased overall effect before imputing the missing studies on the other side of the mean effect size and calculating an adjusted overall effect size. The potential for bias is present when the adjusted effect size shifts to the left of the overall mean effect size in the funnel plot. Using this method, the observed mean effect size and the adjusted mean effect size were identical (Hedges' $g$ = 0.23, 95% CI [0.19, 0.27]), which suggests that no studies are missing and therefore the risk of publication bias is low.

## Discussion

The overall purpose of this meta-analysis was to investigate whether MBPs for students were effective at enhancing educational and mindfulness outcomes when using a rigorous randomized controlled design. Furthermore, the potential influence of study and program characteristics were considered, including the role of different comparison groups, students' educational level, the type of program being used, and the facilitator's training and previous mindfulness experience. A total of 46 studies with students from preschool to undergraduate levels were included in the final analyses.

### Effectiveness of MBPs

The overall effect of MBPs as compared to control groups post-intervention was small for overall school adjustment outcomes. When examining specific school adjustment outcomes, the effects were small for academic performance and impulsivity and small to moderate for attention skills. Finally, moderate effect sizes were found for mindfulness outcomes. These small to moderate effect sizes are consistent with effect sizes found in previous meta-analyses of MBPs with youth or in educational contexts; however, they are particularly informative in the present context given the rigorous design of the studies included (e.g., Carsley et al., 2018; Halladay et al., 2019; Zenner et al., 2014; Zoogman et al., 2015). Therefore, these findings build on previous literature and offer promising evidence of the impact of MBPs on educational outcomes.

A compelling addition to the current meta-analysis was the consideration of prediction intervals for each outcome, which revealed moderate to large dispersion of the true effect size in the population of comparable studies. When looking at the overall effects for each outcome, the lower limit of the prediction intervals was negative, suggesting that, although the mean effect size in this meta-analysis was in the expected direction with MBPs outperforming control groups

in outcomes of interest, there is a possibility that the true effect size in the population of studies may be in the opposite direction, with MBPs underperforming as compared to controls. However, given the variety of programs being offered in the included studies and that most MBPs used in educational settings are adapted from established manualized programs for adults, such as *Mindfulness-Based Stress Reduction* (MBSR), this may be indicative of the need for further investigation on refining these adaptations for students (e.g., Carsley et al., 2018; Semple et al., 2017).

Interestingly, in outcome areas that were more social or behavioural, such as interpersonal skills, school functioning, or student behavior, no significant effects were found. Although there is some evidence in the literature to support the benefits of MBPs on these types of outcomes (e.g., Flett et al., 2018; Lawlor, 2016; Mendelson et al., 2010; Moreno-Gómez & Cejudo, 2019; Schonert-Reichl et al., 2015; Zhang et al., 2018), the present findings are of particular interest given the stronger reliability of meta-analytic evidence. Additionally, the lack of significant effects for student behavioural outcomes is consistent with findings from a meta-analysis by Maynard and colleagues (2017) on students from pre-school to high school in studies using a variety of designs. Therefore, pending replication in studies using randomized and controlled designs, the current study's non-significant findings suggest that MBPs may not offer direct benefits to social and behavioural outcomes, which is not particularly surprising conceptually given that these types of outcomes are more distal than outcomes such as attention or impulsivity. However, as a greater number of studies assess social and behavioural functioning as part of their MBP outcomes, it will be important to replicate these findings.

Finally, findings from this meta-analysis indicated that MBPs had a significantly greater overall effect on mindfulness outcomes as compared to control groups overall. This provides

further evidence of mindfulness-based programs' success at effectively teaching mindfulness skills when looking at studies conducted across thirteen countries.

**Effectiveness Across Comparison Group Types**

When compared to different types of comparison groups, results indicated MBPs did not significantly differ from active control conditions (i.e., groups who received a non-mindfulness-based program during the intervention period) on any educational or mindfulness outcomes assessed; however, significant differences emerged when comparing MBPs to business-as-usual comparison groups (i.e., groups that did not receive any type of program during the intervention period). This could perhaps be explained by the fact that the great majority of MBPs for students are offered in an educational context. Therefore, although not directly providing mindfulness instruction, the active control conditions that are offered might be incorporating components that indirectly target outcomes similar to those in the mindfulness conditions. For example, within the current meta-analysis, some of the active conditions sought to improve students' concentration skills, reduce classroom disruption, and have group discussions about emotion awareness and acceptance, which might all be related to outcomes similar to those targeted by MBPs (e.g., Long et al., 2018; Rahl et al., 2017; Wimmer et al., 2016).

Furthermore, this lack of a significant difference between MBPs and active control conditions is consistent with relatively recent meta-analytic findings by Dunning and colleagues (2019) who compared the effect of MBPs to active control conditions in studies with children and adolescents and found a significant effect on mindfulness and psychological outcomes (i.e., depression, anxiety, and stress) but not on educational outcomes (i.e., social behaviour, problematic behaviour, executive functioning, or attention). Although these meta-analyses present discrepant findings in terms of mindfulness outcomes, this could be explained by the

different populations targeted. Specifically, the studies in the meta-analysis by Dunning and colleagues (2019) included both clinical and non-clinical samples and it has been suggested that effect sizes for MBPs may be stronger within clinical samples (Zoogman et al., 2015).

Altogether, these findings suggest the need for caution in our use of MBPs with students, especially when considering the growing enthusiasm that has been building around mindfulness-based skills-building over the past few years (e.g., Singh & Singh Joy, 2021). Pending replication, it would seem that MBPs are effective when compared to business-as-usual comparison groups; however, active control groups show similar benefits on mindfulness and educational outcomes. Therefore, it would be important for future studies to further investigate the mechanisms through which these programs are effective in order to isolate potential active components.

**Impact of Educational Level**

While investigating the effect of MBPs on mindfulness outcomes or overall school adjustment outcomes across students' educational levels, an interesting pattern was observed. Specifically, MBPs with elementary students had a significant effect on mindfulness outcomes, MBPs with middle or high school students were effective on both mindfulness and school adjustment outcomes, and, finally, MBPs with university students only had a significant effect on educational outcomes.

It is possible that greater compliance with the research or program design may be achievable with elementary and middle or high school students given that MBPs at this educational level are typically embedded in classrooms as part of the general curriculum; therefore, it may be easier for MBPs to successfully improve mindfulness for students at these levels. However, when it comes to school adjustment outcomes, students at the elementary level

might not benefit as much given that (a) their academic demands are lower as compared to students in high school or university settings and (b) they might be less developmentally capable of making the generalization required to transfer mindfulness skills to school adjustment outcomes without direct instruction.

Meanwhile, at the university level, research teams may have less control over participants' adherence to the program being offered; therefore, MBPs may not be as effective at targeting mindfulness skills specifically. Rather, university students may be using the skills taught through MBPs to manage demanding school situations rather than as a contemplative practice; thus, MPBs may be functioning as more general mental health programs that affect overall school adjustment outcomes.

**Impact of Type of MBP**

The type of MBP also had an impact on which outcomes were affected by the program. Specifically, MBPs that used existing programs or adaptations of existing programs were effective at improving overall school adjustment. Surprisingly, MBPs using existing programs were not effective at improving mindfulness; only MBPs using adaptations or researcher-designed programs were effective. A possible explanation could be that existing programs usually rely on the facilitator's understanding of and experience with mindfulness while also being manualized so that mindfulness training is embedded within a larger psychoeducational context. Therefore, facilitators with less training and personal mindfulness practice may focus more heavily on these psychoeducational components. Meanwhile, researcher-designed programs, although less rigorously validated than pre-existing programs, would potentially be more effective at increasing mindfulness but not school adjustment outcomes because the focus is on training students in how to use mindfulness skills. Similarly, adaptations of existing

programs may be more successful than existing programs at improving students' mindfulness given that these tend to have been adapted specifically to their context.

**Impact of Facilitator**

Results from this meta-analysis suggest that the MBP facilitator's training and previous experience with mindfulness may be an important factor to consider. Specifically, MBPs only had a significant effect on overall school adjustment or mindfulness outcomes when delivered by an outside facilitator with previous mindfulness experience, which is unsurprising given that outside facilitators are usually from the research team delivering the program and thus more likely to adhere to the study protocol while maintaining program fidelity. Furthermore, this is consistent with established good practice standards and guidelines for existing manualized programs for adults such as MBSR or *Mindfulness-Based Cognitive Therapy*, which specify that facilitators should have an established personal practice, extensive training, and ongoing supervision (e.g., Crane et al., 2017; Kabat-Zinn, 2003). However, it is surprising that none of the other types of facilitators had a significant effect on outcomes. For instance, previous meta-analyses have found outside facilitators of school-based MBPs had a significant impact on mindfulness outcomes while classroom teachers had a greater effect on non-mindfulness related outcomes (Carsley et al., 2018). However, whereas Carsley and colleagues (2018) focused on MBPs for children and adolescents, the current meta-analysis included a broader range of age groups from preschool to undergraduate students. Therefore, this discrepancy might be indicative of the need to investigate the impact of the facilitator's training and experience within specific educational levels as the field continues to grow and more studies are conducted assessing the impact of MBPs on educational outcomes.

**Limitations & Future Directions**

It is important to note that, although meta-analyses can be powerful tools to investigate systematic differences, there are some limitations. For instance, the differences identified amongst levels within potential moderators are correlational, not causational (Borenstein, 2019). Therefore, more research is needed with rigorous experimental designs to directly investigate the differences between educational levels, types of MBPs, or levels of training for facilitators. Beyond using randomized controlled designs, future studies should also include different kinds of comparison groups simultaneously to better be able to differentiate what aspects of MBPs are effective (Davidson & Kaszniak, 2015).

Additionally, there were a small number of studies included in some of the analyses in the current study (e.g., only three studies at the preschool level when examining effects within educational levels), making generalization of the results difficult in some instances. As the field of mindfulness research continues to grow, it is important to continue investigating the impact of MBPs on a broader variety of outcomes (e.g., educational, physiological, neurological) to better understand how to use MBPs in different contexts as well as to improve the acceptability of these programs with different stakeholders (Felver et al., 2016; Klingbeil et al., 2017; Meiklejohn et al., 2012; Schonert-Reichl & Roeser, 2016). Although the present study refers to specific aspects of school adjustment, this is a broad construct that encompasses additional educational and psychosocial outcomes, including pro-social behaviours, motivation, and school stress; therefore, additional research is needed to further investigate the potential influence of MBPs on broader educational outcomes.

Furthermore, the investigation of possible gender differences in the experience of mindfulness and in response to MBPs is a growing area of interest, with mixed findings from

empirical studies suggesting a need for a meta-analytic understanding of what factors may be contributing to these differences (e.g., Bluth et al., 2017; Carsley et al., 2018; Katz & Toner, 2013). Unfortunately, there is a lack of studies investigating gender differences or reporting the descriptive statistics for such analyses; therefore, future studies should consider including this information in publications.

Similarly, an increasingly recognized problem in the field is the lack of assessment of mindfulness as a direct outcome of MBPs. For instance, only 41.3% of the studies included in the present meta-analysis directly assessed mindfulness as an outcome of the MBPs delivered, with previous meta-analyses reporting even lower rates of MBPs assessing mindfulness as an outcome (e.g., Dunning et al., 2019). Thus, it is important for future studies to routinely incorporate assessments of mindfulness as an outcome of MBPs to enable the identification of processes of therapeutic change for MBPs (Baer, 2011).

Finally, existing MBPs can be lengthy and difficult to implement in educational contexts especially when educators are under great pressure to teach a curriculum. Therefore, there may be merit in investigating how brief a program can be while still having a meaningful impact. A review by Carmody and Baer (2009) reported preliminary evidence that shortened versions of an established MBP for adults, MBSR, were not less effective in terms of distress reduction. Although this is an intriguing avenue for further research, it underscores the need for more dose-response relationships in MBPs to better understand how much mindfulness training or practice is both efficacious and acceptable to different samples (e.g., Schonert-Reichl & Roeser, 2016). Beyond comparing MBPs to control groups, there is a need to replicate and directly compare MBPs to one another while also reporting participants' adherence to practice and length of practice to deepen our understanding of which processes are actively contributing to both short-

term and long-term therapeutic outcomes (e.g., Carmody & Baer, 2009; Dunning et al., 2019; Felver et al., 2016).

**Conclusions**

In conclusion, this meta-analysis provides promising evidence of the effectiveness of MBPs in educational contexts to improve students' school adjustment outcomes beyond typically assessed psychological or mental health benefits even when using rigorous randomized controlled designs. Notably, MBPs may be particularly beneficial at improving attention skills, academic performance, and difficulties with impulsivity while not having a significant impact on interpersonal skills, school functioning, or student behaviour. Interestingly, the benefits of MBPs were only apparent when comparing to business-as-usual control groups and disappeared when comparing to active control groups, which indicates the need for further research with carefully selected active control groups to parse out the true benefits of mindfulness-based training when compared to other types of programs being offered.

Nevertheless, what we do know is that the design of MBPs is particularly important to achieve desired outcomes. Results from the current meta-analysis suggest that MBPs seem to be particularly effective at improving both students' mindfulness and school adjustment outcomes when delivered (a) in middle or high school, (b) by an outside facilitator with previous mindfulness experience, and (c) using an adaptation of an existing program. Overall, these findings significantly contribute to our theoretical understanding of mindfulness and how it can be taught to students at different educational levels while also highlighting the need for further systematic research using stringent methodologies.

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## Supplementary materials: PRISMA checklist

| Section/topic | # | Checklist item | Reported on page # |
|---|---|---|---|
| **TITLE** | | | |
| Title | 1 | Identify the report as a systematic review, meta-analysis, or both. | 2 |
| **ABSTRACT** | | | |
| Structured summary | 2 | Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number. | 1 |
| **INTRODUCTION** | | | |
| Rationale | 3 | Describe the rationale for the review in the context of what is already known. | 2-9 |
| Objectives | 4 | Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS). | 9-10 |
| **METHODS** | | | |
| Protocol and registration | 5 | Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number. | NA |
| Eligibility criteria | 6 | Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale. | 10-11 |
| Information sources | 7 | Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched. | 11 |
| Search | 8 | Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated. | 11 |
| Study selection | 9 | State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis). | 11-12 |
| Data collection process | 10 | Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators. | 12 |
| Data items | 11 | List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made. | 12 |
| Risk of bias in individual studies | 12 | Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis. | 13-14 |
| Summary measures | 13 | State the principal summary measures (e.g., risk ratio, difference in means). | 12 |

| Section/topic | # | Checklist item | Reported on page # |
|---|---|---|---|
| Synthesis of results | 14 | Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., $I^2$) for each meta-analysis. | 12-13 |
| Risk of bias across studies | 15 | Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies). | 14 |
| Additional analyses | 16 | Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified. | 12-13 |
| **RESULTS** | | | - |
| Study selection | 17 | Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram. | 14 |
| Study characteristics | 18 | For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations. | 14-15 |
| Risk of bias within studies | 19 | Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12). | 15 |
| Results of individual studies | 20 | For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot. | 15-19 |
| Synthesis of results | 21 | Present results of each meta-analysis done, including confidence intervals and measures of consistency. | 15-19 |
| Risk of bias across studies | 22 | Present results of any assessment of risk of bias across studies (see Item 15). | 19 |
| Additional analysis | 23 | Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]). | 15-19 |
| **DISCUSSION** | | | |
| Summary of evidence | 24 | Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers). | 19-25 |
| Limitations | 25 | Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias). | 25-27 |
| Conclusions | 26 | Provide a general interpretation of the results in the context of other evidence, and implications for future research. | 27-28 |
| **FUNDING** | | | |
| Funding | 27 | Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review. | NA |

*From:* Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PloS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097. For more information, visit: **www.prisma-statement.org**.

**Table 1**

*Study Characteristics for Each of the Studies Included in the Meta-analysis*

| **Study name/ Country of origin** | **Tx type (*n*)** | **Comparison type (*n*)** | **Education level** | **Facilitator & previous experience** | **Outcomes assessed** | **Time points** |
|---|---|---|---|---|---|---|
| Bazzano et al., 2018 / USA | Existing program (20) | - BAU (32) | Elementary | Outside – previous mindfulness | - Interpersonal skills<br>- School Adjustment | - Post<br>- Follow-up |
| Becerra et al., 2017 / Australia | Researcher-designed (23) | - BAU (23) | Undergraduate | Not specified | - Attention | - Post |
| Bennett & Dorjee, 2016 / UK | Existing program (11) | - BAU (13) | Middle/High School | Outside – previous mindfulness | - Academic performance<br>- School adjustment<br>- Student behaviour | - Post<br>- Follow-up |
| Bergen-Cico et al., 2015 / USA | Adaptation (72) | - BAU (72) | Elementary | Classroom teacher – previous mindfulness | - Impulsivity | - Post |
| Bluth et al., 2016a / USA | Adaptation (14) | - Active control (13) | Middle/High School | Outside – previous mindfulness | - Interpersonal skills | - Post |
| Bluth et al., 2016b / USA | Existing program (16) | - BAU (18) | Middle/High School | Outside – previous mindfulness | - Interpersonal skills | - Post |
| Britt et al., 2018 / USA | Adaptation (133) | - BAU (144) | Undergraduate | Classroom teacher – no previous mindfulness | - Academic Performance | - Post |
| Britton et al., 2015 / USA | Researcher-designed (52) | - Active control (48) | Elementary | Classroom teacher – previous mindfulness | - Attention<br>- Mindfulness<br>- Student behaviour | - Post |
| Burger & Lockhart, 2017 / USA | Researcher-designed (28) | - BAU (24) | Undergraduate | Audio Recordings | - Attention<br>- Mindfulness | - Post |

| | | | | | | |
|---|---|---|---|---|---|---|
| Butzer et al., 2017 / USA | Adaptation (114) | - BAU (91) | Middle/High School | Outside – previous mindfulness | - Impulsivity | - Post<br>- Follow-up |
| Crescentini et al., 2016 / Italy | Adaptation (16) | - Active control (15) | Elementary | Outside – previous mindfulness | - Attention<br>- Impulsivity<br>- Interpersonal skills<br>- Student behaviour | - Post |
| DeVibe et al., 2013 / Norway | Adaptation (144) | - BAU (144) | Undergraduate | Outside – previous mindfulness | - Mindfulness<br>- School Adjustment | - Post |
| Dvoráková et al., 2017 / USA | Adaptation (55) | - BAU (54) | Undergraduate | Outside – no previous mindfulness | - Interpersonal skills<br>- Mindfulness | - Post |
| Felver et al., 2018 / USA | Existing program (16) | - BAU (11) | Middle/High School | Outside – previous mindfulness | - Academic Performance<br>- Student behaviour | - Post |
| Flett et al., 2018 / New Zealand | Existing program (72) | - 2nd Intervention (63)<br>- Active control (73) | Undergraduate | Not specified | - Mindfulness<br>- School Adjustment | - Post<br>- Follow-up |
| Flook et al., 2010 / USA | Researcher-designed (32) | - BAU (32) | Elementary | Not specified | - Student behaviour | - Post |
| Flook et al., 2015 / USA | Existing program (30) | - BAU (38) | Preschool | Outside – previous mindfulness | - Academic Performance<br>- Attention<br>- Impulsivity<br>- Interpersonal skills | - Post |
| Fung et al., 2016 / USA | Adaptation (9) | - BAU (10) | Middle/High School | Outside – no previous mindfulness | - Student behaviour | - Post |

| | | | | | | |
|---|---|---|---|---|---|---|
| Fung et al., 2019 / USA | Adaptation (79) | - BAU (66) | Middle/High School | Outside – no previous mindfulness | - Attention<br>- Student behaviour | - Post |
| Hagins & Rundle, 2016 / USA | Existing program (48) | - Active control (64) | Middle/High School | Classroom teacher – previous mindfulness | - Academic Performance<br>- Mindfulness | - Post |
| Helber et al., 2012 / USA | Researcher-designed (18) | - BAU (13) | Undergraduate | Classroom teacher – previous mindfulness | - Attention | - Post |
| Lin & Mai, 2018 / Taiwan | One activity (42) | - BAU (35) | Undergraduate | Classroom teacher – previous mindfulness | - Academic Performance | - Post |
| Long et al., 2018 / USA | Researcher-designed (22) | - Active control (25)<br>- BAU (26) | Elementary | Classroom teacher – no previous mindfulness | - School Adjustment<br>- Student behaviour | - Post |
| Lu et al., 2019 / China | Adaptation (21) | - BAU (28) | Elementary | Not specified | - Interpersonal skills<br>- Mindfulness | - Post |
| Mendelson et al., 2010 / USA | Existing program (51) | - BAU (46) | Elementary | Outside – previous mindfulness | - Impulsivity<br>- Interpersonal skills<br>- School Adjustment | - Post |
| Modi et al., 2018 a / India | Researcher-designed (10) | - BAU (10) | Middle/High School | Outside – previous mindfulness | - Attention | - Post |
| Modi et al., 2018 b / India | Researcher-designed (50) | - BAU (50) | Middle/High School | Outside – previous mindfulness | - Impulsivity<br>- Mindfulness | - Post |
| Moir et al., 2016 / New Zealand | Researcher-designed (111) | - BAU (121) | Undergraduate | Outside – no previous mindfulness | - Impulsivity<br>- School Adjustment | - Post |

| | | | | | | |
|---|---|---|---|---|---|---|
| Moreno-Gomez & Cejudo, 2019 / Spain | Existing program (48) | - BAU (26) | Elementary | Classroom teacher – no previous mindfulness | - Academic Performance<br>- Attention<br>- Impulsivity<br>- Interpersonal skills<br>- School Adjustment<br>- Student behaviour | - Post |
| Morrison et al., 2014 / USA | Adaptation (30) | - BAU (28) | Undergraduate | Outside – previous mindfulness | - Attention | - Post |
| Poehlmann-Tynan et al., 2016 / USA | Adaptation (13) | - BAU (12) | Preschool | Outside – previous mindfulness | - Impulsivity<br>- Interpersonal skills | - Post<br>- Follow-up |
| Rahl et al., 2017 / USA | One activity (41) | - 2nd Intervention (41)<br>- Active control (38)<br>- Passive control (22) | Undergraduate | Audio Recordings | - Attention | - Post |
| Ramler et al., 2016 / USA | Adaptation (29) | - BAU (26) | Undergraduate | Outside – previous mindfulness | - Mindfulness<br>- School Adjustment | - Post |
| Ricarte et al., 2015 / Spain | Adaptation (45) | - BAU (45) | Elementary | Not specified | - Attention | - Post |
| Sanger et al., 2018 / UK | Existing program (19) | - BAU (21) | Undergraduate | Classroom teacher – no previous mindfulness | - Interpersonal skills<br>- Mindfulness | - Post |
| Schonert-Reichl et al., 2015 / Canada | Existing program (48) | - BAU (51) | Elementary | Classroom teacher – no previous mindfulness | - Interpersonal skills<br>- Mindfulness<br>- School Adjustment | - Post |
| Shapiro et al., 2011 / USA | Adaptation (15) | - BAU (15) | Undergraduate | Not specified | - Interpersonal skills<br>- Mindfulness | - Post<br>- Follow-up |
| Sibinga et al., 2016 / USA | Adaptation (159) | - Active control (141) | Middle/High School | Outside – previous mindfulness | - Mindfulness<br>- Student behaviour | - Post |

| | | | | | | |
|---|---|---|---|---|---|---|
| Tarrasch, 2018 / Israel | Researcher-designed (58) | - BAU (43) | Elementary | Outside – no previous mindfulness | - Attention<br>- Impulsivity | - Post |
| Thomas & Atkinson, 2016 / UK | Existing program (16) | - BAU (14) | Elementary | Outside – previous mindfulness | - Attention | - Post |
| Viglas & Perlman, 2018 / Canada | Existing program (72) | - BAU (55) | Elementary | Outside – no previous mindfulness | - Impulsivity<br>- Interpersonal skills<br>- Student behaviour | - Post |
| Walsh et al., 2019 / Canada | Researcher-designed (45) | - Active control (41) | Undergraduate | Audio Recordings | - Attention<br>- Interpersonal skills<br>- Mindfulness | - Post |
| Wimmer et al., 2016 / Germany | Adaptation (16) | - Active control (8)<br>- Passive control (10) | Elementary | Outside – no previous mindfulness | - Attention | - Post |
| Yamada & Victor, 2012 / USA | One activity (37) | - BAU (23) | Undergraduate | Not specified | - Academic Performance<br>- Mindfulness | - Post |
| Zelazo et al., 2018 / USA | Researcher-designed (74) | - Active control (76)<br>- BAU (68) | Preschool | Classroom teacher – no previous mindfulness | - Academic Performance<br>- Impulsivity | - Post<br>- Follow-up |
| Zhang et al., 2018 / China | Adaptation (34) | - BAU (16) | Undergraduate | Not specified | - Interpersonal skills<br>- Mindfulness | - Post |

*Note.* BAU = business/treatment as usual

**Table 2**

*Effect Sizes (Hedge's g) and Heterogeneity Statistics Along with Associated Significance Tests*

| Analysis | Subgroup | Outcomes | Time Point | *n* | *g* | 95% CI [LL, UL] | *p* | Heterogeneity statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | *Q(df), p* | $I^2$ (%) | $T^2$ | *T* | Prediction interval (95%) |
| Overall effects | | Overall school adjustment | Post | 46 | 0.19 | [0.10,0.27] | < .001 | 111.39(45), $p$ < .001 | 59.60 | 0.04 | 0.21 | -0.24, 0.62 |
| | | | Follow-up | 7 | 0.08 | [-0.05, 0.21] | .210 | 3.17(6), $p$ = .787 | 0 | 0 | 0 | -0.09, 0.26 |
| | | Academic performance | Post | 9 | 0.19 | [0.00, 0.38] | .051 | 6.14(8), $p$ =.632 | 0 | 0 | 0 | -0.04, 0.42 |
| | | Attention | Post | 16 | 0.31 | [0.17, 0.46] | < .001 | 51.34(15), $p$ < .001 | 70.78 | 0.06 | 0.25 | -0.24, 0.87 |
| | | Self-regulation/ Impulsivity | Post | 12 | 0.19 | [0.03, 0.35] | .020 | 79.07(11), $p$ < .001 | 86.09 | 0.13 | 0.36 | -0.63, 1.01 |
| | | Interpersonal skills | Post | 16 | 0.12 | [-0.04, 0.27] | .135 | 33.11(15), $p$ = .005 | 54.69 | 0.05 | 0.21 | -0.37, 0.61 |
| | | School functioning | Post | 10 | 0.14 | [-0.05, 0.32] | .144 | 17.30(9), $p$ = .044 | 47.96 | 0.02 | 0.16 | -0.28, 0.56 |
| | | Student behaviour | Post | 11 | 0.11 | [-0.07, 0.29] | .227 | 3.91(10), $p$ = .951 | 0 | 0 | 0 | -0.10, 0.32 |
| | | Mindfulness | Post | 19 | 0.50 | [0.25 0.74] | < .001 | 117.57(18), $p$ < .001 | 84.69 | 0.23 | 0.48 | -0.56, 1.55 |
| | | | Follow-up | 3 | 0.32 | [0.07, 0.57] | .013 | 1.56(2), $p$ = .458 | 0 | 0 | 0 | -1.30, 1.93 |
| Education level | Preschool | Overall school adjustment | Post | 3 | 0.12 | [-0.19, 0.44] | .450 | 2.16(2), $p$ = .340 | 7.28 | 0 | 0.04 | -2.00, 2.24 |
| | | Mindfulness | Post | - | - | - | - | - | - | - | - | - |
| | Elementary | Overall school adjustment | Post | 15 | 0.12 | [-0.03, 0.27] | .104 | 37.53(14), $p$ = .001 | 62.70 | 0.04 | 0.21 | -0.36, 0.61 |
| | | Mindfulness | Post | 4 | 0.53 | [0, 1.05] | .051 | 8.13(3), $p$ = .043 | 63.10 | 0.09 | 0.30 | -1.21, 2.26 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of MBP | Middle/High School | Overall school adjustment | Post | 11 | 0.22 | [0.03, 0.41] | .026 | 47.02(10), $p < .001$ | 78.73 | 0.15 | 0.38 | -0.67, 1.11 |
| | | Mindfulness | Post | 5 | 0.96 | [0.48, 1.45] | < .001 | 84.11(4), $p < .001$ | 95.24 | 1.05 | 1.02 | -2.39, 4.31 |
| | Undergraduate | Overall school adjustment | Post | 17 | 0.26 | [0.11, 0.41] | .001 | 23.21(16), $p = .108$ | 31.06 | 0.02 | 0.13 | -0.06, 0.58 |
| | | Mindfulness | Post | 10 | 0.26 | [-0.07, 0.60] | .125 | 6.47(9), $p = .692$ | 0 | 0 | 0 | -0.13, 0.66 |
| | Existing program | Overall school adjustment | Post | 13 | 0.22 | [0.06, 0.38] | .007 | 18.65(12), $p = .097$ | 35.67 | 0.01 | 0.12 | -0.10, 0.53 |
| | | Mindfulness | Post | 6 | 0.37 | [-0.09, 0.84] | .117 | 7.39(5), $p = .193$ | 32.31 | 0.02 | 0.16 | -0.42, 1.16 |
| | Adaptation | Overall school adjustment | Post | 18 | 0.16 | [0.02, 0.31] | .026 | 33.27(17), $p = .010$ | 48.90 | 0.03 | 0.18 | -0.25, 0.58 |
| | | Mindfulness | Post | 8 | 0.41 | [0, 0.81] | .048 | 10.56(7), $p = .159$ | 33.71 | 0.02 | 0.13 | -0.19, 1.01 |
| | One activity | Overall school adjustment | Post | 3 | 0.34 | [-0.04, 0.71] | .077 | 1.29(2), $p = .524$ | 0 | 0 | 0 | -2.07, 2.74 |
| | | Mindfulness | Post | 1 | 0.28 | [-0.87, 1.44] | .632 | - | - | - | - | - |
| | Researcher-designed | Overall school adjustment | Post | 12 | 0.17 | [0, 0.34] | .056 | 53.24(11), $p < .001$ | 79.34 | 0.12 | 0.34 | -0.62, 0.95 |
| | | Mindfulness | Post | 4 | 0.93 | [0.35, 1.50] | .002 | 94.93(3), $p < .001$ | 96.84 | 1.82 | 1.35 | -5.01, 6.86 |
| Facilitator | Outside – previous mindfulness | Overall school adjustment | Post | 17 | 0.27 | [0.12, 0.42] | .001 | 63.86(16), $p < .001$ | 74.95 | 0.10 | 0.32 | -0.43, 0.97 |
| | | Mindfulness | Post | 6 | 0.82 | [0.32, 1.32] | .001 | 97.22(5), $p < .001$ | 94.86 | 0.59 | 0.76 | -1.42, 3.06 |
| | Outside – no previous mindfulness | Overall school adjustment | Post | 7 | 0.07 | [-0.15, 0.29] | .527 | 10.09(6), $p = .121$ | 40.55 | 0.01 | 0.12 | -0.35, 0.49 |
| | | Mindfulness | Post | 2 | 0.29 | [-0.57, 1.14] | .512 | - | - | - | - | - |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Educator – previous mindfulness | Overall school adjustment | Post | 5 | 0.13 | [-0.14, 0.40] | .355 | 1.81(4), $p$ = .770 | 0 | 0 | 0 | -0.31, 0.57 |
| | Mindfulness | Post | 2 | 0.17 | [-0.68, 1.01] | .699 | - | - | - | - | - |
| Educator – no previous mindfulness | Overall school adjustment | Post | 6 | 0.18 | [-0.04, 0.41] | .110 | 15.23(5), $p$ = .009 | 67.16 | 0.04 | 0.20 | -0.46, 0.83 |
| | Mindfulness | Post | 2 | 0.42 | [-0.46, 1.30] | .348 | - | - | - | - | - |
| Audio recording | Overall school adjustment | Post | 3 | 0.17 | [-0.19, 0.53] | .364 | 3.54(2), $p$ = .170 | 43.54 | 0.04 | 0.19 | -3.23, 3.57 |
| | Mindfulness | Post | 2 | 0.27 | [-0.60, 1.14] | .540 | - | - | - | - | - |
| Not specified | Overall school adjustment | Post | 8 | 0.21 | [-0.04, 0.45] | .095 | 13.30(7), $p$ = .065 | 47.37 | 0.06 | 0.24 | -0.45, 0.86 |
| | Mindfulness | Post | 5 | 0.48 | [-0.08, 1.04] | .096 | 3.55(4), $p$ = .470 | 0 | 0 | 0 | -0.43, 1.39 |

*Note*. *N:* the number of studies included within each analysis.

**Table 3**

*Effect Sizes (Hedge's g) and Heterogeneity Statistics Along with Associated Significance Tests for Each Comparison Group Within Overall School Adjustment, Specific School Adjustment Outcomes, and Mindfulness Outcomes*

| Outcomes | Subgroup | *n* | *g* | 95% CI | *p* | Heterogeneity statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | *Q(df), p* | $I^2$ (%) | $T^2$ | *T* | Prediction interval (95%) |
| Overall school adjustment | BAU | 37 | 0.23 | [0.13, 0.33] | < .001 | 81.04(36) $p < .001$ | 55.58 | 0.06 | 0.25 | -0.28, 0.74 |
| | Active comparison | 11 | 0.08 | [-0.11, 0.27] | .410 | 4.21(10), $p = .937$ | 0.00 | 0.00 | 0.00 | -0.14, 0.30 |
| | Passive comparison | 2 | 0.46 | [-0.15, 1.08] | .138 | - | - | - | - | - |
| Academic performance | BAU | 8 | 0.23 | [0.08, 0.38] | .003 | 2.97(7), $p = .887$ | 0.00 | 0.00 | 0.00 | 0.04, 0.41 |
| | Active comparison | 2 | 0.03 | [-0.24, 0.30] | .813 | - | - | - | - | - |
| | Passive comparison | - | - | - | - | - | - | - | - | - |
| Attention | BAU | 11 | 0.36 | [0.17, 0.55] | < .001 | 18.42(10), $p = .048$ | 45.70 | 0.05 | 0.23 | -0.21, 0.93 |
| | Active comparison | 5 | 0.12 | [-0.17, 0.41] | .410 | 1.76(4), $p = .779$ | 0.00 | 0.00 | 0.00 | -0.35, 0.59 |
| | Passive comparison | 2 | 0.50 | [-0.07, 1.07] | .088 | - | - | - | - | - |
| Self-regulation/ Impulsivity | BAU | 11 | 0.23 | [-0.05, 0.51] | .104 | 62.62(10), $p < .001$ | 84.03 | 0.19 | 0.44 | -0.81, 1.28 |
| | Active comparison | 2 | 0.09 | [-0.61, 0.79] | .802 | - | - | - | - | |
| | Passive comparison | - | - | - | - | - | - | - | - | - |
| Interpersonal skills | BAU | 13 | 0.13 | [-0.04, 0.30] | .141 | 20.93(12), $p = .051$ | 42.65 | 0.05 | 0.22 | -0.39, 0.65 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Active comparison | 3 | 0.01 | [-0.40, 0.39] | .971 | 0.29(2), $p$ =.865 | 0.00 | 0.00 | 0.00 | -2.57, 2.55 |
| | Passive comparison | - | - | - | - | - | - | - | - | - |
| School functioning | BAU | 9 | 0.13 | [-0.06, 0.33] | .188 | 13.37(8), $p$ = .100 | 40.15 | 0.03 | 0.17 | -0.33, 0.59 |
| | Active comparison | 2 | 0.12 | [-0.31, 0.56] | .574 | - | - | - | - | - |
| | Passive comparison | - | - | - | - | - | - | - | - | - |
| Student behaviour | BAU | 8 | 0.12 | [-0.06, 0.29] | .186 | 2.53(7), $p$ = .924 | 0.00 | 0.00 | 0.00 | -0.10, 0.33 |
| | Active comparison | 4 | 0.11 | [-0.07, 0.29] | .248 | 0.29(3), $p$ = .962 | 0.00 | 0.00 | 0.00 | -0.29, 0.51 |
| | Passive comparison | - | - | - | - | - | - | - | - | - |
| Mindfulness | BAU | 13 | 0.61 | [0.30, 0.92] | < .001 | 109.22(12), $p$ < .001 | 89.01 | 0.41 | 0.64 | -0.84, 2.06 |
| | Active comparison | 6 | 0.27 | [-0.17, 0.71] | .234 | 6.38(5), $p$ = .271 | 21.68 | 0.01 | 0.10 | -0.41, 0.95 |
| | Passive comparison | - | - | - | - | - | - | - | - | - |

*Note*. BAU = Business as usual

**Figure 1**

*PRISMA Flow Chart of the Selection Process for Study Inclusion*

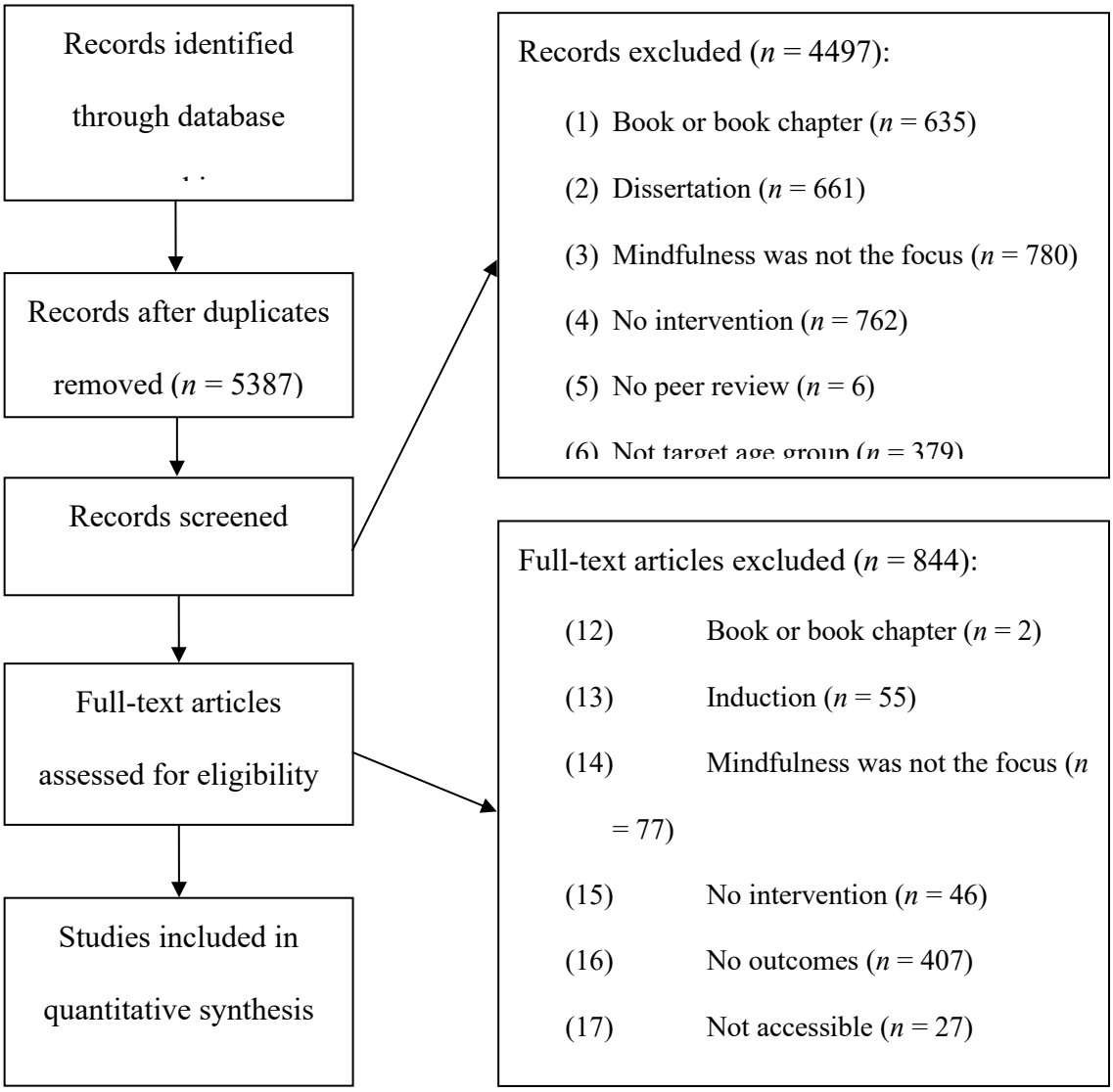


**Figure 2**

*Risk of Bias Graph Showing the Frequency of Each Level of Risk Across the Seven Domains Assessed*

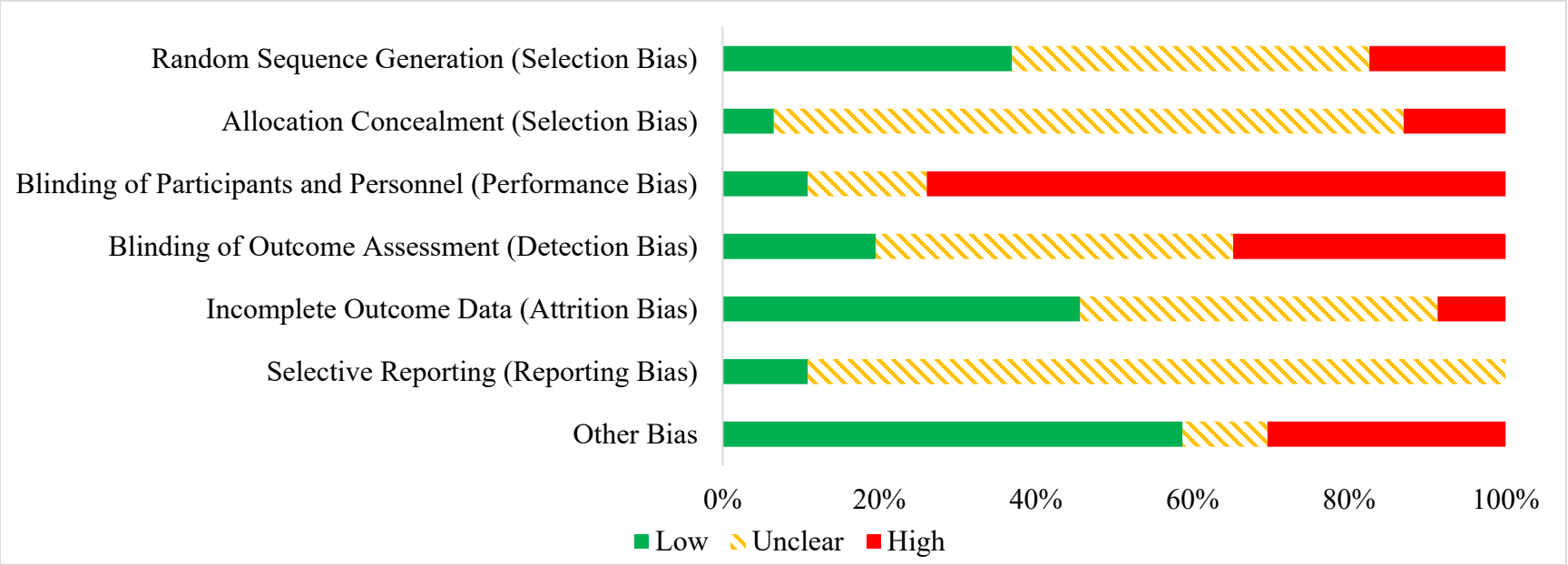
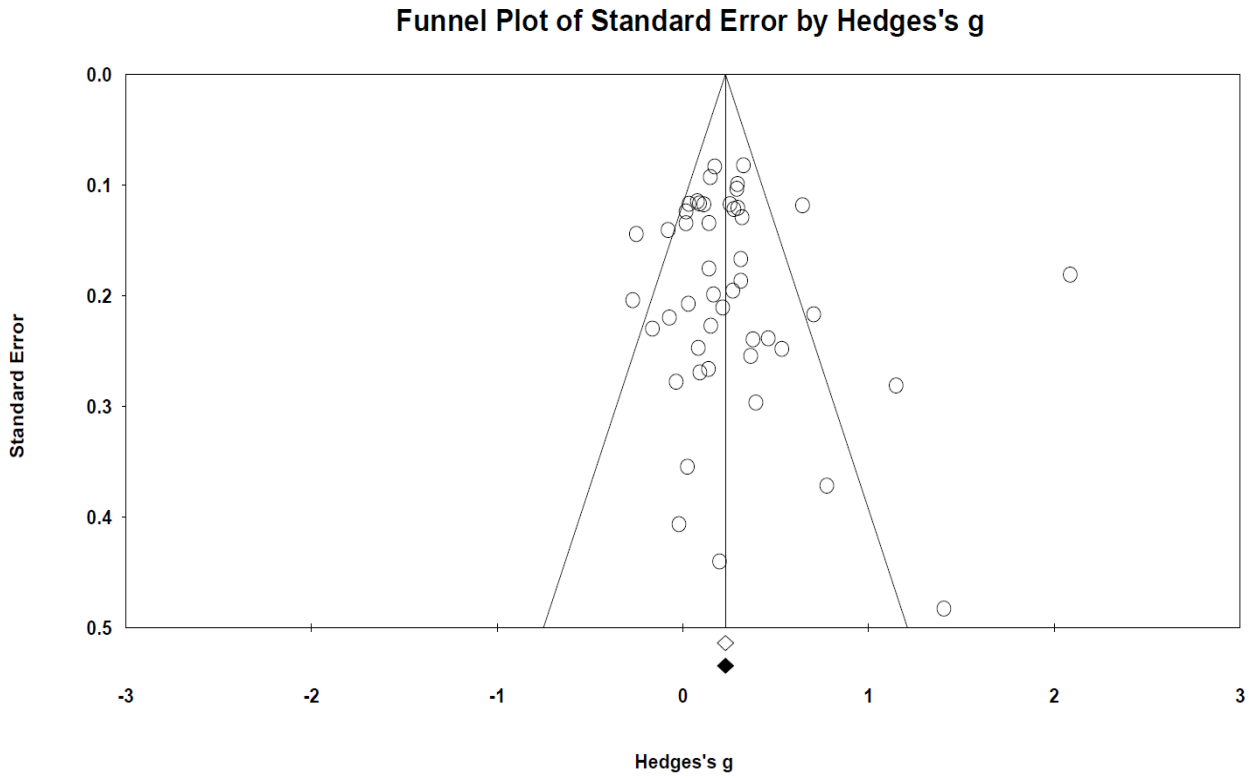


**Figure 3**

*Funnel Plot Assessing Publication Bias Based on Observed and Adjusted Mean Effect Sizes (Hedges' g)*




*Note.* The white diamond at the bottom of the funnel plot represents the observed mean effect while the black diamond represents the adjusted mean effect once the Trim and Fill method is used.

## Bridging to Study 2

The systematic review and meta-analysis presented in Study 1 provided an overview of the state of research on mindfulness-based program implementation for students across educational levels using rigorously designed studies. This study demonstrated that mindfulness-based programs had a significant impact on students' dispositional mindfulness and certain school adjustment outcomes (i.e., academic performance, attention, impulsivity); however, no effect was found for school functioning, student behaviour, interpersonal skills. Additionally, the results highlighted the need to carefully design mindfulness-based programs for students. Specifically, significant effects for both dispositional mindfulness and school adjustment outcomes were only found for adolescents, in programs delivered by an outside facilitator with personal experience of mindfulness practice, and in programs using an adaptation of an established mindfulness program.

Thus, Study 1 established that mindfulness-based programs for students *can* be effective under certain circumstances. However, a common criticism of the use of mindfulness instruction in general is that there is a great deal of diversity in terms of the programs being implemented; thus, it is difficult to compare effectiveness across programs since they tend to differ in terms of the type of content and mindfulness strategies being taught (e.g., Felver et al., 2016; Roeser et al., 2022; Semple et al., 2016; Tudor et al., 2022). There is a need to better understand what types of mindfulness strategies work for whom.

Additionally, adolescence has been identified as a particular window of opportunity for mindfulness instruction given that it is a period of dynamic cognitive and self-regulation development (e.g., Roeser & Pinela, 2014; Siegel, 2006; WHO & UNICEF, 2021). The findings from Study 1, supported by previous literature (e.g., Carsley et al., 2018; Montero-Marin, 2022),

suggest that students in adolescence stand to particularly benefit from mindfulness-based programs. However, there are increasingly reports that adolescents may find traditional mindfulness instruction aversive or difficult to engage in (e.g., Montero-Marin et al., 2022; Nam & Toneatto, 2016; Quach et al., 2017). Adolescence is a period in which attention regulation and executive function skills are still developing (e.g., Patton et al., 2016; Thillay et al., 2015). Thus, traditional mindfulness instruction may lack accessibility for adolescents, given that it often heavily focuses on formal mindfulness strategies in which participants are asked to sustain attention for specific periods of time. It may be that informal mindfulness techniques, which are brief and unstructured moments of mindfulness integrated within day-to-day experiences, may be more acceptable and accessible for adolescents. Hence, in Study 2, a randomised controlled experimental design will be used to parse out the effectiveness and acceptability of formal and informal mindfulness in a sample of adolescents.

# Chapter 3: Study 2

## Formal vs. Informal mindfulness practice in adolescence: Does type of mindfulness influence mental health and educational outcomes?

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**Abstract**

While mindfulness activities can be effective in promoting well-being and academic success in adolescents, which aspects of mindfulness practice (i.e., formal or informal practice) are most effective remain unclear. Thus, using a randomized experimental design, the present study sought to parse out potential differences in acceptability and effectiveness of formal and informal mindfulness practice for adolescents over time (pre, post, 1 month follow-up). The sample consisted of 122 students (73% female participants; *M*age=15.36, *SD*=0.94) who were randomly assigned to a 4-week formal mindfulness practice (*n* = 37), informal mindfulness practice (*n*=37), or a comparison group (*n*=48). Students completed measures assessing stress, anxiety, depression, positive and negative affect, school stress, classroom attentional control, school satisfaction, and acceptability of the mindfulness practice. Students who practiced informal mindfulness were significantly more likely than those who practiced formal mindfulness to report intending to continue frequently using the strategies. Results from a mixed design ANOVA also showed that students who practiced informal mindfulness reported increased dispositional mindfulness over time relative to the comparison group; no change was reported in the formal group relative to either of the other two groups. Finally, half-longitudinal ANCOVA mediation models fitted with the Latent Change Score specification showed that students who practiced informal mindfulness reported decreased stress, anxiety, depression, negative affect, and school stress and increased classroom attentional control from baseline to follow-up through a concurrent increase in dispositional mindfulness. These findings highlight the importance of informal mindfulness practice for adolescents both in terms of acceptability and effectiveness.

**Keywords:** mindfulness; adolescence; secondary schools; student well-being

## Introduction

Mindfulness-based programs (MBPs) are being increasingly used within educational settings to promote adolescent mental health and well-being. Existing MBPs for adolescents teach a mix of both formal and informal mindfulness practices, with the main goal of establishing a regular formal mindfulness practice, and are typically evaluated as a whole, without comparing and contrasting the potential individual effects of the two distinct practices. Research investigating the specific benefits of informal mindfulness practice has focused on adult samples making it difficult to generalize findings to adolescents. Given that adolescence is a critical period in the development of cognitive functions (e.g., attention; Thillay et al., 2015), formal activities (which require sustained attention) may be challenging. As such, informal mindfulness practice might present a beneficial alternative for this age group. However, it is still unclear which mechanisms of mindfulness practice (i.e., formal or informal) are effective in promoting mental health, well-being, and educational outcomes. Thus, the current study sought to better understand the implications of these mechanisms by examining differences in acceptability and effectiveness between formal and informal mindfulness practice among adolescents.

Adolescence is an important period for brain plasticity and affective development in which adolescents may be particularly vulnerable to stress exposure that has lasting effects persisting into adulthood (e.g., Chaby et al., 2017; Tottenham & Galván, 2017). This is particularly important given the prevalence of adolescent stress, with 27% reporting moderate to high levels of stress and 31% reporting increases in stress over the past year (e.g., American Psychological Association, 2014). Furthermore, research has shown adolescent stress is

associated with increased risk for unhealthy coping, school dropout, and poor academic performance (Agnafors et al., 2021; Dupéré et al., 2015; O'Connell et al., 2009).

Thus, it is crucial to provide adolescents with evidence-based support to enhance their well-being and healthy coping. Schools are key settings to provide this support given the opportunity to reach a large body of students and the large amount of time students spend in school (e.g., Stuart et al., 2017). Increasingly, MBPs have been gaining popularity as a school-wide strengths-based prevention approach and are being integrated into the curriculum or offered as after-school programs to better support students (e.g., McKeering & Hwang, 2019).

Mindfulness can be defined as an intentional awareness of moment-by-moment experiences with a nonjudgmental acceptance of thoughts, feelings, and sensations (Kabat-Zinn, 2013). It can be characterized as both a general tendency to be mindful (i.e., dispositional mindfulness) or as a state that occurs in the present moment, for instance immediately following an intervention or mindfulness-based activity (i.e., state mindfulness; Brown & Ryan, 2003). Additionally, research has shown that mindfulness is a dynamic process whereby the act of practicing mindfulness strategies, which induce state mindfulness, in turn leads to increased dispositional mindfulness (e.g., Carmody & Baer, 2008; Khoury et al., 2013).

One of the most commonly used programs to teach mindfulness in secular medical, professional, or educational settings is Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 2013) for adults or an adaptation of this program for children and adolescents. MBSR consists of a series of mindfulness strategies practiced over an 8-week period to encourage participants to become aware of and accept their thoughts, feelings, and sensations without attempting to change or criticize them, using a combination of formal and informal mindfulness activities. Formal mindfulness practice can be conceptualised as a structured practice in which a

specific time period is allocated to engage in a guided or unguided mindfulness meditation activity (e.g., body scan, sitting meditation), whereas informal mindfulness practice is characterized as being actively mindful while pursuing everyday activities (e.g., washing dishes, walking to school), usually in an unstructured and brief way spontaneously practiced throughout the day (e.g., Crane et al., 2017). Overall, research with adults shows MBPs are effective in increasing dispositional and state mindfulness as well as reducing psychological distress, anxiety, or depression (e.g., Carmody & Baer, 2008; Khoury et al., 2013). Although research evaluating MBPs among adolescents is more limited and inconsistent than that with adults, a growing body of research suggests that MBPs may be particularly effective with adolescent students in terms of sustained benefits to mental health and educational outcomes (e.g., Carsley et al., 2018; Maynard et al., 2017; Mettler et al., 2021).

Despite this encouraging evidence, further research is needed to better understand the mechanisms by which MBPs are effective at targeting dispositional mindfulness or associated psychosocial or educational outcomes. For instance, existing MBPs typically teach a mix of both formal and informal mindfulness practices simultaneously, with a greater emphasis on establishing a regular practice of formal mindfulness. Furthermore, most MBPs' effectiveness is evaluated without differentiating between the potential individual effects of formal and informal mindfulness practices, making it difficult to compare effectiveness and acceptability.

However, over the past decade, there has been growing interest in investigating the individual benefits of formal and informal mindfulness practice. Indeed, emerging evidence suggests that formal and informal mindfulness practice may function differently for certain groups; however, findings are limited and inconsistent. For instance, Birtwell and colleagues (2019) conducted a survey of novice and experienced adult meditators and found that frequency

of informal practice was the greatest predictor of wellbeing and psychological flexibility compared to formal practice, which in fact did not significantly predict psychological flexibility.

Other studies have evaluated associations between reported frequency of engagement in either formal or informal mindfulness practice and mental health or well-being outcomes in MBPs that concurrently teach formal and informal practices to adult participants. Findings are inconsistent, with some studies finding an association for frequency of formal practice but not informal on mental health and well-being outcomes (e.g., Carmody & Baer, 2008), others finding no association with either type of mindfulness practice (Ribeiro et al., 2018), and others yet finding that frequency of informal practice was significantly associated with less anxiety and stress over time (e.g., McClintock et al., 2019; Morgan et al., 2014).

Furthermore, in studies using an experimental design to investigate the effectiveness of either only informal mindfulness practice or the separate benefits of formal and informal practice, adult participants who practiced informal mindfulness reported significantly increased positive affect (Hanley et al., 2015) and self-compassion (Hindman et al., 2015) as well as lower stress, anxiety, depression, (Shankland et al., 2021) and negative affect (Hanley et al., 2015). However, findings are also mixed within these studies; specifically, in contrast to the decreases in stress reported by Shankland and colleagues (2021) for the informal mindfulness group, Hindman and colleagues (2015) found that only university students who engaged in formal mindfulness practice reported decreased stress. Therefore, further research is needed to truly parse out the individual effectiveness of formal and informal mindfulness practice and to go beyond investigating these differences within adult samples and extend to other age groups who may also stand to benefit from the lower demands of informal mindfulness.

This is particularly important given that, despite the benefits that are inherent to mindfulness practice, there are common challenges in MBP implementations resulting in high attrition rates (e.g., Nam & Toneatto, 2016). For example, adult participants report challenges in adhering to standard formal mindfulness practice including falling asleep while meditating or not being able to find time to practice regularly (e.g., Birtwell, 2018). With adolescents in particular, studies report high levels of non-compliance with suggested home practice for formal mindfulness activities, with adolescents reporting engaging in only about one fourth of the suggested amount of home practice (e.g., Quach et al., 2017). These findings are not surprising when considering that adolescents often face difficulties with sustained attentional control and may thus find engaging in structured formal mindfulness activities particularly aversive despite the development accommodations that are usually implemented in MBPs for this age group (e.g., shortening practice length; Black, 2015; Thillay et al., 2015). Therefore, brief and unstructured informal mindfulness strategies may be more appropriate for this population because they can easily be implemented within daily routine activities, require less sustained attention, and can improve practice rates (Crane, 2017; Shankland et al., 2021).

Overall, while mindfulness activities have been found to be effective in promoting mental health, well-being, and academic success in adolescents, which aspects of mindfulness practice (i.e., formal or informal) are most effective is still unknown. Although there is preliminary evidence for potential benefits of informal mindfulness practice, most studies focus on adult samples, making it difficult to generalize findings to adolescents, who may particularly benefit from informal mindfulness practice. Thus, the present study sought to parse out potential differences in acceptability and effectiveness of formal and informal mindfulness practice for adolescents. Additionally, specific consideration was given with regards to common criticisms of

current mindfulness studies. First, a randomized controlled experimental design was used to minimize the risk of sampling bias or placebo effects (e.g., Black, 2015; Dunning et al., 2019). Consistent with best practice guidelines for existing manualized MBPs, the mindfulness practice facilitators were rigorously trained to have an established personal practice of mindfulness (e.g., Crane et al., 2017). Finally, dispositional mindfulness was assessed as an outcome of mindfulness practice to facilitate assessment of the mechanisms of change (e.g., Baer et al., 2011).

**Objectives and Hypotheses**

Using an experimental design, the present study explored differences in outcomes reported by adolescents who used different types of mindfulness practice (formal or informal). The first objective was to investigate whether the mindfulness groups differed in their acceptability of the type of mindfulness practiced. Based on Kirkpatrick's model of training satisfaction (2016), it was hypothesized that the informal group would report higher satisfaction than the formal group.

The second objective was to assess group differences (formal, informal, comparison) over time (baseline to follow-up) across mental health and well-being outcomes (i.e., depression, anxiety, perceived stress, and positive and negative affect), mindfulness outcomes, and educational outcomes (i.e., classroom attention, school stress, and school satisfaction). It was hypothesized that adolescents who used formal or informal mindfulness strategies would show stronger improvements over time than the comparison group.

Finally, the third objective was to determine whether the effect of type of mindfulness practice on changes in mental health, well-being, and educational outcomes from baseline to follow-up occurred through the influence of changes in dispositional mindfulness over that same

time period. Specifically, it was hypothesised that changes in dispositional mindfulness would explain the effect of mindfulness practice on an increase or decrease of the targeted mental health, well-being, and educational outcomes over time.

## Method

### Participants

Following institutional research ethics approval and school board approval, participants were 190 Grade 9, 10, or 11 students recruited from two schools in two school boards in Montreal, Quebec in 2018-2019, based on a priori power analyses and accounting for attrition; of these, 153 students participated in the study (70.9% female participants; *M*age = 15.31, *SD* = .93). However, 11 students were excluded from analyses due to lack of completion of most of the measures; thus, the final sample was 142 students (73.9% female particpants, *M*age = 15.32, *SD* = 0.93). As detailed below, based on current literature suggesting the importance of participants' engagement with strategies in mindfulness-based intervention research (e.g., Davidson & Kasniak, 2015; Schussler et al., 2021), the sample for Objectives 2 and 3 was restricted to students self-reporting an intention to continue practicing mindfulness from post to follow-up (*n* = 122; 85.92% original sample retained; 73% female participants; *M*age = 15.36, *SD* = 0.94). Of these students, 3.3% reported no previous knowledge of mindfulness, 57.9% a small amount, 34.7% a medium amount, and 4.1% a lot of previous mindfulness knowledge. Furthermore, 30.3% reported having used guided relaxation exercises in the past, 18.9% reported using meditation, and 22.1% reported using yoga.

### Measures

**Acceptability of practice.** Participant satisfaction with the mindfulness practice was assessed with a researcher-designed measured focusing on Kirkpatrick and Kirkpatrick's model

(2016): (1) response to the training (satisfaction, engagement, relevance, usefulness of training), (2) learning (knowledge, skill, attitude, confidence, commitment), and (3) use of skills. All 15 items used a 4-point scale from 1 (*Nothing* or *Strongly disagree*) to 4 (*A Lot* or *Strongly agree*), with higher scores indicating greater satisfaction. Sample questions include: "I found that the information presented in the mindfulness sessions was relevant for adolescents."; "I feel I learned…".

**Dispositional mindfulness.** The *Five Facets of Mindfulness Questionnaire – Short Form* (FFMQ-SF; Baer et al., 2006; Bohlmeijer et al., 2011) is a 24-item self-report measure with a 5-point scale, with higher scores indicating greater mindfulness. Items include "I'm good at finding words to describe my feelings" and "I watch my feelings without getting carried away by them." It has high internal consistency with adult samples (Cronbach alphas ranging from .73 to .91), high test-retest reliability, as well as discriminant, convergent, and criterion validity (Baer et al. 2006). Validation with adolescents is more limited (Pallozzi, et al., 2017); however, a study by Royuela-Colomer and Calvete (2016) found adequate factor structure, test-retest reliability, and good convergent validity. In the present study, the internal reliability of the FFMQ was good, with a Cronbach's alpha of .86.

**Depression and Anxiety**. The Patient Health Questionnaire (PHQ-4; Kroenke et al., 2009) is a brief measure with 4 items assessing each of the two core DSM criteria for depression and anxiety. Items are rated along a 4-point scale ranging from 0 (*Not at All*) to 3 (*Nearly Everyday*), with higher scores indicating greater depression or anxiety symptoms. Sample items include "Little interest or pleasure in doing things" or "Feeling nervous, anxious or on edge". The questionnaire can either be used as 2 subscales (depression and anxiety) or as an overall total

score to indicate psychological distress, and has good construct validity (Kroenke et al., 2009). In the present study, the internal reliability of the PHQ was good, with a Cronbach's alpha of .81.

**Perceived stress.** The *Perceived Stress Scale* (Cohen et al., 1983) is a self-report measure of individuals' perception of stress widely used with both young adults and adolescents. It contains 10 items in which participants indicate their experience of stress on a 5-point scale, with higher scores indicating higher stress. Items include statements such as "In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?"; however, in the present study, the time frame was modified from "past month" to "past week". The PSS has adequate internal reliability (Cronbach's alpha of .78), construct validity, and predictive validity with psychological/ physical symptoms (Cohen & Williamson, 1988). This is in line with the strong reliability found in this sample (Cronbach's alpha = .94).

**Positive and Negative Affect**. The International Positive and Negative Affect Schedule – Short Form (I-PANAS-SF; Thompson, 2007) were used to assess positive and negative affect. Two 5-item subscales,) assessed the frequency with which positive and negative emotions (e.g., "Determined", "Inspired", "Afraid", "Ashamed") are experienced using a 5-point scale, with higher scores reflecting higher frequency of affect. In the current study, participants were asked to rate the frequency with which they have experienced these emotions over the past week. This measure has demonstrated adequate internal consistency (positive = .78; negative = .76), and convergent validity (Thompson, 2007). In the present study, the reliability for negative affect was good (Cronbach's alpha = .8) and satisfactory for positive affect (Cronbach's alpha = .70).
Educational outcomes

**Classroom Attention**. The *Attentional control scale-adapted (ACS-A)* is a 20 item self-report measure of attentional control used with individuals of all ages (Olafsson et al., 2011),

with higher scores indicating greater classroom attention. Items include "When trying to focus my attention on something, I have difficulty blocking out distracting thoughts". The ACS demonstrated high internal consistency in the present study with a Cronbach's alpha of .86. Importantly, it was adapted in two ways: (1) each question started with "In class I…" in order to focus specifically on classroom attention, and (2) to reflect experiences of the past week.

**School Stress**. The *Adolescent stress questionnaire (ASQ)* is a self-report measure of aspects of adolescent stress (e.g., home life, school performance, school attendance; Byrne et al., 2007). Only the Stress of School Performance (7 items) and School Attendance (3 items) subscales were used in the present study given time constraints. Participants indicate how stressful an item has been for them in the past, with higher scores indicating greater stress. Sample items include: "Keeping up with schoolwork", or "Getting up early in the morning to go to school". The ASQ has good test-retest reliability and internal consistency (Byrne et al., 2007). In the present study, the reliability was also strong (Cronbach's alpha = .9). Given the large number of measures in this study, an average total score of school-related stress was used.

**School Satisfaction**. The *School Satisfaction* subscale of the *Multidimensional Students' Life Satisfaction Scale (MSLSS*; Huebner, 2001) is an 8-item subscale in which students indicate their level of agreement with items such as "I like going to school" on a 6-point scale from 1 (*strongly disagree*) to 6 (*strongly agree)*. In the present study, participants were asked to reflect about their experiences in the past week specifically. Previous research has demonstrated good internal consistency, test-retest reliability, and concurrent validity for the MSLSS (e.g., Huebner, 2001). In the present study, internal consistency was satisfactory, with a Cronbach's alpha of .72.

**Procedure**

Following university ethics approval and school board approval, the study was presented to students in class and parental consent forms were distributed. All students who obtained parental consent to participate also provided their own student assent at the start of the study when completing baseline measures.

Using a prospective randomized experimental design, participants were randomly assigned to one of three gender-matched conditions: (a) a formal guided mindfulness practice, (b) an informal mindfulness practice, or (c) a business-as-usual comparison group. The intervention was conducted over a period of 4 weeks, with weekly 45-minute-long small group meetings held over the lunch hour at school (snacks were provided but students could also bring their own lunch). Participants were also asked to commit to a minimum of 10 minutes of daily practice within the formal mindfulness condition and to a minimum of 3 instances of informal practice in the informal condition (i.e., brief everyday activities they engaged in mindfully).

Both mindfulness groups (formal and informal) were adapted from the standard MBSR (Kabat-Zinn, 2013) and an adolescent adaptation, *Learning to Breathe* (Broderick & Metz, 2009). The facilitators were rigorously trained by the first and last authors both on the study protocol but also in developing their own regular mindfulness practice through weekly sessions over a period of months prior to the start of the study, given prior emphasis in the field of the importance of facilitators' own practice of mindfulness to successfully deliver MBPs (e.g., Crane et al., 2017). Importantly, the two mindfulness groups only differed in which type of mindfulness strategies (formal vs. informal) students were presented with and asked to practice. During each weekly session, both groups were presented with identical psychoeducational content and group discussion topics focusing on what mindfulness is and is not (e.g., not a form of relaxation, not

trying to feel anything in particular), how it can be practiced by cultivating nonjudgmental and nonreactive qualities of attention, the potential challenges encountered, as well as how it can affect the stress response, emotional regulation and reactivity, and thought patterns. Additionally, students in the formal mindfulness group were taught a series of guided mindfulness practices (i.e., Week 1: body scan, guided breath awareness; Week 2: awareness of emotions; Week 3: awareness of thoughts). Meanwhile, students in the informal group were taught how to use mindfulness on an informal daily basis (e.g., Week 1: becoming aware of the senses, using the breath as an anchor; Week 2: awareness of emotions while doing comfortable and uncomfortable activities; Week 3: awareness of thoughts during stressful task or social interaction) and guided through a series of demonstrations within the group sessions.

At the end of each session, students in both groups received an identical infographic detailing the psychoeducational content learned in each session. Additionally, students in the formal mindfulness group received audio recordings of guided mindfulness meditations and committed to a minimum of 10 minutes of daily practice five out of seven days to help them develop a daily practice. The informal mindfulness groups were asked to commit to a minimum of three instances of daily informal practice. To encourage participation, automated text message reminders about mindfulness practice were sent to students.

At three time points (one-week pre, one-week post, and one-month follow-up), participants received a battery of questionnaires as detailed above. Students were given the option to complete questionnaires in-person over the lunch hour or online through Qualtrics and survey completion varied between 20-40 minutes depending on the student. The acceptability of the intervention for each participant in the two mindfulness groups was assessed at post and follow-

up. Finally, participants in the business-as-usual comparison group were asked to complete the evaluation sessions at all three time points but did not attend weekly mindfulness group sessions.

**Data Analytic Plan**

The first objective was to examine whether group differences exist between students in the formal and informal mindfulness practice groups in terms of their satisfaction with the type of strategies practiced. Using SPSS v27, chi square analyses were used to determine whether there was a significant difference in the proportion of participants endorsing each training satisfaction item. Given the importance of continued use of the mindfulness strategies, these analyses were conducted both within the full sample and within a subsample restricted to students who planned to continue using these strategies (see details in Results).

The second objective was to assess potential differences between adolescents who practiced formal or informal mindfulness or a comparison group in terms of their change over time (baseline, post, follow-up) across mental health and well-being, mindfulness, and educational outcomes. A series of 3 (Condition) x 3 (Time) mixed design ANOVAs were conducted with each of the outcomes of interest. Significant interaction effects were further investigated through simple main effects of both time and condition. Finally, Bonferonni-corrected post-hoc pairwise comparisons were run to better understand the source of the differences.

Finally, the third objective was to determine whether the effect of practicing mindfulness on changes in outcomes over time (baseline to follow-up) was occurring through changes in dispositional mindfulness over that same time period. As per recommendations by Valente and MacKinnon (2017), half-longitudinal ANCOVA mediation models fitted with the Latent Change Score (LCS) specification were used to estimate mediation effects given that they perform best

compared to different kinds of models (e.g., difference score model) in studies using a similar design. This model estimates the effect of group assignment (type of mindfulness practice vs comparison group) on the outcome (mental health, well-being, and education outcomes) at Time 2 through its effect on the mediator (dispositional mindfulness) at Time 2, adjusted for both the outcome and the mediator at Time 1 (Valente & MacKinnon, 2017). As can be seen in Figure 1, the indirect effect was calculated by calculating the product of *Am2x* by *by2m2*.

These analyses were conducted in Mplus 8.6. using the bootstrapping procedure with 5000 replications. Model fit was evaluated using the Comparative Fit Index (CFI), Tucker–Lewis fit index (TLI) values, Root Mean Square Error of Approximation (RMSEA) and Standardized Root-Mean Square (SRMR). As per best practice guidelines, model fit was determined using a combination of values of at least 0.90 for acceptable fit and 0.95 for good fit for the CFI and the TLI, values of at least 0.08 for acceptable fit and 0.05 for good fit for the RMSEA, and 0.08 for acceptable fit for the SRMR (Bentler, 1990; Browne & Cudeck, 1993; Hu & Bentler, 1999).

**Transparency and Openness**

We have reported how our sample size was determined, what measures were used, how data cleaning and analyses were conducted. De-identified data and research materials can be made available upon request. All data analyses were conducted with either SPSS v27 or Mplus v8.6. This study's design and analyses were not pre-registered.

## Results

Data were assumed to be missing completely at random (MCAR) given less than 5% of data were missing on most variables and Little's test was nonsignificant. Imputation was conducted within each group at each time point using the expectation maximization procedure. Univariate outliers were identified as standardized z scores above 3.29 within each group for

each variable within each time point. One potential outlier was identified within the formal mindfulness group (i.e., high dispositional mindfulness score at follow-up). This potential outlier was retained in the sample given the small difference in means between this score and the next highest score, thus indicating it is likely part of the distribution of interest (i.e., not an error or unexplainable score). No multivariate outliers were found.

**Objective 1: Acceptability of the Types of Mindfulness Practice**

Given the high proportion of positive answers, the scoring of the satisfaction items, which was originally scored along a 4-point Likert scale, was combined into 2 subgroups: (1) *Nothing/A small amount* or *Strongly Disagree/Disagree* and (2) *A Medium Amount/A Lot* or *Agree/Strongly Agree.* Chi square analyses were then conducted where possible (i.e., when expected cell sizes were 5 or greater) to assess potential differences between the formal and informal mindfulness groups but no significant differences emerged for any of the satisfaction items. Thus, as can be seen in Table 1, overall, when looking at the full sample, most participants reported comparably high acceptability for both types of mindfulness practice.

However, given the importance of engaging with and practicing mindfulness strategies on the effectiveness of MBPs, analyses focused on students who intended to continue using the strategies they were taught. Both the formal and informal groups in the full sample were similar in terms of their self-reported intention to continue using the mindfulness strategies taught (i.e., no group differences were found; see Table 1); therefore, twenty students who, at post, did not intend to continue using the mindfulness strategies between post and follow-up were excluded ($n$=8 formal and $n$=12 informal). Thus, the sample used in the final analyses consisted of 122 adolescent students (73% female participants; $M$age = 15.36, $SD$ = 0.94; 37 formal mindfulness, 37 informal mindfulness, and 48 comparison group).

The acceptability of the two types of mindfulness practice was also investigated within this group specifically. As can be seen from Table 1, results from chi square analyses revealed that, even though both groups reported intending to continue using mindfulness strategies to the same degree, the two groups significantly differed from one another in terms of the frequency of their intention to keep using the mindfulness strategies they were taught. Interestingly, the informal mindfulness group was significantly more likely than the formal mindfulness group to report intending to continue using the strategies *Everyday* or *Frequently.*

**Objective 2: Change in Outcomes Over Time and Between Conditions**

The second objective of this study was to determine whether (a) there was change over time across the variety of mental health, well-being, and educational outcomes assessed, (b) whether adolescents who practiced mindfulness (formal or informal) differed significantly from one another or from a comparison group in their change over time, and (c) whether there was an interaction between change over time and group assignment. Therefore, a series of mixed 3 (Group: formal, informal, comparison) X 3 (Time: Baseline, post, follow-up) ANOVAs were conducted for each type of outcome assessed: dispositional mindfulness, mental health & well-being, and educational. Table 2 presents the means and standard deviations of each outcome within each group and time point as well as the results of the mixed ANOVAs.

Contrary to our hypothesis, the only significant interaction occurred for dispositional mindfulness, $F(1, 3.82) = 2.47$, $p = .048$, $\eta_p^2 = .041$. Further analysis of simple main effects followed by Bonferroni-corrected pairwise comparisons revealed no simple main effects of time. Similarly, no simple main effects of group were found at baseline; however, there was a significant simple main effect of group at post and follow-up whereby adolescents who practiced

informal mindfulness reported significantly higher dispositional mindfulness than the comparison group.

Given that none of the other mixed ANOVAs revealed significant interactions, the main effects of group and time were looked at next for the remaining outcomes (see Table 2). Significant main effects of group were found for positive affect and school satisfaction. Specifically, when combining all time points together, high school students in the comparison group reported significantly lower positive affect than students who practiced either formal or informal mindfulness as well as lower school satisfaction than the formal mindfulness group. Additionally, significant main effects of time were found for anxiety and perceived stress whereby, regardless of group assignment, students reported lower anxiety symptoms from baseline to post as well as lower perceived stress from baseline to follow-up; no other differences were found between other time points. Finally, no main effects of group or time were found for depression symptoms, classroom attentional control, negative affect, or perceived school stress.

**Objective 3: Effect of Group on Outcomes Through Mindfulness Over Time**

The final objective was to assess whether a change in dispositional mindfulness would mediate the effect of the type of mindfulness practice on mental health, well-being, and educational outcomes from baseline to follow-up. Thus, a series of half-longitudinal ANCOVA mediation models fitted with the LCS specification were used to estimate these mediation effects (Valente & MacKinnon, 2017). Given results from the mixed design ANOVAs showing that dispositional mindfulness did not significantly change within the formal mindfulness group over time, the mediation analyses focused on comparing adolescents in the informal mindfulness group to those in the comparison group. Figure 1 presents a template of the mediation models

analysed. Table 3 presents the results for the model fit indices, as well as the path coefficients and their 95% confidence intervals.

As can be seen from Table 3, path *a,* representing the influence of group (i.e., the predictor) on the change in dispositional mindfulness (i.e., the mediator), was positive and significant for each outcome assessed. Thus, the informal mindfulness practice group (coded as *1*) reported a greater increase in dispositional mindfulness over time.

Results were mixed for path *b*, which represented the influence of the change in dispositional mindfulness on the change in outcomes from baseline to follow-up. Specifically, the change in dispositional mindfulness was significantly negatively associated with a change in perceived stress, anxiety symptoms, depression symptoms, negative affect, and perceived academic stress, (i.e., increase in mindfulness = lower outcomes) while being significantly positively associated with a change in classroom attentional control (i.e., increase in mindfulness = greater attentional control). However, there was no significant relationship between the change in dispositional mindfulness and the change in positive affect or school satisfaction over time.

Finally, there was no significant direct effect of group on the change in any of the outcomes assessed over time (i.e., path *c*). However, despite this lack of a direct effect, when looking at the indirect effect of the changes in dispositional mindfulness on the relationship between group and change in the outcomes over time, an interesting pattern of results emerged. Specifically, this indirect effect was significant and negative for perceived stress, anxiety symptoms, depression symptoms, negative affect, and perceived academic stress while being significant and positive for classroom attentional control. However, there was no significant indirect effect for either positive affect or school satisfaction. In other words, students who practiced informal mindfulness from baseline to follow-up reported lower perceived stress,

anxiety, depression, negative affect, and perceived academic stress as well as higher classroom attentional control than students in the comparison group and this was due to a concurrent increase in dispositional mindfulness during that same time frame.

## Discussion

The present study first sought to investigate potential differences in acceptability of formal and informal mindfulness practice for adolescent students. Subsequently, the second and third objectives were to explore potential group differences (formal vs. informal mindfulness practices, comparison group) on well-being and school-related outcomes (a) over time (baseline to follow-up) and (b) over time influenced by a concurrent change in dispositional mindfulness. Overall, findings reveal that, using a rigorously designed pretest-posttest randomised controlled study where mindfulness was taught to students through either formal or informal practices, informal mindfulness practice seems to offer clear benefits beyond that of formal mindfulness practice. Surprisingly, students who practiced formal mindfulness did not report a significant improvement over time on any of the mental health, well-being, or educational outcomes being assessed and, most importantly, did not report an increase in dispositional mindfulness over time.

Contrary to what was hypothesized, high school students who were asked to engage in formal mindfulness practice and those who were asked to engage in informal mindfulness practice over the course of four weeks rated their experience equally favourably both when looking at the full sample and when looking specifically at a subsample of students who intended to continue using the mindfulness strategies they were taught. Accordingly, both types of mindfulness practice seem highly acceptable to adolescent students in terms of their relevance, value, helpfulness, as well as the students' confidence in their understanding of the techniques taught.

Interestingly, although students in the formal and informal groups did not differ in terms of their liking the strategies, they did differ in terms of the students' intent to continue using the strategies learned. Specifically, adolescent students in the formal mindfulness practice group were significantly less likely to report intending to continue practicing mindfulness once the sessions were over whereas students in the informal group reported a significantly greater frequency of intent to continue practicing. This may seem counterintuitive; however, it is consistent with best-practice program evaluation models' emphasis on the need to go beyond assessing satisfaction with a program to also investigate willingness to change behaviours (Kirkpatrick & Kirkpatrick, 2016). These findings are particularly important given the emphasis of MBPs is to teach participants to develop their own regular mindfulness practice to experience associated benefits associated. Thus, informal mindfulness practice may be more appealing to high school students when it comes to actual sustained individual practice over time.

Beyond acceptability, the present study also sought to ascertain whether the formal and informal practice groups differed from one another or from a comparison group in terms of benefits of the mindfulness practice over time; a surprising pattern of results emerged, contrary to what was hypothesised. Namely, dispositional mindfulness was the only outcome for which there was a significant interaction. In other words, the informal mindfulness group was significantly higher in dispositional mindfulness at post and follow-up relative to the comparison group; however, no significant interactions were found for mental health, well-being, or educational outcomes. Additionally, the formal mindfulness group was not significantly different from either the informal mindfulness group or the comparison group on any of the outcomes.

Such results are particularly surprising given previous studies showing that MBPs are effective with adolescents not only at increasing mindfulness but also at improving mental health

and well-being and potentially benefitting educational outcomes as well (e.g., Carsley et al., 2018; Dunning, 2019; Maynard et al., 2017). It may be possible that the lack of significant findings on the effectiveness of formal mindfulness in this study may be due to the rigorous parsing out of formal and informal mindfulness. Although the focus in MBPs is usually strongly on formal mindfulness practice, these programs typically also encourage participants to actively practice informal mindfulness on a daily basis as well (e.g., Crane et al., 2017). Thus, although the programs demonstrate effectiveness across different outcomes, it is typically not possible to truly parse out which type of mindfulness practice is driving the impact.

Interestingly, previous research has suggested the importance of establishing a regular formal practice stems from the resulting increase in one's general tendency to be mindful throughout the day (i.e., dispositional mindfulness), which in turn mediates the impact of practice on outcomes (e.g., Baer et al., 2012). Therefore, it may be that informal mindfulness is in fact key to MBPs' effectiveness whereby the act of frequently practicing brief daily moments of mindfulness may be especially helpful in increasing dispositional mindfulness.

This is particularly important given the difficulties participants report in trying to develop a sustainable formal practice due to lack of time or inability to fit the practice in their routine (e.g., Birtwell et al., 2019). Additionally, although MBPs for adolescents are typically adapted to shorten the formal mindfulness practices (e.g., to 10 minutes daily), students often still struggle with formal mindfulness practice (e.g., Quach et al., 2017). For instance, anecdotally, participants in the present study commented finding the formal mindfulness recordings challenging to listen to in one sitting, boring, too long, or difficult to find time for during the day.

Therefore, for students in this specific developmental period, who not only have shorter attention spans but also very busy schedules, informal mindfulness offers a promising alternative

that is less time-consuming and rigid to implement and that seems to be more likely to result in students' sustained practice. The present findings suggest that students can directly be taught to frequently incorporate informal mindfulness in their lives and that this results in an increase in their general tendency to be mindful (i.e., dispositional mindfulness).

Alternatively, it may be that perhaps more time is needed for adolescents to establish a regular formal practice beyond the four weeks of training in the present study. Anecdotal evidence from the present study suggests students were reporting having difficulty finding time to practice mindfulness in the formal group. This is particularly salient given that previous research has highlighted the importance of dosage for mindfulness practice; specifically, a recent meta-analysis by Parsons and colleagues (2017) revealed a small to moderate association between frequency of formal mindfulness practice and MBPs' effectiveness.

Finally, one of the proposed mechanisms for the beneficial outcomes associated with MBPs is that, through repeated mindfulness practice and experiences of state mindfulness, dispositional mindfulness gradually increases, and, in turn, this increase in dispositional mindfulness may be what is driving the beneficial outcomes (e.g., Carmody & Baer, 2008; Khoury et al., 2013). Therefore, the final objective of the present study was to further investigate whether the change in dispositional mindfulness over time would in fact be driving the influence of informal mindfulness practice on changes in target outcomes.

Interestingly, for students who practiced informal mindfulness, their increase in dispositional mindfulness over time fully explained their increased classroom attentional control and decreased perceived stress, anxiety, depression symptoms, negative affect, and perceived academic stress. Most importantly, these group differences over time between students who practiced informal mindfulness and students in the comparison group only existed when taking

into account the change in dispositional mindfulness. Thus, results highlight the importance of the changes in dispositional mindfulness (in this case, associated with informal mindfulness practice specifically) in bringing about benefits from mindfulness practice as well as the need to make sure that MBPs are actively targeting mindfulness and increasing dispositional mindfulness to have an impact. This is especially important given that a recurring criticism in the field of mindfulness research has been that MBPs focus almost exclusively on psychological outcomes often without assessing the MBPs' effectiveness at increasing participants' state or dispositional mindfulness (e.g., Baer, 2011).

These findings also highlight the fact that informal mindfulness practices like the ones delivered in the present study may be particularly beneficial for mental health, wellbeing, and educational outcomes that are more proximal to mindfulness practice, such as classroom attention, or depression and anxiety (Maynard et al., 2017). Meanwhile, in line with previous research, more distal outcomes, such as school satisfaction, may require a more time for MBPs to have an impact (e.g., Maynard et al., 2017).

**Limitations and Future Directions**

Although these preliminary findings are promising, further research is needed to replicate these given the small effect sizes that were found. Additionally, to ascertain the potential benefits of informal mindfulness practice in terms of greater accessibility, further research is needed to test the impact of actual student engagement with mindfulness practice. Indeed, previous research has highlighted the need to consider the frequency of home practice (e.g., Davidson & Kaszniak, 2015; Klingbeil et al., 2017). Unfortunately, it was not possible to adequately quantitively assess this in the present study given high participant demands, particularly for adolescents. Specifically, adolescents' home practice logs were regularly lost, misplaced, or

either retrospectively or incorrectly completed, thus ensuring questionnable reliability of the home practice data collected. Future research with adult participants, who may be more willing to adhere to a rigorous self-assessment of mindfulness practice, should investigate the dose-response relationship between mindfulness home practice and the potential benefits of MBPs. Furthermore, studies with adolescent participants using a classroom-embedded MBP may also have greater facility in assessing adherence to practice, particularly if the teacher is on-board and willing to dedicate a brief period of class time (e.g., in the mornings) for students to complete a brief, individual, and confidential self-assessment. Alternatively, going forward, electronic logs might bypass the problems encountered with adolescents in the present study; however, this approach needs to be evaluated.

At the time of data collection, the school board insisted on the omission of gender-related information sensitive to the continuum of gender identity (i.e., restricting to *Male*, *Female*, and *Other*), thus gender identity and sex differences were conflated. Additionally, in the present study, only 2 participants identified as *Other* and it was not clear whether this was due to a lack of specificity in the question or whether this reflects the difficulties in recruiting participants who do not identify as male or female. However, given the growing attention in mindfulness research on the potential influence of gender differences in MBPs (e.g., Bluth et al., 2017), future research teams who have an opportunity to collect nuanced gender identity data should do so to better understand how gender identity may influence the preference for and effectiveness of formal versus informal mindfulness practice.

**Conclusion**

Despite these limitations, these findings provide an important contribution to mindfulness research and the implementation of MBPs in schools by suggesting that, when using a rigorous

randomized-controlled design, informal mindfulness practice may be particularly feasible and accessible for adolescents compared to formal mindfulness practice or a passive comparison group. Specifically, students who practiced brief informal mindfulness strategies for four weeks were more likely than those who practiced formal mindfulness to want to continue to practice mindfulness following the end of the study. Most interestingly, students who practiced informal mindfulness reported an increase in dispositional mindfulness after two months and, in turn, this change in mindfulness contributed to concurrent increases in mental health, well-being, and educational outcomes over time. The current study provides important preliminary evidence of the benefits of teaching adolescents brief informal mindfulness strategies that may be less time-consuming and easier for students to use on a regular basis than formal mindfulness activities.

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**Table 1**

*Student Acceptability of the Formal vs. Informal Mindfulness Strategies Taught, Within the Full Sample (FS) and a Subsample of Students Who Planned to Continue Using the Strategies Taught (PTU): Frequencies and Chi-square Analyses*[1]

| | **Mindfulness Groups Students FS (*N* = 94)** | | | | **Mindfulness Groups Students PTU (*N* = 74)** | | | |
|---|---|---|---|---|---|---|---|---|
| | **Formal (*n* = 45)** | | **Informal (*n* = 49)** | | **Formal (*n* = 37)** | | **Informal (*n* = 37)** | |
| | *n* (%) | *n* (%) | *n* (%) | *n* (%) | *n* (%) | *n* (%) | *n* (%) | *n* (%) |
| | **Nothing/A small amount** | **A lot/ A medium amount** | **Nothing/A small amount** | **A lot/ A medium amount** | **Nothing/A small amount** | **A lot/ A medium amount** | **Nothing/ A small amount** | **A lot/ A medium amount** |
| **After participating in the mindfulness session, I feel I have learned…**<br>*FS:* $\chi 2(1) = 2.52$, $p = .133$; Cramer's V = .165 | 5 (11.6) | 38 (88.4) | 12 (24.5) | 37 (75.5) | 4 (11.1) | 32 (88.69) | 5 (13.5) | 32 (86.5) |
| | **Strongly disagree/ disagree** | **Strongly agree/ Agree** | **Strongly disagree/ disagree** | **Strongly agree/ Agree** | **Strongly disagree/ disagree** | **Strongly agree/ Agree** | **Strongly disagree/ disagree** | **Strongly agree/ Agree** |
| **I found that the information presented in the mindfulness sessions was relevant for adolescents.** | 1 (2.3) | 43 (97.7) | 1 (2.0) | 48 (98.0) | 1 (2.7) | 36 (97.3) | 0 (0.0) | 37 (100) |
| **Overall, the mindfulness sessions were informative and understandable.** | 0 (0.0) | 44 (100) | 1 (2.0) | 48 (98.0) | 0 (0.0) | 37 (100) | 1 (2.7) | 36 (97.3) |
| **Overall, the content in the mindfulness sessions was easily understood.** | 1 (2.3) | 43 (97.7) | 1 (2.0) | 48 (98.0) | 1 (2.7) | 36 (97.3) | 1 (2.7) | 36 (97.3) |
| **Overall, I found my session facilitators were very good.** | 0 (0.0) | 44 (100) | 2 (4.1) | 47 (95.9) | 0 (0.0) | 37 (100) | 1 (2.7) | 36 (97.3) |
| **Overall, I found that the mindfulness sessions presented valuable strategies and techniques.** | 0 (0.0) | 44 (100) | 5 (10.2) | 44 (89.8) | 0 (0.0) | 37 (100) | 1 (2.7) | 36 (97.3) |
| **Overall, participating in the mindfulness sessions was a valuable experience for me.** | 2 (4.5) | 42 (95.5) | 8 (16.3) | 41 (83.7) | 2 (5.4) | 35 (94.6) | 2 (5.4) | 35 (94.6) |
| **I would recommend the mindfulness sessions to other adolescents in high school.** | 0 (0.0) | 44 (100) | 8 (16.3) | 41 (83.7) | 0 (0.0) | 37 (100.0) | 2 (5.4) | 35 (94.6) |
| **I feel confident in my understanding of the suggested techniques.**<br>*FS:* $\chi 2(1) = 1.00$, $p = .318$; Cramer's V = .104 | 4 (9.3) | 39 (90.7) | 8 (16.3) | 41 (83.7) | 3 (8.1) | 34 (91.9) | 3 (8.1) | 34 (91.9) |
| **I plan to use these mindfulness strategies over the coming weeks.**<br>*FS:* $\chi 2(1) = 1.05$, $p = .306$; Cramer's V = .106 | 7 (15.9) | 37 (84.1) | 12 (24.5) | 37 (75.5) | 0 (0.0) | 37 (100.0) | 0 (0.0) | 37 (100.0) |

| | Never/ Sometimes | Frequently / Everyday | Never/ Sometimes | Frequently / Everyday | Never/ Sometimes | Frequently / Everyday | Never/ Sometimes | Frequently/ Everyday |
|---|---|---|---|---|---|---|---|---|
| **If you plan to use these strategies, how often do you plan to use them over the coming weeks?**<br>*FS:* $\chi 2(1) = 2.58$, $p = .109$; Cramer's V = .168<br>*PTU:* $\chi 2(1) = 5.01$, $p = .025$; Cramer's V = .262 | 30 (71.4) | 12 (28.6) | 27 (55.1) | 22 (44.9) | 24[b] (66.7) | 12[a] (33.3) | 15[b] (40.5) | 22[a] (59.5) |

[1]*Note.* Within each group (full sample (FS) vs. plan to continue using (PTU)), chi square analyses were not run for items with expected cell counts < 5. When applicable, chi square analyses were conducted separately within each group (FS or PTU). Within each chi-square analysis, significant differences between cells are indicated by superscript letters. Specifically, cells within the same row and subsample (FS or PTU) with the same superscript letter are not significantly different from one another.

**Table 2**

*Series of 3 (Group: Formal, Informal, Comparison) x 3 (Time: Pre, Post, Follow-up) Mixed Design ANOVAs for Mental Health, Well-Being & Educational Outcomes Within Students Who Planned to Continue Using the Mindfulness Strategies (N = 122)*

| Outcome (* = $p < .05$) | Time point | Formal | | Informal | | Comparison | |
|---|---|---|---|---|---|---|---|
| | | ***M*** | ***SD*** | ***M*** | ***SD*** | ***M*** | ***SD*** |
| **Dispositional Mindfulness** | Pre | 3.25 | 0.48 | 3.16 | 0.57 | 3.06 | 0.52 |
| ***Int**: $F(3.82,225.12) = 2.71$, $p = .033$, $\eta_p^2 = .044$ | Post | 3.17 | 0.50 | 3.23 | 0.53 | 2.95 | 0.48 |
| | Follow-up | 3.14 | 0.53 | 3.28 | 0.49 | 2.99 | 0.44 |
| **Depressive Symptoms** | Pre | 0.54 | 0.68 | 0.90 | 0.92 | 1.06 | 0.94 |
| **Int**: $F(3.74,220.92) = 1.67$, $p = .163$, $\eta_p^2 = .027$ | Post | 0.69 | 0.79 | 0.68 | 0.73 | 1.09 | 0.95 |
| **MET**: $F(1.87,220.92) = 0.05$, $p = .943$, $\eta_p^2 = .000$ | Follow-up | 0.72 | 0.81 | 0.83 | 0.96 | 0.98 | 0.93 |
| **MEG**: $F(2,118) = 3.01$, $p = .053$, $\eta_p^2 = .049$ | | | | | | | |
| **Anxiety Symptoms** | Pre | 1.11 | 0.95 | 1.44 | 1.07 | 1.48 | 0.98 |
| **Int**: $F(3.78,222.82) = .47$, $p = .750$, $\eta_p^2 = .008$ | Post | 0.92 | 0.85 | 1.13 | 0.96 | 1.32 | 0.94 |
| ***MET**: $F(1.89,222.82) = 3.84$, $p = .025$, $\eta_p^2 = .032$ | Follow-up | 1.11 | 0.88 | 1.19 | 0.88 | 1.42 | 1.07 |
| **MEG**: $F(2,118) = 2.04$, $p = .135$, $\eta_p^2 = .033$ | | | | | | | |
| **Perceived Stress** | Pre | 2.67 | 0.39 | 2.52 | 0.52 | 2.48 | 0.47 |
| **Int**: $F(3.73,219.84) = 0.60$, $p = .652$, $\eta_p^2 = .010$ | Post | 2.65 | 0.46 | 2.63 | 0.47 | 2.46 | 0.40 |
| ***MET**: $F(1.86,219.84) = 4.53$, $p = .014$, $\eta_p^2 = .037$ | Follow-up | 2.66 | 0.43 | 2.59 | 0.47 | 2.45 | 0.37 |
| **MEG**: $F(2,118) = 2..49$, $p = .087$, $\eta_p^2 = .041$ | | | | | | | |
| **Positive Affect** | Pre | 3.41 | 0.86 | 3.14 | 0.73 | 2.78 | 0.67 |
| **Int**: $F(3.91,230.74) = 2.25$, $p = .066$, $\eta_p^2 = .037$ | Post | 3.05 | 0.89 | 3.24 | 0.81 | 2.85 | 0.79 |
| ***MET**: $F(1.96,230.74) = 3.25$, $p = .041$, $\eta_p^2 = .027$ | Follow-up | 3.30 | 0.79 | 3.39 | 0.69 | 2.99 | 0.83 |
| ***MEG**: $F(2,118) = 5.12$, $p = .007$, $\eta_p^2 = .080$ | | | | | | | |
| **Negative Affect** | Pre | 2.05 | 0.87 | 2.51 | 0.94 | 2.50 | 0.86 |
| **Int**: $F(3.77,222.25) = 1.05$, $p = .381$, $\eta_p^2 = .017$ | Post | 2.06 | 0.77 | 2.29 | 0.96 | 2.43 | 0.78 |
| **MET**: $F(1.88,222.25) = 2.32$, $p = .104$, $\eta_p^2 = .019$ | Follow-up | 2.25 | 0.76 | 2.38 | 0.98 | 2.55 | 0.83 |
| **MEG**: $F(2,118) = 2.65$, $p = .075$, $\eta_p^2 = .043$ | | | | | | | |
| **Classroom Attentional Control** | Pre | 1.86 | 1.07 | 2.24 | 1.10 | 2.36 | 0.89 |
| **Int**: $F(3.90,226.07) = .08$, $p = .515$, $\eta_p^2 = .014$ | Post | 1.85 | 0.93 | 2.04 | 1.16 | 2.30 | 0.77 |
| **MET**: $F(1.95,226.07) = .19$, $p = .825$, $\eta_p^2 = .002$ | Follow-up | 1.79 | 0.95 | 1.92 | 0.97 | 2.11 | 0.91 |
| **MEG**: $F(2,116) = 2.67$, $p = .074$, $\eta_p^2 = .044$ | | | | | | | |
| **Perceived School Stress** | Pre | 2.63 | 0.93 | 3.04 | 0.98 | 3.06 | 0.95 |
| **Int**: $F(3.80,222.12) = 0.69$, $p = .595$, $\eta_p^2 = .012$ | Post | 2.65 | 1.05 | 2.86 | 1.07 | 3.13 | 0.91 |
| **MET**: $F(1.90,222.12) = 1.99$, $p = .142$, $\eta_p^2 = .017$ | Follow-up | 2.56 | 0.85 | 2.85 | 1.05 | 2.90 | 0.89 |
| **MEG**: $F(2,117) = 2.61$, $p = .078$, $\eta_p^2 = .043$ | | | | | | | |
| **School Satisfaction** | Pre | 4.01 | 1.02 | 3.82 | 0.93 | 3.48 | 0.94 |
| **Int**: $F(3.85,227.14) = 0.58$, $p = .671$, $\eta_p^2 = .010$ | Post | 4.09 | 0.91 | 3.94 | 0.89 | 3.47 | 0.98 |
| **MET**: $F(1.93,227.14) = 0.54$, $p = .577$, $\eta_p^2 = .005$ | Follow-up | 4.00 | 0.84 | 3.98 | 0.93 | 3.46 | 0.89 |
| ***MEG**: $F(2,118) = 5.43$, $p = .006$, $\eta_p^2 = .084$ | | | | | | | |

*Note.* **Int** = interaction, **MET** = Main effect,of Time, **MEG** = Main effect of Group;

**Table 3**

*Model Fit Statistics & Mediation Results for the Mediation Models for Mental Health, Well-Being, and Educational Outcomes*

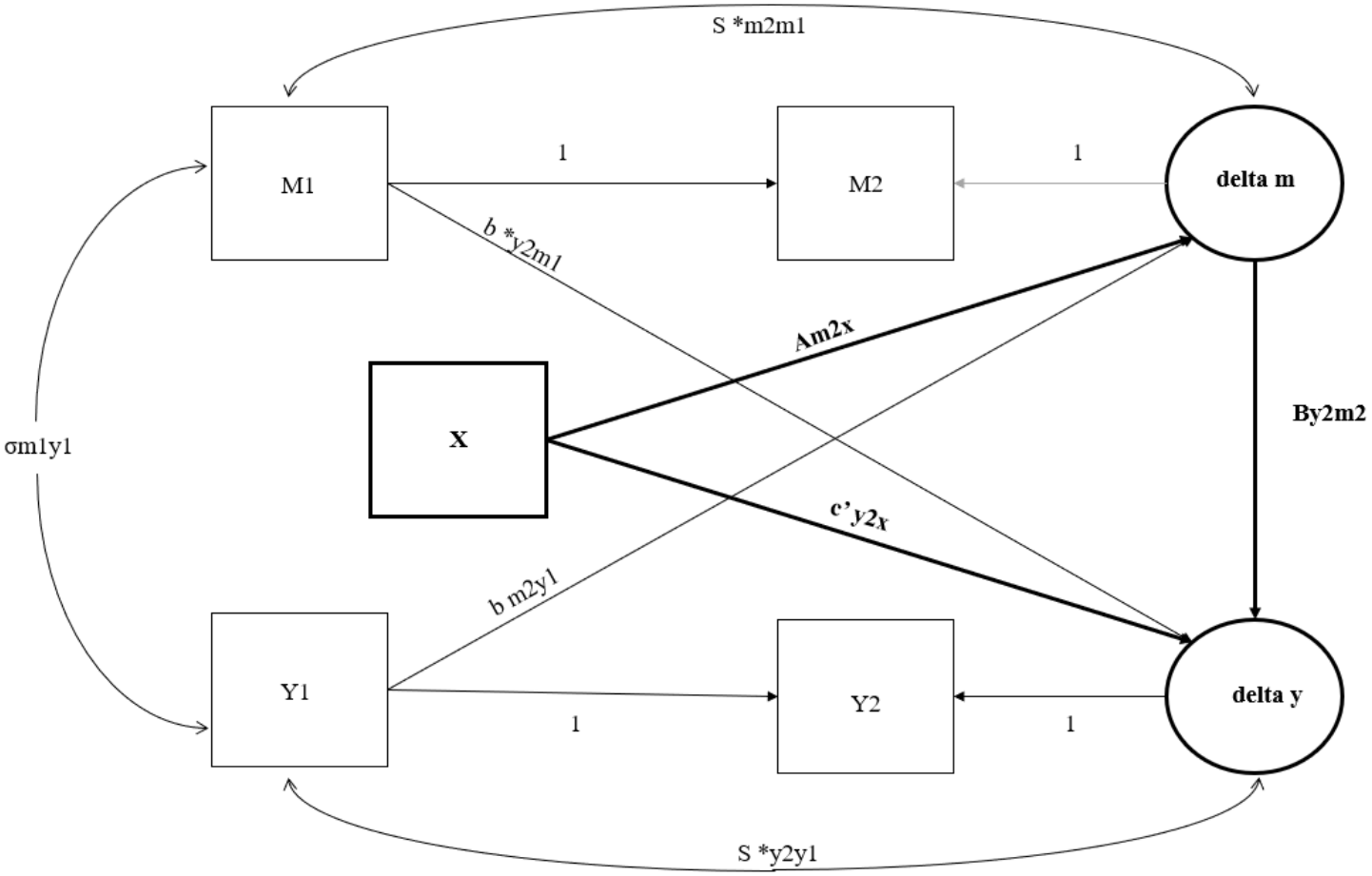
| | Model Fit Statistics | | | | | | Mediation Analysis Path Coefficients & Confidence Intervals | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Mediators** | **$\chi^2$** | ***df*** | **RMSEA** | **CFI** | **TLI** | **SRMR** | **Indirect Effect ($a_{m2x} \times b_{y2m2}$)** | **Path A ($a_{m2x}$)** | **Path B ($b_{y2m2}$)** | **Path C' ($c'_{y2x}$)** |
| | | | | | | | **Estimate (95% CI)** | **Estimate (95% CI)** | **Estimate (95% CI)** | **Estimate (95% CI)** |
| Depression | 0.85 | 2 | .00 | 1 | 1 | .04 | -.21* [-.40, -.07] | .58** [.25, .91] | -.40** [-.60. -.20] | .18 [-.19, .58] |
| Anxiety | 0.85 | 2 | .00 | 1 | 1 | .04 | -.27** [-.45, -.11] | .57** [.24, .88] | -.48** [-.63, -.34] | .09 [-.21, .41] |
| Perceived Stress | 0.78 | 2 | .00 | 1 | 1 | .04 | -.22* [-.42, -.06] | .57** [.22, .89] | -.44** [-.62, -.25] | .14 [-.20, .48] |
| Positive Affect | 5.11 | 2 | .14 | .97 | .88 | .07 | .09 [-.01, .22] | .61** [.29, .92] | .20 [-.03, .42] | .14 [-.27, .57] |
| Negative Affect | 1.51 | 2 | .00 | 1 | 1 | .04 | -.21* [-.41, -.07] | .58** [.25, .88] | -.48** [-.71, -.25] | .08 [-.29, .50] |
| Attentional Control | 0.78 | 2 | .00 | 1 | 1 | .04 | .09* [.03, .15] | .57** [.23, .91] | .40** [.18, .60] | .03 [-.29, .37] |
| School Stress | 1.04 | 2 | .00 | 1 | 1 | .04 | -.21* [-.37, -.07] | .58** [.23, .90] | -.39** [-.58, -.20] | .20 [-.20, .55] |
| School Satisfaction | 2.58 | 2 | .06 | 1 | .99 | .07 | .07 [-.04, .22] | .55** [.22. .87] | .18 [-.11, .43] | .31 [-.16, .74] |

*Note.* The coefficients and Cis for paths a, b, and c are standardized (STDY).

** $p <= .001$; * $p < .05$

**Figure 1**

*Conceptual Diagram Depicting the Half-longitudinal Mediation Models Used Based on Valente & Mackinnon (2017)*



## Bridging to Study 3

Consistent with recent evidence that mindfulness-based instruction for students may not be effective using a one-size-fits-all approach (e.g., Montero-Marin et al., 2022), there has increasingly been calls to better understand how mindfulness instruction works and for whom (e.g., Davidson & Kasniak, 2015; Kuyken et al., 2022; Roeser et al., 2022). Study 1 revealed some of the conditions under which mindfulness-based programs can effectively increase students' dispositional mindfulness and school adjustment outcomes. Subsequently, findings in Study 2 showed that informal mindfulness practice may be more accessible and effective for adolescents specifically.

Beyond better understanding what works and for whom, it is also important to clarify how mindfulness may be benefitting students. A commonly accepted mechanism of action explaining mindfulness-based programs' effectiveness is that by repeatedly practicing mindfulness strategies, change is enacted through concurrent increases in individuals' general tendency to be mindful (i.e., dispositional mindfulness) in their day-to-day experiences and interactions (e.g., Kabat-Zinn, 2013; Roeser et al., 2022; Siegel, 2006). Indeed, consistent with research supporting this proposed theory of change (e.g., Verhaeghen, 2021), findings from Study 2 showed that adolescents who practiced informal mindfulness reported benefits specifically through increased dispositional mindfulness.

However, dispositional mindfulness is increasingly being recognised as a complex, multifaceted construct (e.g., Baer, 2019; Baer et al., 2006); thus, there is a need to better understand how the different components of mindfulness function together to effectively impact student outcomes. Unfortunately, most studies with adolescents have used uni-dimensional conceptualisations of mindfulness (e.g., Potts et al., 2021).

Additionally, another proposed mechanism of action for the benefits of mindfulness practice is through its impact on attentional control (e.g., Hölzel et al., 2011; Siegel, 2006; Verhaeghen, 2021). This is particularly important in adolescence due to this developmental period's difficulties with sustained attention and developing self-regulation skills (e.g., Patton et al., 2016; Thillay et al., 2015).

Therefore, Study 3 sought to further investigate how the different facets of dispositional mindfulness and attentional control function together to explain adolescents' stress, both general and academic.

**Chapter 4:** Study 3

# Mechanisms of change for mindfulness in adolescence: Attention control mediates the impact of facets of dispositional mindfulness on student stress

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**Abstract**

It is important to better understand how two potential mechanisms of change in mindfulness research, dispositional mindfulness and attentional control, function together in adolescence to impact students' stress, given the potential benefits to students' overall functioning. Thus, this study sought to investigate the potential role of adolescent students' ability to focus and shift their attention in the relationship between facets of dispositional mindfulness and stress (i.e., general and school-related stress), while considering potential gender differences. A total of 651 Grade 10 students (*M*age = 15.23; *SD* = .47; 61.4% female participants) were recruited from 6 urban schools and completed a series of questionnaires assessing dispositional mindfulness, attentional control, and stress. Findings from a series of SEM mediation models revealed that the acting with awareness, describe, and non-reactivity facets of dispositional mindfulness predicted lower student stress through attention focusing and attention shifting. Gender moderated some of these relationships such that boys' ability to describe predicted higher attention focusing while their ability to act with awareness predicted higher attention shifting. While the non-judgment facet of dispositional mindfulness had a direct inverse impact on student stress, there were no indirect effects through attention focusing or shifting. Finally, the observe facet of mindfulness was not associated with either aspect of attention control or student stress. Overall, these findings contribute to our growing understanding of the distinct benefits of the different facets of dispositional mindfulness and of how attentional control may be an important mechanism through which mindfulness may be beneficial to students' stress and of the importance of taking into account potential gender differences.

**Keywords:** mindfulness; adolescence; attention control; student stress

## Introduction

Over the past decades, mindfulness, an intentional and non-judgmental awareness of present moment experience, has become increasingly popular across a variety of domains including medicine, psychology, business, and, more recently, education (e.g., Kabat-Zinn, 2013). Indeed, mindfulness has been identified as one of the key means of supporting mental health and well-being both globally and for students specifically (e.g., World Health Organization (WHO), 2022; WHO & United Nations Children's Fund (UNICEF), 2021). Additionally, mindfulness has been suggested to be foundational to healthy coping (e.g., Stallman, 2020). As a consequence, mindfulness-based programs (MBPs) for students have become increasingly implemented in educational settings to support students' mental health and well-being. However, there has increasingly been a call for a more nuanced understanding of the mechanisms through which mindfulness may impact students (e.g., Kuyken et al., 2022; Montero-Marin et al., 2022; Weare & Bethune, 2022).

Unfortunately, the term "mindfulness" is often used vaguely; thus, it is important to recognise that mindfulness can be conceptualised in different ways. Firstly, it can be conceptualised as either a passing experience in which we are momentarily aware (i.e., state mindfulness) or as an individual characteristic such as our general tendency to be mindful (i.e., dispositional mindfulness; e.g., Brown & Ryan, 2003). One of the most commonly accepted operational definitions of dispositional mindfulness proposes that it consists of five facets that are inter-related yet distinct from one another: the ability to (a) act with intentional awareness, (b) be non-judgmental of present moment experience, (c) refrain from automatic internal reactivity, (d) describe and label present moment experience, and (e) observe the sensations, thoughts, and emotions we experience (Baer et al., 2006).

Alternatively, mindfulness can also refer to a process (i.e., mindfulness practice) used to cultivate the above facets. Indeed, several well-validated programs for adults have been developed and show benefits for psychological and health outcomes (e.g., Fjorback et al., 2011; Khoury et al., 2013). More recently, a great variety of MBPs have been developed to be developmentally appropriate for children and adolescents. These are being implemented in schools and reporting significant benefits in terms of buffering against stress and reducing anxiety or depression symptoms (e.g., Dunning et al., 2022). This is particularly important given the detrimental impact of stress on students' academic performance and well-being as well as on later functioning well into adulthood (e.g., Agnafors et al., 2021; Chaby et al., 2017; Dupéré et al., 2015; Tottenham & Galván, 2017). There have also recently been attempts to look at the benefits of mindfulness (i.e., dispositional mindfulness and mindfulness practice) beyond psychological outcomes and research shows that mindfulness impacts educational outcomes like academic success; however, this impact may be more indirect through other factors such as students' engagement with school or adaptability (e.g., Elphinstone et al., 2019; Maynard et al., 2017; Mettler et al., 2023).

Despite these promising findings regarding the benefits of mindfulness for students, how these benefits occur is still unclear. It has been proposed that the mechanisms through which change is enacted may be through increased dispositional mindfulness or through our ability to pay attention (e.g., Hölzel et al., 2011; Verhaegen, 2020; Visted et al., 2015); however, these relationships are complex and require further investigation.

Research with adults has suggested that the benefits of mindfulness practice occur through repeated experiences of state mindfulness, which in turn result in increased dispositional mindfulness and associated psychological benefits (e.g., Khoury et al., 2013; Kiken et al., 2015;

Siegel et al., 2016; Visted et al., 2015). Although research with children and adolescents is still sparse in this area, recent evidence suggests dispositional mindfulness may play a key role in predicting beneficial outcomes. For example, a recent study by Mettler and colleagues (2022) revealed that when compared to a control group, adolescents who practiced informal mindfulness (i.e., brief, unstructured mindfulness activities typically integrated within daily activities) reported significantly reduced stress, anxiety, depression, and negative affect as well as increased classroom attention after 2 months compared to a comparison group, and these changes were mediated by concurrent increases in dispositional mindfulness. Given that mindfulness is a complex multi-faceted construct, other research has also investigated nuanced relationships between students' dispositional mindfulness facets and psychological outcomes; however, research in this area is still limited (e.g., Bender et al., 2022; Pallozi et al., 2017; Potts et al., 2021). However, findings suggest that adolescents' increased reports of acting with awareness and non-reactivity may predict lower depression symptoms (Royuela-Colomer & Calvete, 2016), and that acting with awareness, non-reactivity, and having a non-judgmental attitude may buffer the impact of life stress on ruminative tendencies (Ciesla et al., 2012).

Furthermore, there is a need to consider potential gender differences in mindfulness research; however, findings in this area are mixed, with some studies reporting gender differences whereby male students report higher dispositional mindfulness (e.g., Marks et al., 2010; Royuela-Colomer & Calvete, 2016) or female students report better outcomes after participating in a mindfulness-based program (e.g., Bluth et al., 2017; Carsley et al., 2015; Kang et al., 2018). Altogether, a more nuanced understanding of dispositional mindfulness and its constituent facets is needed.

Beyond the possibility of the benefits of mindfulness practice arising due to changes in dispositional mindfulness, a second mechanism is through increased attentional control. When practicing mindfulness, one of the principal goals is to regulate attention by focusing on a target (i.e., often starting with a focus on the breath) and switching attention back to the target when it invariably wanders. Thus, the development of attentional control is generally considered one of the foundational components of mindfulness practice (Hasenkamp et al., 2012; Hölzel et al., 2011; Verhaegen, 2020). Indeed, research shows that both mindfulness practice and dispositional mindfulness are associated with increased attention levels and it has been suggested that the impact of increased dispositional mindfulness on outcomes as a result of mindfulness practice can be mediated by attentional control (e.g., Hölzel et al., 2011; Siegel, 2006, p. 115; Verhaegen, 2020). However, as concluded in a recent meta-analysis on mindfulness and attention in adults, it remains unclear how these changes in attention as a result of mindfulness practice may be related to changes in well-being that are often associated with mindfulness (Verhaegen, 2020).

Importantly, while dispositional mindfulness and attentional control may seem conceptually similar, they are separate and distinct constructs. Specifically, dispositional mindfulness is conceptualised as an individual's general tendency to purposefully pay attention to their present moment experience with a non-judgmental and non-reactive awareness. Thus, while having a general tendency to be mindful entails paying attention in a specific way, it is conceptualised as a higher-order process that goes beyond attentional control (e.g., Baer, 2019; Baer et al., 2011). Indeed, as discussed above, the capacity to regulate attention is considered one of the foundational aspects of mindfulness practice (e.g., Hölzel et al., 2011); however, dispositional mindfulness goes beyond attentional control given the specific qualities of attention (e.g., nonjudgment, non-reactivity) which are inherently implied in its multi-faceted

conceptualisation (e.g., Baer, 2019). Thus, further research is needed to better understand the complex relationship between these constructs.

This is especially relevant for students given that the ability to regulate attention is crucial for students' academic performance and success (see Weare & Ormston, 2021 for a review). Specifically, attentional control has been associated with a variety of student-relevant outcomes including lower depression and anxiety as well as increased self-efficacy and active learning (e.g., Du Rocher, 2020; Gagné et al., 2016; MacDonald et al., 2020). However, it is important to consider students' developmental stages given differences in cognitive, emotional, and social skills and aptitude (e.g., Lyons & DeLange, 2016; Potts et al., 2021). For instance, adolescence is a developmental stage of great neuroplasticity in which executive functioning skills, such as attention regulation, are still being developed (e.g., Thillay et al., 2015). It is also a transitional period in which students report high levels of stress while being particularly vulnerable to the detrimental impacts of stress, with potential lasting influences (e.g., Chaby et al., 2017; Tottenham & Galván, 2017). Finally, adolescence, specifically late adolescence, has been identified as a developmental stage in which students are particularly likely to benefit from mindfulness (e.g., Carsley et al., 2018; Dunning et al., 2022; Mettler et al., 2023).

Given the potential benefits to students' overall functioning, it is important to better understand how two potential mechanisms of change in mindfulness research, dispositional mindfulness and attentional control, function together in adolescence to impact students' stress. It may be that students' general tendency to be mindful may impact students' functioning differently depending on the facets of dispositional mindfulness assessed. Due to the foundational aspect of attention regulation to mindfulness practice's efficacy, it may be that the impact of facets of dispositional mindfulness may occur through associated changes in students'

ability to control their attention. Additionally, these relationships may be stronger for boys due to a potential ceiling effect in attentional control for girls, since previous studies have shown that adolescent boys report significantly less attentional control than girls (e.g., Gagné et al., 2016). Thus, the ability to focus or shift attention may be particularly important for adolescent boys in this developmental period and some aspects of dispositional mindfulness may be particularly important in helping boys focus or shift their attention.

In summary, both increased dispositional mindfulness and attentional control have been identified as potentially key mechanisms of action in mindfulness research; however, the relationship between dispositional mindfulness and attentional control is not well understood, particularly in terms of their impact on student outcomes. Thus, the main objective of this study was to investigate the potential role of adolescent students' ability to focus and shift their attention in the relationship between the different facets of dispositional mindfulness on students' stress (i.e., general and school-related stress). It was hypothesised that attention focusing would function differently than attention shifting in explaining the relationship between mindfulness facets as well as general and school stress. Additionally, it was hypothesised that the facets of mindfulness would differentially impact general stress, school stress, and aspects of attentional control; however, no hypotheses were made about which facets would emerge stronger. Finally, it was also hypothesised that gender differences may occur although the exact nature of these differences were not specified due to insufficient prior research.

## Method

### Participants

Participants were Grade 10 high school adolescent students recruited in 6 anglophone urban schools in the Montreal region in 2018-2019, following the obtention of institutional

research ethics approval as well as school board approval. Consistent with ther legal age of consent in Quebec (14 or older), students' informed consent was obtained. A total of 798 students were approached in classrooms; however, 130 students (16.3%) did not provide consent, 15 were absent, and 2 had to be excluded given problematic answer patterns on their questionnaire sheets (e.g., zigzag answers). Therefore, the final sample used in all main analyses consisted of 651 students (*M*age = 15.23; *SD* = .47; 61.4% female participants). Students reported various levels of prior knowledge of mindfulness as follows: 14% no prior knowledge, 44.9% a small amount, 27.6% a medium amount, and 5.5% a lot of previous knowledge (8% skipped the question).

**Measures**

***Dispositional mindfulness***. The 24-item *Five Facets of Mindfulness Questionnaire – Short Form* (FFMQ-SF; Baer et al., 2006; Bohlmeijer et al., 2011) will be used to assess five facets of dispositional mindfulness: *acting with awareness* (e.g., "I find myself doing things without paying attention), *describing* (e.g., "I'm good at finding words to describe my feelings"), *non-reactivity* (e.g., "I watch my feelings without getting carried away by them."), *non-judgmental acceptance* (e.g., "I tell myself I shouldn't be thinking the way I'm thinking"), and *observing* (e.g., "I notice the smells and aromas of things"). Responses are rated on a 5-point scale (1 = never or very rarely true to 5 = very often or always true) over the past month, with some questions requiring reverse scoring. Studies with adults report high internal consistency (Cronbach alphas ranging from .73 to .91), high test-retest reliability, and discriminant, convergent, and criterion validity (e.g., Baer et al. 2006). Validation with adolescents is much more limited (e.g., Bender et al., 2022; Pallozzi, et al., 2017); however, previous research with adolescents revealed adequate factor structure, test-retest reliability, and good convergent

validity (e.g., Cortazar & Calvete, 2019; Royuela-Colomer & Calvete, 2016). In the present study, it also demonstrated strong internal consistency (Cronbach's alphas ranging from .72 to .8)

***Attentional control.*** Students' attentional control was assessed using the 20-item *Attentional control scale (ACS;* Derryberry & Reed, 2002; 2007), with higher scores indicating greater self-perceived attentional control. The ACS is split into two subscales: attention focusing (9 items; e.g., "When concentrating, I can focus my attention so that I become unaware of what's going on in the room around me") and attention shifting (10 items; e.g., "When a distracting thought comes to mind, it is easy for me to shift my attention away from it."). Previous research has shown acceptable to good reliability both for adults (focusing: $\alpha$ = .82; shifting: $\alpha$ = .68; Olafsson et al., 2011) and for adolescents (focusing: $\alpha$ = .70; shifting: $\alpha$ = .63; Verstraeten et al., 2010). High internal consistency was found in the present study, with a Cronbach's alpha of ..76 for attention focusing and .75 for attention shifting.

***General stress.*** Students' perceived stress was assessed with the *Perceived Stress Scale* (Cohen et al., 1983), which consists of 10 items on a 5-point scale (0 = *never*; 4 = *very often*). Sample items include "In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?" The PSS has demonstrated good psychometric properties in general with adequate internal reliability (Cronbach's alpha of .78), construct validity, and predictive validity with psychological/ physical symptoms (e.g., Cohen & Williamson, 1988). In the present study, it also demonstrated strong internal consistency (Cronbach's alpha of .94).

***School stress.*** Students' perceived school-related stress was measured using the Stress of school performance (7 items) and school attendance (3 items) subscales of the *Adolescent stress*

*questionnaire* (ASQ; Byrne et al., 2007). Sample items include "Keeping up with schoolwork" or "Getting up early in the morning to go to school". Ratings are assessed on a 5-point scale (1 = *Not at all stressful (or irrelevant to me)* to 5 = *Very stressful*), with higher ratings indicating greater levels of stress. Previous research has demonstrated good test-retest reliability and internal consistency (Byrne et al., 2007) and reliability was also strong in the present study, with a Cronbach's alphas of .79 for school attendance and .91 for school performance.

**Procedure**

Following school board and school governing board approval, the study was presented in-class to Grade 10 students, who provided informed consent if they chose to participate. All participants were offered a 1 in 30 chance of winning a $50 gift card as a form of compensation for their time. One week later, the research team returned to the schools to collect data in classrooms. Students received an envelope containing the measures described above, which they had to complete during that class period. Following data collection, participants received a handout with information about the study and what this might mean for them as well as the contact information of key mental health professionals within their school who could be reached for support.

**Analytical Plan**

Analyses were conducted using MPlus 8.6 (Muthén & Muthén, 2015). In line with structural equation modeling guidelines, measurement models were first conducted to ensure good model fit for the latent variables under observation. Prior to conducting moderated mediation models, group measurement invariance across genders was also investigated by sequentially evaluating configural, metric, and scalar invariance for all latent constructs. Given the size of the final models under investigation, a two-step approach was taken. First, separate

latent path analyses were conducted to assess moderated mediations for each facet of mindfulness as an IV, with each type of attentional control as mediators, the different outcome variables as DVs, and gender as a moderator of the relationship between the IV and mediator for those latent constructs for which full or partial measurement invariance could be established. Secondly, combined models were run to predict the relationships from the five facets of dispositional mindfulness (IVs) to each outcome (DV; i.e., general and academic stress) through each aspect of attentional control (mediator; i.e., attention focusing & shifting). Within these combined models, interaction terms with gender were included for those latent constructs for which moderated mediations were indicated in the first step. Indirect and total effects were calculated, along with bootstrapped confidence intervals with 5000 resampling. Acceptable model fit was indicated by values of .08 or lower for root mean square error of approximation (RMSEA), .9 or higher for the comparative fit index (CLI), and less than .05 for the standardized root mean squared residual (SRMR) (Bentler, 1990; Browne & Cudeck, 1993; Hu & Bentler, 1999; Kline, 2016).

Furthermore, in interpreting significance, there has increasingly been a call to look beyond making a binary evaluation of significance based only on *p* values and to also report confidence intervals (e.g., du Prel et al., 2009; Kline, 2013). Therefore, to be more conservative, we will report both indices for all analyses in the present study.

Finally, given that the data were collected across 6 schools, dummy variables were created and new moderated mediation models were analysed including these dummy variables to control for the effect of schools. The models with and without the school dummy variables were then compared using AIC/BIC values. A difference of 2 or greater was deemed significant, with lower AIC/BIC values reflecting a better model.

# Results

## Measurement Invariance

Supplemental appendix A displays the fit indices and the final included items for all of the models conducted to assess the latent constructs' measurement fit prior to conducting structural models and measurement invariance between genders prior to using gender as a moderator. All latent constructs had well-fitting measurement models and most achieved partial scalar measurement invariance except for the non-reactivity facet of dispositional mindfulness, perceived general stress, and perceived school stress. Therefore, the moderating impact of gender on the relationship between dispositional mindfulness and types of attentional control was investigated for all facets of mindfulness except for non-reactivity.

## Moderated mediations: Does attention control mediate the relationship between dispositional mindfulness and student stress, with gender as a potential moderator?

As indicated in the data analytic section, the moderated mediation structural models were built using a two-step approach. In Step 1, findings from a series of models suggested that gender moderated the relationship between the describe facet of mindfulness and attention focusing only in the models whereby attention focusing mediated the relationship between describe and both general and school stress outcomes. Additionally, for the models with attention shifting as a mediator, gender only moderated the relationship between the awareness facet of mindfulness and attention shifting in the model with general stress as an outcome. No moderated mediations were found for the models with attention shifting as the mediator and school stress as the outcome.

Subsequently, in Step 2, four complex structural models were built within which all five facets of dispositional mindfulness were evaluated simultaneously to investigate the indirect effects of attention focusing and attention shifting in explaining the relationships between mindfulness facets and outcomes (i.e., general stress, school stress). Additionally, gender was added as a moderator of the relationship between facets of mindfulness and attentional control as appropriate based on results of Step 1. Figure 1 presents the conceptual diagrams of these models. The results of these structural models are presented in Table 1 (i.e., attention focusing) and Table 2 (i.e., attention shifting) respectively.

**Attention Focusing.** Interestingly, in the models investigating the indirect effect of attention focusing, a significant moderated mediation was found only for the describe facet of mindfulness. Specifically, higher reports of the ability to describe inner experiences was significantly related to decreased perceived general and school stress and this relationship occurred partially through increased ability to focus attention, but only for boys. However, the results for school stress need to be interpreted with caution given that the *p*-value suggests a significant indirect effect while the 95% Cis do not confirm this.

Additionally, students' ability to act with awareness significantly predicted general and school stress indirectly through attention focusing but these relationships were not moderated by gender. A similar pattern was suggested for the non-reactivity facet; however, the indirect effects for non-reactivity and school stress need to be interpreted with caution given that the 95% CIs suggest a significant effect but the *p*-values suggest a risk of sampling error greater than 5%. No significant indirect effects of attention focusing were found for the observe facet or the non-judgment facet on any of the outcomes.

**Attention shifting.** In terms of attention shifting, the results were more mixed. Firstly, a mediation was observed whereby adolescents who reported higher acting with awareness also reported lower perceived general and school stress and this was partly through higher reports of ability to shift attention. Furthermore, gender moderated the relationship between awareness and attention shifting but only in the models including general stress as an outcome; although this indirect effect was present for both boys and girls, it was stronger for boys. However, the model with general stress needs to be interpreted with caution given differences in interpretation between the 95% CI and the *p*-values.

Secondly, students' ability to describe and to be non-reactive significantly predicted general and school stress indirectly through their ability to shift attention; however, these relationships were not moderated by gender. In addition, these findings are based only on the 95% CIs and must therefore be interpreted tentatively.

**Non-judgment & Observe.** Interestingly, neither nonjudgment nor observe facets of dispositional mindfulness were significantly predictive of either type of attentional control. Although there was no direct link with school stress, nonjudgment was significantly predictive of general stress across all models. Meanwhile, the observe facet was not predictive of any outcome across all models except for general perceived stress in one of the models (attention shifting as mediator), with greater ability to observe predicting greater general stress.

**Impact of schools**

Given that data were collected across several schools, we sought to investigate whether the impact of schools needed to be controlled for. The models were rerun including dummy variables for schools, as per guidelines for datasets with few clusters (<30; Muthén, 2013). A comparison of the AIC and BIC scores of the models with and without the dummy variables

revealed that, although AIC values slightly favored the models controlling for the effect of schools, BIC comparisons strongly favored models without the school dummy variables (see Table 3 for AIC/BIC comparisons). Thus, given that the BIC index is more conservative and parsimonious, the final models did not control for schools.

## Discussion

The current study sought to investigate how two key theorised mechanisms of change for mindfulness-based programs (i.e, dispositional mindfulness and attentional control) function together to impact students' general and school stress in adolescence. Overall, the findings support the fact that one of the mechanisms of dispositional mindfulness' usefulness for adolescent students is through its impact on attentional control and, more specifically, on students' ability to focus and shift attention. Specifically, results indicate that acting with awareness, non-reactivity, and describe seem to be beneficial to students' stress through increased attentional control. Some of these relationships also seem to be stronger for boys in that their ability to describe predicts higher attention focusing while their ability to act with awareness predicts higher attention shifting.

It may be that acting with awareness, describe, and non-reactivity are the three facets of dispositional mindfulness whose impact on stress is being mediated by attentional focusing or shifting because these aspects of mindfulness are closely conceptually related to attention as a cognitive construct. In order to be able to focus or shift our attention to something else, we need to (a) be mindfully aware of our present moment experience, (b) be able to label it or put it into words, and (c) be able to maintain a sense of non-attachment to either focus or shift attention without interference from all the other things vying for our attention.

In some cases, the benefits through increased attentional control are there exclusively, or more strongly for boys than for girls. Specifically, findings suggest the greater boys' ability to describe or label their experiences (i.e., describe facet), the better they can focus their attention, which in turn leads to lower general and school stress. However, there was no indirect effect of describe on stress through attention focusing for girls. Research has shown that males individuals tend to report greater difficulties with emotional intelligence and alexithymia (e.g., Fischer et al., 2018; Levant et al., 2009), which in turn have both been negatively associated with the describe facet of dispositional mindfulness (e.g., Baer et al., 2006). Thus, it is possible that the experience of labeling or putting their experience into words may be particularly important for boys in helping narrow down their field of attention and sustain focus, which in turn is related to lower general or school stress.

Similarly, the findings suggest that adolescents who reported greater acting with awareness also reported less general stress through increased attention shifting, and that this relationship was again stronger for boys, albeit still present for girls. It may be that the more students are consciously and intentionally aware of what they are experiencing, the better they are able to be open to the scope or breadth of what they are experiencing and to intentionally control their ability to shift attention from one stimulus to another. Indeed, a commonly cited model of attentional processes in mindfulness meditation suggests that awareness of present moment experience is an important precursor to attention shifting in order to bring attention back to a state of focusing (Hasenkamp et al., 2012). Additionally, it may be that the relationship between acting with awareness and the ability to shift attention is particularly important for boys given previous research showing that male participants report significantly greater levels of mind wandering than female participants (e.g., Mowlem et al., 2019).

Interestingly, although gender differences in favour of boys were found for the relationship between describe and attention focusing as well as acting with awareness and attention shifting, most of the models in the present study did not reveal significant gender differences in the relationship between facets of dispositional mindfulness and attentional control. A recent review by Grissom and Reyes (2018) suggests that sex and gender differences in executive function (including attention) are overall slight and that the mixed evidence in the literature is probably reflective of differences in mechanisms of action rather than actual ability. The review highlights the need to consider contextual and individual factors which may be interacting with sex or gender to impact executive functions (Grissom & Reyes, 2018). Consistent with this claim, the present findings suggest that the impact of dispositional mindfulness on attentional control in adolescence may differ across genders as a function of specific facets of mindfulness; however, overall, there seem to be more similarities than differences.

Furthermore, the present results suggest that, in each model, non-judgment was directly associated with less general and school stress; however, this effect was not influenced by either aspect of attentional control. This may be due to the fact that this aspect of mindfulness may be less closely conceptually related to attention. Specifically, rather than tapping into the more cognitive aspects of dispositional mindfulness, non-judgment may be more of an emotional aspect of mindfulness and thus more closely related to constructs such as self-compassion. Indeed, mindfulness and self-compassion are closely related constructs (e.g., Bluth & Blanton, 2014; Hölzel et al., 2011; Neff & Dahm, 2015;) and studies show that cultivating an attitude of non-judgment may help buffer against self-criticism (e.g., Wakelin et al., 2021).

As discussed earlier, mindfulness is typically conceptualised as being purposefully aware of the present moment, with a nonjudgmental acceptance of whatever thoughts, sensations, or emotions arise. Thus, given that the non-reactivity and non-judgment facets of dispositional mindfulness are conceptualised as assessing this nonjudgmental acceptance aspect of mindfulness (e.g., Lindsay & Creswell, 2017), the discrepancy in patterns between these two facets in the present study is particularly interesting. Although both non-reactivity and non-judgment seem to have an impact on stress, these benefits may be occurring through distinct mechanisms. While the ability to be non-reactive may be beneficial through its impact on cognitive functions like attentional control, the ability to be non-judgmental may be beneficial through emotional factors such as increased self-compassion.

In terms of the observe facet of dispositional mindfulness, mixed results were found, with a significant positive direct relationship of observe on general stress but only in the model including attention shifting as a mediator. No other relationships were found with this facet of dispositional mindfulness. However, these findings are consistent with previous literature which shows that the Observe facet of the FFMQ functions differently to the other facets in general community samples and is indeed positively associated with constructs related to negative outcomes such as dissociation, absent-mindedness, psychological symptoms, and thought suppression in adults as well as stress and psychological symptoms in adolescents (e.g., Baer et al., 2006; Cortazar & Calvete, 2019). Indeed, it has been suggested that having the ability to observe internal and external experiences may be beneficial or detrimental depending on participants' previous experience with mindfulness practice, with novice or non-meditators more likely to report associations between observing and detrimental outcomes (e.g., Baer et al., 2006; Baer, 2019).

**Limitations and Future Directions**

Overall, these findings provide interesting evidence that attentional control may be an important mechanism through which mindfulness' benefits are experienced in adolescence, particularly for boys. However, several limitations need to be considered both in interpreting these results and for future research.

It is important to interpret these findings with caution given that our conservative approach in interpreting both *p*-values and CIs sometimes revealed discrepancies between these two indices of significance in some cases, as discussed in the results section. These findings serve as preliminary indicators of the pathways through which dispositional mindfulness and attentional control may work to impact adolescents' stress. However, further research is needed to replicate and confirm these findings and to enable a more complex understanding of potential gender differences as well as of longitudinal causational trajectories that may be at work.

Although the present study investigated the potential impact of gender differences, it was limited to binary definition of gender due to school board restrictions during the data collection period. However, gender-based research has increasingly emphasised the importance of studying gender identification along a continuum (e.g., Belfi et al., 2014; Yarnell et al., 2019). Therefore, there is a strong need for future studies to include a more complex definition of gender, particularly given that adolescence is a critical period for gender identification (e.g., see Steensma et al., 2013 for a review).

Additionally, while students' attentional control was assessed using a well validated measure, further exploration of the relationship between dispositional mindfulness and attention is needed using more objective assessments of attention. A recent meta-analysis of mindfulness-based programs with adults revealed that only the acting with awareness facet of dispositional

mindfulness was significantly associated with objective assessments of attention, with none of the other facets reaching significance (Verhaegen, 2020). Indeed, it would be important to investigate how students' dispositional mindfulness may potentially interact with their self-perceived ability to control their attention to impact their actual attention. Additionally, there is a need to specifically investigate students with attentional difficulties given the centrality of attentional control in explaining the benefits of mindfulness for most of the facets of dispositional mindfulness.

Finally, a limitation of this study is its cross-sectional nature. Longitudinal research is needed to investigate whether changes in dispositional mindfulness impact student stress over time through concurrent changes in attentional control. Despite this limitation, however, this study highlights the complexity of the different trajectories by which dispositional mindfulness can impact student stress. While some facets (i.e., acting with awareness, describe, non-reactivity) predict stress through aspects of attentional control, others, like non-judgment, have a direct impact on stress potentially through different mechanisms of action. Thus, future studies should investigate both how these relationships operate over time as well as how different types of mindfulness strategies may be targeting different facets of dispositional mindfulness.

**Conclusion**

Despite some limitations, the present study provides important contributions to the field of mindfulness research. This study highlights the importance of ensuring that mindfulness instruction to students is effective at increasing dispositional mindfulness specifically. Although this may seem obvious, a common criticism of mindfulness-based program implementation is a lack of assessment of dispositional mindfulness as an outcome. Over the past decade, there has been growing evidence of the essentiality of dispositional mindfulness in predicting beneficial

outcomes (e.g., Baer et al., 2011; Roeser et al., 2022; Siegel et al., 2016), and the present findings contribute to this literature by demonstrating the impact of facets of dispositional mindfulness on students' general and school stress.

Additionally, given the distinct relationships between facets of dispositional mindfulness and aspects of attentional control on students' stress and the moderating influence of gender, these findings strongly denote the importance of better understanding what works for whom. It is important to learn more about whether different types of strategies target specific facets of dispositional mindfulness given that not all facets function through the same mechanisms or have the same impact on student outcomes. These findings highlight that mindfulness is not one-size-fits-all and that mindfulness instruction should include a breadth of mindfulness strategies for students to choose from until more is know about potential differences between strategies.

Overall, these findings contribute to our growing understanding of the distinct benefits of the different facets of dispositional mindfulness and of how attentional control may be an important mechanism through which mindfulness may be beneficial to students' stress and of the importance of taking into account potential gender differences. Thus, it is critical to ensure that schools' often limited resources will be used to teach mindfulness to students in ways that (a) are actually effective at increasing students' dispositional mindfulness; (b) take into consideration students' individual differences (e.g., gender or attentional control differences); are accessible to students and adapted to target different facets of dispositional mindfulness.

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**Supplemental Materials**

*Goodness-of-fit Indices for the Gender Measurement Invariance Models*

| Models | $X^2$ | *df* | RMSEA | CFI | SRMR | $\Delta X^2$ | Δ CFI | Model Comparison | Conclusions (& Modifications) |
|---|---|---|---|---|---|---|---|---|---|
| **FFMQ - Acting with Awareness** | | | | | | | | | |
| **0** Measurement model | 7.12 | 2 | 0.07 | 0.99 | 0.02 | - | - | - | Good measurement & partial invariance (remove # 8 & unconstraining # 17 intercept) |
| **1** Configural invariance | 7.30 | 4 | 0.05 | 1.00 | 0.02 | - | - | - | |
| **2** Metric invariance | 9.50 | 7 | 0.04 | 1.00 | 0.03 | 2.20 | 0.00 | 1 vs 2 | |
| **3** Scalar invariance | 28.44 | 11 | 0.07 | 0.98 | 0.06 | 18.94 | 0.02 | 2 vs 3 | |
| **4** Scalar invariance modified | 18.84 | 10 | 0.05 | 0.99 | 0.05 | 9.35 | 0.01 | 2 vs 4 | |
| **FFMQ - Describe** | | | | | | | | | |
| **0** Measurement model | 10.69 | 4 | 0.05 | 0.99 | 0.02 | - | - | - | Good measurement & partial invariance (unconstraining intercepts for # 5 & 11) |
| **1** Configural invariance | 13.09 | 8 | 0.05 | 0.99 | 0.02 | - | - | - | |
| **2** Metric invariance | 20.91 | 12 | 0.05 | 0.99 | 0.05 | 7.82 | 0.01 | 1 vs 2 | |
| **3** Scalar invariance | 60.92 | 17 | 0.09 | 0.95 | 0.10 | 40.01 | 0.04 | 2 vs 3 | |
| **4** Scalar invariance modified | 26.06 | 14 | 0.07 | 0.98 | 0.08 | 5.15 | 0.01 | 2 vs 4 | |
| **FFMQ - Non-Judgment** | | | | | | | | | |
| **0** Measurement model | 19.94 | 5 | 0.07 | 0.99 | 0.03 | - | - | - | Good measurement & partial invariance (unconstraining intercepts for # 4 and 14) |
| **1** Configural invariance | 19.94 | 5 | 0.07 | 0.99 | 0.03 | - | - | - | |
| **2** Metric invariance | 23.95 | 14 | 0.05 | 0.99 | 0.04 | 2.29 | 0.00 | 1 vs 2 | |
| **3** Scalar invariance | 58.98 | 19 | 0.08 | 0.96 | 0.09 | 35.03 | 0.03 | 2 vs 3 | |
| **4** Scalar invariance modified | 34.34 | 17 | 0.06 | 0.98 | 0.05 | 10.39 | 0.01 | 2 vs 4 | |
| **FFMQ - Non-Reactivity** | | | | | | | | | |
| **0** Measurement model | 2.22 | 2 | 0.01 | 1.00 | 0.01 | - | - | - | Good measurement but no invariance (remove #9) |
| **1** Configural invariance | 3.66 | 4 | 0.00 | 1.00 | 0.02 | - | - | - | |
| **2** Metric invariance | 13.75 | 7 | 0.06 | 0.97 | 0.05 | 10.09 | 0.03 | 1 vs 2 | |
| **3** Scalar invariance | - | - | - | - | - | - | - | 2 vs 3 | |
| **4** Scalar invariance modified | - | - | - | - | - | - | - | 2 vs 4 | |
| **FFMQ - Observe** | | | | | | | | | |
| **0** Measurement model | 0.84 | 2 | 0.00 | 1.00 | 0.01 | - | - | - | Good measurement & partial invariance |
| **1** Configural invariance | 3.45 | 4 | 0.00 | 1.00 | 0.01 | - | - | - | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **2** | Metric invariance | 3.66 | 7 | 0.00 | 1.00 | 0.02 | 0.21 | 0.00 | 1 vs 2 | (unconstraining #6 intercept) |
| **3** | Scalar invariance | 17.81 | 11 | 0.05 | 0.98 | 0.05 | 14.14 | 0.02 | 2 vs 3 | |
| **4** | Scalar invariance modified | 7.37 | 10 | 0.00 | 1.00 | 0.03 | 3.71 | 0.00 | 2 vs 4 | |
| **ACS - Focusing** | | | | | | | | | | |
| **0** | Measurement model | 32.54 | 13 | 0.05 | 0.98 | 0.03 | - | - | - | Good measurement & partial invariance (remove #6 & 9, unconstraining #4 intercept) |
| **1** | Configural invariance | 62.50 | 26 | 0.07 | 0.96 | 0.04 | - | - | - | |
| **2** | Metric invariance | 74.73 | 32 | 0.07 | 0.96 | 0.05 | 12.23 | -0.01 | 1 vs 2 | |
| **3** | Scalar invariance | 102.65 | 39 | 0.07 | 0.94 | 0.06 | 27.92 | -0.02 | 2 vs 3 | |
| **4** | Scalar invariance modified | 91.65 | 38 | 0.07 | 0.95 | 0.06 | 16.92 | -0.01 | 2 vs 4 | |
| **ACS - Shifting** | | | | | | | | | | |
| **0** | Measurement model | 43.90 | 21 | 0.04 | 0.97 | 0.03 | - | - | - | Good measurement & partial invariance (removed #10 & 20, unconstraining #18 intercept) |
| **1** | Configural invariance | 76.68 | 42 | 0.05 | 0.96 | 0.04 | - | - | - | |
| **2** | Metric invariance | 85.63 | 50 | 0.05 | 0.95 | 0.05 | 8.95 | 0.00 | 1 vs 2 | |
| **3** | Scalar invariance | 110.58 | 59 | 0.05 | 0.93 | 0.06 | 24.95 | -0.02 | 2 vs 3 | |
| **4** | Scalar invariance modified | 102.39 | 58 | 0.05 | 0.94 | 0.05 | 16.76 | -0.01 | 2 vs 4 | |
| **PSS** | | | | | | | | | | |
| **0** | Measurement model | 130.80 | 27 | 0.08 | 0.97 | 0.03 | - | - | - | |
| **1** | Configural invariance | 58.83 | 54 | 0.08 | 0.97 | 0.03 | - | - | - | Good measurement but no invariance (removed #8) |
| **2** | Metric invariance | 177.09 | 62 | 0.08 | 0.96 | 0.05 | 118.26 | 0.00 | 1 vs 2 | |
| **3** | Scalar invariance | 286.51 | 71 | 0.10 | 0.93 | 0.13 | 109.42 | -0.03 | 2 vs 3 | |
| **4** | Scalar invariance modified | - | - | - | - | - | - | - | 2 vs 4 | |
| **ASQ** | | | | | | | | | | |
| **0** | Measurement model | 101.51 | 26 | 0.07 | 0.97 | 0.03 | | | - | |
| **1** | Configural invariance | 130.53 | 52 | 0.07 | 0.97 | 0.04 | | | - | Good measurement but no invariance (removed #9) |
| **2** | Metric invariance | 141.16 | 59 | 0.07 | 0.97 | 0.05 | 10.63 | 0.00 | 1 vs 2 | |
| **3** | Scalar invariance | 242.79 | 68 | 0.09 | 0.93 | 0.11 | 101.63 | -0.04 | 2 vs 3 | |
| **4** | Scalar invariance modified | - | - | - | - | - | - | - | 2 vs 4 | |

*Note.* FFMQ = Five Facets of Mindfulness Questionnaire (i.e., dispositional mindfulness); ACS = Attentional Control Scale (i.e., attentional control); PSS = Perceived Stress Scale (i.e., perceived stress); ASQ = Adolescent Stress Questionnaire (i.e., school stress)

**Table 1**

*Model Fit Statistics and Path Coefficients for the Full Mediation and Moderated Mediation Models Assessing the Influence of Attention Focusing on the Relationship Between Facets of Mindfulness and Student General and School Stress*

| | | **PSS** | | | | **ASQ-A** | | | | **ASQ-P** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Model fit statistics** | | | | **Model fit statistics** | | | | **Model fit statistics** | | | |
| | | $X^2$ = 1123.94; df = 538; p = <.001; RMSEA = .042; CFI = .93; SRMR = .05 | | | | $X^2$ = 1065.18; df = 531; p = <.001; RMSEA = .04; CFI = .93; SRMR = .05 | | | | | | | |
| **Model Paths** | | **Path Coefficient** | ***p* value** | **95% LCI** | **95% UCI** | **Path Coefficient** | ***p* value** | **95% LCI** | **95% UCI** | **Path Coefficient** | ***p* value** | **95% LCI** | **95% UCI** |
| Y on M | DV on ACSF | -0.42 | **<.001** | **-0.61** | **-0.26** | -0.36 | **0.01** | **-0.62** | **-0.12** | -0.63 | **<.001** | **-0.92** | **-0.37** |
| Y on X1 | DV on AA | -0.21 | **<.001** | **-0.30** | **-0.11** | -0.26 | **0.001** | **-0.40** | **-0.12** | -0.18 | **0.03** | **-0.33** | **-0.03** |
| Y on X2 | DV on NJ | -0.26 | **<.001** | **-0.35** | **-0.17** | -0.02 | 0.72 | -0.13 | 0.09 | -0.07 | 0.28 | -0.20 | 0.06 |
| Y on X3 | DV on NR | -0.36 | **0.001** | **-0.54** | **-0.19** | -0.33 | **0.03** | **-0.57** | **-0.10** | -0.53 | **0.00** | **-0.86** | **-0.26** |
| Y on X4 | DV on DS | -0.07 | 0.09 | -0.16 | 0.01 | -0.02 | 0.78 | -0.14 | 0.10 | 0.03 | 0.71 | -0.10 | 0.16 |
| Y on X5 | DV on OB | 0.06 | 0.16 | -0.02 | 0.14 | 0.03 | 0.67 | -0.09 | 0.15 | -0.03 | 0.69 | -0.16 | 0.09 |
| M on X1 | ACSF on AA | 0.22 | **<.001** | **0.15** | **0.31** | 0.23 | **<.001** | **0.15** | **0.31** | 0.23 | **<.001** | **0.15** | **0.31** |
| M on X2 | ACSF on NJ | 0.01 | 0.79 | -0.06 | 0.08 | 0.01 | 0.78 | -0.06 | 0.08 | 0.01 | 0.78 | -0.06 | 0.08 |
| M on X3 | ACSF on NR | 0.26 | **<.001** | **0.13** | **0.40** | 0.27 | **<.001** | **0.13** | **0.42** | 0.27 | **<.001** | **0.13** | **0.42** |
| M on X4 | ACSF on DS | 0.16 | **0.00** | **0.07** | **0.26** | 0.16 | **0.001** | **0.07** | **0.26** | 0.16 | **0.001** | **0.07** | **0.26** |
| M on X5 | ACSF on OB | -0.04 | 0.35 | -0.11 | 0.04 | -0.04 | 0.35 | -0.12 | 0.04 | -0.04 | 0.35 | -0.12 | 0.04 |
| W | ACSF on GENDER | 0.01 | 0.85 | -0.08 | 0.11 | 0.00 | 0.94 | -0.09 | 0.13 | 0.00 | 0.94 | -0.09 | 0.13 |
| XW | ACSF on Interaction | -0.11 | **0.05** | **-0.23** | **-0.01** | -0.11 | **0.05** | -0.22 | 0.01 | -0.11 | **0.05** | -0.22 | 0.01 |
| **Mediation FFMQ facets** | | | | | | | | | | | | | |
| **Indirect effect AA** | | -0.09 | **0.001** | **-0.15** | **-0.05** | -0.08 | **0.05** | **-0.16** | **-0.03** | -0.14 | **0.01** | **-0.24** | **-0.07** |
| Total effect AA | | -0.30 | **<.001** | **-0.39** | **-0.21** | -0.26 | **0.00** | **-0.42** | **-0.12** | -0.40 | **0.00** | **-0.56** | **-0.25** |
| **Indirect effect NJ** | | 0.00 | 0.81 | -0.033 | 0.02 | -0.003 | 0.87 | -0.03 | 0.02 | -0.01 | 0.84 | -0.05 | 0.04 |
| Total effect NJ | | -0.26 | **<.001** | **-0.36** | **-0.164** | -0.08 | 0.25 | -0.21 | 0.06 | -0.03 | 0.66 | -0.15 | 0.09 |
| **Indirect effect NR** | | -0.11 | **0.03** | **-0.18** | **-0.06** | -0.10 | 0.28 | **-0.19** | **-0.03** | -0.17 | 0.12 | **-0.28** | **-0.09** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total effect NR | -0.47 | **<.001** | **-0.66** | **-0.30** | -0.63 | **0.00** | **-0.97** | **-0.35** | -0.50 | **0.00** | **-0.76** | **-0.25** |
| **Indirect effect OB** | 0.02 | 0.35 | -0.02 | 0.05 | 0.01 | 0.39 | -0.01 | 0.05 | 0.02 | 0.37 | -0.02 | 0.08 |
| Total effect OB | 0.07 | 0.08 | -0.01 | 0.16 | -0.01 | 0.85 | -0.14 | 0.11 | 0.05 | 0.45 | -0.08 | 0.18 |
| **Moderated Mediation - Describe** | | | | | | | | | | | | |
| Simple slopes boys | 0.16 | **0.00** | **0.07** | **0.26** | 0.16 | **0.001** | **0.07** | **0.26** | 0.16 | **0.001** | **0.07** | **0.26** |
| Simple slopes girls | 0.05 | 0.29 | -0.04 | 0.13 | 0.05 | 0.28 | -0.04 | 0.14 | 0.05 | 0.28 | -0.04 | 0.14 |
| **Indirect effect boys** | -0.07 | **0.01** | **-0.12** | **-0.02** | -0.06 | 0.06 | **-0.12** | **-0.02** | -0.10 | **0.02** | -0.19 | 0.02 |
| **Indirect effect girls** | -0.02 | 0.33 | -0.06 | 0.02 | -0.02 | 0.46 | -0.06 | 0.01 | -0.03 | 0.38 | -0.09 | 0.11 |
| IMM | 0.05 | 0.09 | 0.00 | 0.11 | 0.04 | 0.12 | **0.00** | **0.11** | 0.07 | **0.08** | **0.01** | **0.16** |
| Total effect boys | -0.14 | **0.00** | **-0.23** | **-0.05** | -0.08 | 0.25 | -0.21 | 0.05 | -0.07 | 0.32 | -0.21 | 0.07 |
| Total effect girls | -0.09 | 0.04 | **-0.18** | **-0.01** | -0.04 | 0.57 | -0.16 | 0.09 | -0.01 | 0.94 | -0.14 | 0.14 |

*Note.* Significant values are bolded.

AA = Acting with Awareness; ACSF = Attention focusing; ACSS = Attention shifting; DS = Describe; NJ = Non-judgment; NR = Non-reactivity; OB = Observe

**Table 2**

*Model Fit Statistics and Path Coefficients for the Full Mediation and Moderated Mediation Models Assessing the Influence of Attention Shifting on the Relationship Between Facets of Mindfulness and Student General and School Stress*

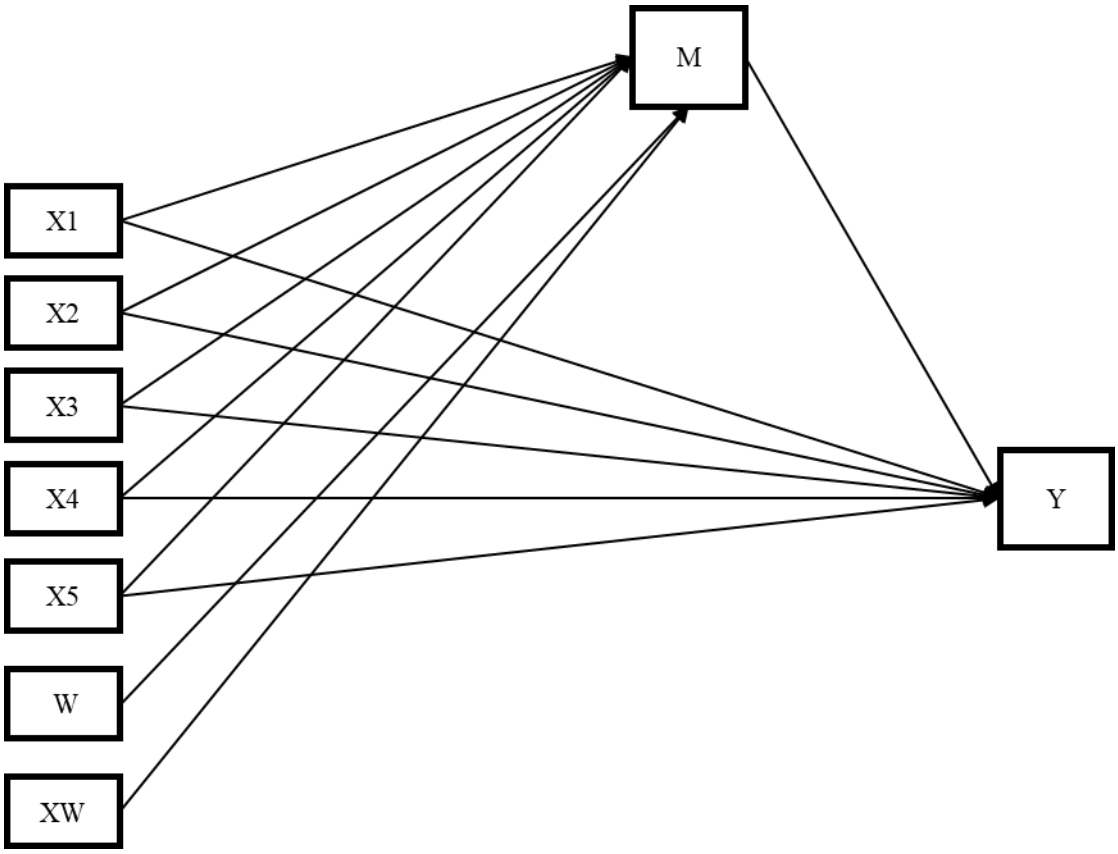
| | | PSS | | | | ASQ-A | | | | ASQ-P | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Model fit statistics** | | | | **Model fit statistics** | | | | **Model fit statistics** | | | |
| | | $X^2$ = 1327.97; df = 639; p = <.001; RMSEA = .04; CFI = .92; SRMR = .05 | | | | $X^2$ = 1205; df = 595; p = <.001; RMSEA = .04; CFI = .92; SRMR = .05 | | | | | | | |
| **Model Paths** | | **Path Coefficient** | ***p* value** | **95% LCI** | **95% UCI** | **Path Coefficient** | ***p* value** | **95% LCI** | **95% UCI** | **Path Coefficient** | ***p* value** | **95% LCI** | **95% UCI** |
| Y on M | DV on ACSF | -0.35 | 0.19 | **-0.62** | **-0.08** | -0.52 | **0.004** | **-0.90** | **-0.20** | -0.73 | **<.001** | **-1.13** | **-0.36** |
| Y on X1 | DV on AA | -0.25 | **<.001** | **-0.35** | **-0.16** | -0.26 | **<.001** | **-0.41** | **-0.13** | -0.20 | **0.01** | **-0.35** | **-0.06** |
| Y on X2 | DV on NJ | -0.26 | **<.001** | **-0.36** | **-0.17** | -0.03 | 0.59 | -0.15 | 0.08 | -0.09 | 0.16 | -0.22 | 0.04 |
| Y on X3 | DV on NR | -0.39 | 0.15 | **-0.59** | **-0.20** | -0.30 | **0.02** | **-0.56** | **-0.05** | -0.54 | **0.001** | **-0.86** | **-0.24** |
| Y on X4 | DV on DS | -0.06 | 0.41 | -0.16 | 0.03 | 0.03 | 0.70 | -0.10 | 0.16 | 0.09 | 0.25 | -0.05 | 0.23 |
| Y on X5 | DV on OB | 0.09 | **0.05** | **0.01** | **0.18** | 0.06 | 0.33 | -0.06 | 0.19 | 0.03 | 0.66 | -0.10 | 0.16 |
| M on X1 | ACSS on AA | 0.24 | **<.001** | **0.14** | **0.36** | 0.16 | **<.001** | **0.09** | **0.24** | 0.16 | **<.001** | **0.09** | **0.24** |
| M on X2 | ACSS on NJ | -0.01 | 0.67 | -0.07 | 0.05 | -0.01 | 0.70 | -0.07 | 0.05 | -0.01 | 0.70 | -0.07 | 0.05 |
| M on X3 | ACSS on NR | 0.25 | **0.00** | **0.12** | **0.39** | 0.25 | **<.001** | **0.13** | **0.38** | 0.25 | **<.001** | **0.13** | **0.38** |
| M on X4 | ACSS on DS | 0.15 | **<.001** | **0.08** | **0.22** | 0.15 | **<.001** | **0.08** | **0.23** | 0.15 | **<.001** | **0.08** | **0.23** |
| M on X5 | ACSS on OB | 0.05 | 0.18 | -0.02 | 0.11 | 0.05 | 0.16 | -0.01 | 0.12 | 0.05 | 0.16 | -0.01 | 0.12 |
| W | ACSS on GENDER | 0.01 | 0.87 | -0.08 | 0.10 | | N/A | | | | N/A | | |
| XW | ACSS on Interaction | -0.13 | **0.02** | **-0.24** | **-0.03** | | N/A | | | | N/A | | |
| **Mediation FFMQ facets** | | | | | | | | | | | | | |
| **Indirect effect AA** | | N/A (Moderated Mediation Below) | | | | -0.08 | **0.01** | **-0.17** | **-0.03** | -0.12 | **0.003** | **-0.21** | **-0.05** |
| Total effect AA | | | | | | -0.34 | **<.001** | **-0.48** | **-0.22** | -0.32 | **<.001** | **-0.46** | **-0.19** |
| **Indirect effect NJ** | | 0.01 | 0.90 | -0.02 | 0.03 | 0.01 | 0.72 | **0.02** | **0.04** | 0.01 | 0.71 | -0.04 | 0.05 |
| Total effect NJ | | -0.26 | **<.001** | **-0.36** | **-0.16** | -0.03 | 0.68 | -0.14 | 0.09 | -0.09 | 0.22 | -0.22 | 0.05 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Indirect effect NR** | -0.09 | 0.71 | **-0.18** | **-0.03** | -0.13 | **0.02** | **-0.28** | **-0.05** | -0.18 | **0.003** | **-0.33** | **-0.08** |
| Total effect NR | -0.48 | **<.001** | **-0.67** | **-0.31** | -0.43 | **<.001** | **-0.68** | **-0.22** | -0.72 | **<.001** | **-1.04** | **-0.43** |
| **Indirect effect DS** | -0.05 | 0.33 | **-0.11** | **-0.01** | -0.08 | **0.02** | **-0.17** | **-0.03** | -0.11 | **0.01** | **-0.22** | **-0.04** |
| Total effect DS | -0.11 | **0.01** | **-0.20** | **-0.02** | -0.05 | 0.39 | -0.17 | 0.08 | -0.03 | 0.72 | -0.16 | 0.12 |
| **Indirect effect OB** | -0.02 | 0.47 | -0.06 | 0.00 | -0.02 | 0.23 | -0.08 | 0.00 | -0.03 | 0.19 | -0.10 | 0.01 |
| Total effect OB | 0.07 | 0.08 | 0.00 | 0.16 | 0.04 | 0.55 | -0.08 | 0.16 | -0.01 | 0.94 | -0.14 | 0.13 |
| **Moderated Mediation - Acting with Awareness** | | | | | | | | | | | | |
| Simple slopes boys | 0.24 | **-0.06** | **0.00** | **-0.06** | | | | | | | | |
| Simple slopes girls | 0.12 | **-0.06** | **0.00** | **-0.06** | | | | | | | | |
| **Indirect effect boys** | -0.08 | 0.13 | **-0.06** | **0.00** | | | | | | | | |
| **Indirect effect girls** | -0.04 | 0.40 | **-0.06** | **0.00** | N/A (Mediation Above) | | | | | | | |
| IMM | 0.04 | 0.10 | **-0.06** | **0.00** | | | | | | | | |
| Total effect boys | -0.33 | **-0.06** | **0.00** | **-0.06** | | | | | | | | |
| Total effect girls | -0.29 | **-0.06** | **0.00** | **-0.06** | | | | | | | | |

Note. Significant values are bolded.
AA = Acting with Awareness; ACSF = Attention focusing; ACSS = Attention shifting; DS = Describe; NJ = Non-judgment; NR = Non-reactivity; OB = Observe

**Figure 1**

*Conceptual Diagram of the Mediation and Moderated Mediation Models Investigating the Relationship of Dispositional Mindfulness Facets on Student Stress Through Aspects of Attentional Control*




*Note,* **X1-X5** = Dispositional mindfulness facets; **W** = Gender; **XW** = Interaction term; **M** = Aspect of attentional control; **Y** = General or school stress

# Chapter 5: General Discussion

## Summary of Findings & Original Contributions to Knowledge

Although educational settings have increasingly been using mindfulness instruction as a means of supporting students' mental health, well-being, and overall functioning, there is still a dearth of research to understand the conditions under which mindfulness instruction is effective (e.g., Bamber & Schneider, 2016; Black, 2015; Bluth, et al., 2017; Kuyken et al., 2013; Roeser et al., 2022; Schutt & Felver, 2021; Tomlinson et al., 2018). Additionally, mindfulness instruction in schools only works if students actually use and engage with the strategies being taught; however, issues with student adherence and participation are consistently reported in mindfulness research with youth (e.g., Montero-Marin et al., 2022; Parsons et al., 2017; Quach et al., 2017). Thus, it is critical to also look beyond effectiveness to better understand how to make mindfulness instruction more accessible to students. Namely, how can it be taught effectively, for whom does it work, and how does it work?

Therefore, informed by the principles of equifinality and multifinality (Cicchetti & Rogosch, 1996), this dissertation research contributes to the literature on mindfulness and mindfulness-based activities by identifying multiple pathways through which mindfulness instruction can be effective and accessible for students in general and in adolescence specifically across a variety of outcomes including mental health, well-being, and educational outcomes. Additionally, these findings demonstrate how the impact of dispositional mindfulness on student outcomes occurs through nuanced and complex mechanisms of action. In the present chapter, discussion will center around key findings and contributions as they relate to the overarching rationale of the three dissertation manuscripts, followed by implications and future directions for practice and research.

**Key takeaway #1: Mindfulness *can* be effective for students.** Altogether, the results from all three manuscripts in this dissertation show that mindfulness practice and dispositional mindfulness for students can be effective; however, they also demonstrate the need to go beyond using a "one size fits all" approach to mindfulness instruction. With the attention the MYRIAD team studies have recently been garnering in academia and in the news, it is likely that the field of mindfulness research, particularly in its applications with youth, is at a critical junction in terms of making decisions regarding the role of mindfulness in supporting students' coping capacity (Hunt, 2022; Kuyken et al., 2022; Weare & Ormston, 2022). These dissertation findings are thus particularly timely in contributing support for the need to qualify mindfulness instruction's effectiveness based on a variety of contextual and student individual factors.

Across the three studies, a key take-home message is that mindfulness instruction for students *can* be effective under certain conditions. Results from Study 1, a meta-analysis of rigorously designed studies using mindfulness-based programs with students, revealed that they may have an impact on students' dispositional mindfulness and school adjustment outcomes specifically when delivered to adolescents, by an outside facilitator with established personal experience with mindfulness practice, and using an adaptation of an existing program. Additionally, findings from Study 2 demonstrated that adolescents who were taught to practice informal mindfulness strategies over a 4-week period reported significantly increased dispositional mindfulness which explained benefits in mental health, well-being, and educational outcomes up to one month later. Finally, Study 3 revealed that adolescents' general tendency to be mindful predicted lower general and academic stress; however, not all facets of dispositional mindfulness (i.e., observe facet) followed this pattern and these relationships were influenced both by adolescents' ability to regulate their attention and their gender.

Overall, these three studies highlight the complexity of the role of both mindfulness instruction and dispositional mindfulness for students. These findings provide further evidence that, consistent with Stallman's Health Theory of Coping (2020), mindfulness instruction may be an important low-intensity strengths-based approach to support students' coping capacity and overall functioning. Going forward, future research needs to further investigate the circumstances that contribute to making mindfulness instruction effective and accessible to students and the school context in which it is being implemented, while moving beyond merely adapting instruction based on adult models (e.g., Emerson et al., 2020). As will be discussed further, these dissertation studies provide important contributions regarding (a) what mindfulness can and cannot do and (b) what next steps should be taken to offer sustainable and effective support to students.

**Key takeaway #2: Dispositional mindfulness as a mechanism of change.** Another key contribution is to the literature suggesting that dispositional mindfulness may be a core mechanism of change in mindfulness-based interventions for students. As discussed in the theoretical frameworks above, theories of therapeutic change in mindfulness research have long suggested that mindfulness practice gradually increases individuals' general tendency to be mindful (i.e., dispositional mindfulness), which in turn leads to associated benefits (e.g., Baer et al., 2011; Khoury et al., 2013; Roeser et al., 2022; Siegel et al., 2016). Indeed, there has been increasing research evidence, including large meta-analyses, demonstrating that the effectiveness of mindfulness-based programs for adults on their mental health or cognitive outcomes occurs through increases in their dispositional mindfulness (e.g., Carmody & Baer, 2008; Carrière et al., 2018; Khoury et al., 2013; Khoury et al., 2015; Kiken et al., 2015; Visted et al., 2015; Verhaeghen, 2021).

However, this dissertation offers additional support suggesting that this mechanism of change is also present for adolescents and plays a critical role in explaining potential benefits for students, particularly in adolescence. Specifically, the results from the randomised controlled design experimental study in Study 2 suggests that adolescents who practiced informal mindfulness had significantly greater dispositional mindfulness than the comparison group both after 4 weeks of practice (post) and at the 1-month follow-up. Further analyses revealed that it was precisely this change in dispositional mindfulness that explained concurrent changes in mental health, well-being, and educational outcomes.

Furthermore, findings from Study 3 also highlighted the centrality of dispositional mindfulness in predicting adolescents' stress as well as the need to consider the intersectionality between dispositional mindfulness and adolescents' ability to control their attention. Additionally, informed by the principle of multifinality (e.g., Cicchetti & Rogosch, 1996), Study 3 revealed distinct pathways through which stress was impacted depending on the different facets of dispositional mindfulness, the types of attentional control, and adolescents' gender. Thus, these findings underscore the need for a complex and nuanced investigation of how dispositional mindfulness, both as a whole and as distinct facets, is impacted through mindfulness instruction in order to better understand what works and for whom.

Altogether, this dissertation research provides additional support to the growing recognition across the field of mindfulness research of the need to ensure that mindfulness instruction is directly targeting students' dispositional mindfulness (e.g., Baer et al., 2011; Dunning et al., 2022). Indeed, in line with this, findings from the meta-analysis in Study 1 revealed that only 19 out of the 46 studies included (41%) included assessment of dispositional mindfulness as an outcome of the mindfulness-based programs being evaluated. This lack of

assessment of dispositional mindfulness as an outcome of MBPs' effectiveness has been a long-standing issue in mindfulness research (e.g., Baer et al., 2011), particularly since dispositional mindfulness has been suggested to be one of the key mechanisms of change in mindfulness-based programs. Indeed, a recent meta-analysis of mindfulness-based programs with students by Dunning and colleagues (2022) still reported that only 25 out of 66 included studies (37.9%) included dispositional mindfulness as an outcome.

**Key takeaway #3: Importance of accessibility.** Another key contribution of this dissertation research is in highlighting the need to consider the accessibility of the mindfulness instruction being offered to students. Given that a key theory of therapeutic change in mindfulness-based programs is through mindfulness practice increasing dispositional mindfulness, it is critical to ensure that participants actually use and engage with the strategies being taught both during the program sessions and at home in their day-to-day life (e.g., Parsons et al., 2017). Unfortunately, mindfulness-based programs often report high levels of participant attrition, with participants reporting difficulties in adhering to formal mindfulness activities both in terms of integration in daily routines and with the strategies themselves (e.g., Birtwell et al., 2018; Kerrigan et al., 2011; Nam & Toneatto, 2016). Indeed, studies of mindfulness-based program implementation with adolescents also reveal very high levels of non-compliance with home mindfulness practice, with the majority reporting not practicing mindfulness outside of the required program sessions (e.g., Montero-Marin et al., 2022; Quach et al., 2017). Thus, it is crucial to ensure that mindfulness instruction is accessible and appealing to participants, particularly for adolescents, in order to ensure that individuals are using these strategies beyond the limited scope of the program implementation period.

Indeed, meta-analytic findings from Study 1 point to the importance of adapting mindfulness instruction to meet the needs of different contexts and target populations. Results revealed that only adapted mindfulness-based programs for students were effective for both school adjustment and mindfulness outcomes, perhaps because they are adapted specifically to the contexts in which they are being implemented. Meanwhile, established programs only had an impact on school adjustment but not on mindfulness. Given that established school-based mindfulness programs often aim for sustainability by encouraging implementation directly through school staff (e.g., by educators), they tend to be manualised and offered as stand-alone curricula to be embedded within the broader classroom curriculum (e.g., Emerson et al., 2020). However, this may create an undue reliance on facilitators' understanding of mindfulness, which in turn may impact facilitators' ability to effectively teach mindfulness skills.

In support of this interpretation, finding from this meta-analysis also revealed that mindfulness-based programs for students were only effective on school adjustment and mindfulness outcomes when delivered by outside facilitators with previous personal experience in mindfulness practice. When delivered by educators, regardless of personal experience with mindfulness, mindfulness-based programs had no impact on students' school adjustment or dispositional mindfulness. This is consistent with recent findings from the largest randomised controlled trial of mindfulness for students in which no significant impact on student outcomes was found when using a universal implementation approach (Montero-Marin et al., 2022). It has been suggested that this may be due to the fact that almost all of the facilitators in this study were new to mindfulness practice and, even following training, were on average rated as competent enough to teach mindfulness only at a basic level (e.g., Montero-Marin et al., 2022; Weare & Ormston, 2022). This may, in turn, have affected student engagement with the mindfulness

strategies since findings also showed that the teachers who were rated highest in terms of competency to teach mindfulness were also the ones who had the most students reporting using the strategies taught and benefiting from these (Weare & Ormston, 2022). Thus, these findings underscore the importance of being able to provide accessible mindfulness instruction that facilitates student engagement.

In further support of the importance of accessibility (Takeaway #3), the second study of this dissertation sought to better understand what type of content was more acceptable and effective in mindfulness instruction for adolescents. A randomised experimental design was used to parse out the impact of formal and informal mindfulness strategies for adolescents. Most importantly, findings from Study 2 showed that, although adolescents in both the formal and informal groups reported high acceptability of the taught strategies, only those who practiced informal mindfulness were more likely to report intending to continue using the mindfulness strategies than those practicing formal mindfulness. Additionally, adolescents who practiced informal mindfulness reported increased dispositional mindfulness over time compared to the comparison group which, in turn, explained concurrent beneficial changes to adolescents' stress, anxiety, depression, negative affect, school stress, and classroom attentional control. Therefore, these findings highlight the need to provide mindfulness instruction that is accessible to students.

Although previous meta-analyses of mindfulness-based programs for students have shown that adolescence is potentially a particularly important window of opportunity in which to offer mindfulness instruction to students (e.g., Carsley et al., 2018), the present study found no impact of effectiveness as a result of formal mindfulness instruction. Traditional mindfulness instruction, both for adults and adolescents, typically focuses greatly on teaching formal mindfulness strategies and requiring a commitment to practice these strategies regularly, while

also encouraging participants to use informal mindfulness skills in their day-to-day life (e.g., Kabat-Zinn, 2013; Segal et al., 2002). However, a commonly accepted theory of change in mindfulness programs is that by regularly practicing formal mindfulness, individuals will gradually be able to transfer these skills informally in their day-to-day functioning, thus increasing their general tendency to be mindful (e.g., Goodman et al., 2015).

Thus, it may be that the key ingredient driving the effectiveness of mindfulness-based programs is participants' ability to engage in frequent informal mindfulness. The findings in Study 2 might be an indication that traditional mindfulness-based programs are particularly beneficial in adolescence since this is a developmental period in which youth are able to make the cognitive leap from learning and practicing the taught formal mindfulness strategies to transferring these skills to impact their day-to-day life. Therefore, it may be this ability to integrate mindfulness skills in their daily life that is driving the effectiveness of mindfulness-based programs in adolescence; however, further research is needed to assess this potential mechanism of change.

Furthermore, a key take-home message from the findings in Study 3 was that adolescents' stress can be impacted through various trajectories depending on adolescents' different facets of dispositional mindfulness, different components of their capacity to regulate their attention, and their gender. These findings highlight the importance of better understanding *who* is receiving mindfulness instruction. As suggested in Hölzel and colleagues' theoretical framework (2011), these findings suggest that attention regulation seems to play a central role in explaining the benefits of mindfulness for adolescents. This is particularly important given that adolescence is a period of rapid neuroplasticity in which the capacity to control attention is still developing. Additionally, the impact of the components of attentional control (i.e., attention focusing or

shifting) differed depending on both participants' gender and different facets of dispositional mindfulness. Thus, these findings highlight the importance of individual differences such as adolescents' gender, attentional control, or their general tendency to be mindful, and of taking into consideration the different pathways through which student outcomes may be impacted.

Overall, informed by the principle of equifinality (Cicchetti & Rogosch, 1996), Studies 1, 2, and 3 demonstrate how students, particularly in adolescence, can benefit from mindfulness instruction and dispositional mindfulness through facilitating accessibility in different ways. Thus, this dissertation research emphasises the need to ensure that mindfulness instruction is accessible to youth in order to ensure effectiveness.

**Key takeaway #4: Need for differentiation of strategies.** Finally, informed by the principle of multifinality (Cicchetti & Rogosch, 1996), another contribution of this dissertation is that these studies highlight the need to differentiate between the different types of mindfulness strategies being taught in order to better understand what outcomes are being targeted. Unfortunately, the term "mindfulness" is often used indiscriminately to encompass a wide variety of strategies being taught in mindfulness-based program (e.g., Van Dam et al., 2018), from simple breath awareness activities, to body scans which incorporate awareness of the body both in part and as a whole, to more complex sitting meditations which traditionally require being aware of the breath, bodily sensations, emotions, thoughts, as well as having an open awareness of whatever objects of attention emerge in our consciousness (e.g., Gould et al., 2016; Kabat-Zinn, 2013; Segal et al., 2002).

For example, one of the core and foundational skill for mindfulness practice is breath awareness, where the emphasis is on focusing attention on the breath and shifting it back to the breath when the mind inevitably wanders. However, traditional mindfulness practice goes

beyond breath awareness to encompass a quality of attention that is non-judgmental and non-reactive (e.g., Kabat-Zinn, 2013). While more traditional mindfulness practices like those in MBSR do incorporate all of these elements in their activities (e.g., sitting meditation, body scan), there is a great deal of heterogeneity in terms of how these different components are included, if at all, across the multitude of mindfulness activities and programs that are available (e.g., Emerson et al., 2020; Gould et al., 2016; Palacios et al., 2022; Tudor et al., 2022; Van Dam et al., 2018).

Importantly, we know very little about what these mindfulness different strategies are specifically targeting or the mechanisms through which they are effective (e.g., Gould et al., 2016; Palacios et al., 2022). For example, mindfulness strategies differ in terms of the types of attentional control required, with some requiring individuals to focus and switch attention repeatedly from the breath to bodily senses, or thoughts, or emotions while others also require a form of open monitoring of whatever comes into experience (e.g., choiceless awareness or non-selective awareness). This distinction is important because research with adults shows distinct benefits for these two types of attentional control, particularly for experienced meditators (e.g., Van Vugt & Slagter, 2014).

Indeed, increasingly, with the need to adapt mindfulness instruction for different groups, and students in particular, a common adaptation is to significantly shorten the mindfulness activities to accommodate the more limited attention spans of children and adolescents (e.g., Black, 2015). Additionally, it has been suggested that, due to cognitive developmental differences, younger children may benefit more from simplified mindfulness activities while older adolescents may be able to engage more in strategies with greater complexity (e.g., involving open monitoring, metacognitive skills, etc.; e.g., Greenberg & Harris, 2012; Potts et

al., 2021). For example, a shortening of a traditional 45-minute sitting meditation to a 10-minute activity might mean that some traditional objects of awareness that are more complex to both understand and practice are removed such awareness of thoughts or open monitoring of experiences. Similarly, some shortenings of body scan meditations may focus exclusively on focusing and shifting attention to different body parts, with a minimisation of emphasis on acceptance and the non-judgmental and non-reactive qualities of attention that are traditionally encouraged. Thus, further research is needed to better understand what components of mindfulness are effective in terms of impacting change on outcomes.

In this dissertation, the meta-analysis in Study 1 demonstrated that the level of experience of facilitators had an important impact on the effectiveness of mindfulness-based programs for students. Specifically, mindfulness-based programs had an effect on students' dispositional mindfulness and school adjustment outcomes only when they were facilitated by external facilitators (e.g., research team) with previous personal experience in mindfulness practice. It may be that facilitators who have a personal mindfulness practice are more comfortable in (a) teaching more complex strategies, (b) communicating the different aspects of mindfulness practice including the importance of nonjudgmental and nonreactive acceptance of present moment experience, and perhaps also in (c) teaching a broader variety of mindfulness strategies. Conversely, facilitators with less experience may have a simpler understanding of mindfulness practice (e.g., mindfulness as a means of directing attention) and perhaps an overreliance on more foundational and less complex strategies such as breath awareness. Thus, these findings support the need for further research moving beyond mindfulness practice being possible using an indiscriminate variety of strategies. Rather, we need to better understand whether different

mindfulness activities impact different outcomes in order to better support mindfulness instruction implementation, both for facilitators and for their students.

Furthermore, findings from Study 2 revealed that, when parsing out formal and informal mindfulness instruction to adolescents, the two types of mindfulness practice were not equally effective within the same 2-month time period. However, these findings do not necessarily mean that formal mindfulness instruction is ineffective for adolescents; rather, it may be that practicing formal mindfulness requires more time, effort, and in-depth teaching to show effectiveness. Indeed, this is consistent with common criticisms of mindfulness literature that more research is needed to understand the dose-response relationship within mindfulness-program implementation (e.g., Emerson et al., 2020; Gould et al., 2016; Rosenkranz et al., 2019; Tudor et al., 2022). Similarly, it may be that different outcomes may require different lengths of time before being impacted. For example, it may be that more proximal outcomes like dispositional mindfulness may be impacted before more distal outcomes like well-being or educational outcomes (e.g., Roeser et al., 2022; Rosenkranz et al., 2019). Therefore, findings from Study 2 could indicate that formal mindfulness practice might require more time to be effective for adolescents perhaps due to the fact that, as discussed above, these strategies might be less readily accessible to them and thus more difficult to practice regularly.

Most importantly, findings from Study 2 do show the importance of informal mindfulness practice for adolescents and suggest that the active ingredient in mindfulness practice may be primarily informal mindfulness practice rather than formal mindfulness. While an increased frequency of informal mindfulness has been a proposed mechanism of therapeutical change within mindfulness-based programs (e.g., Goodman et al., 2015), there has been very little research so far actively parsing out the relative effectiveness of formal and mindfulness practice.

Further research is needed to replicate these findings and support the potential merits of informal mindfulness practice specifically; however, these findings offer an important prospective avenue of research particularly for individuals for whom formal mindfulness practice may be aversive or inaccessible.

Additionally, findings from Study 3 also suggest that dispositional mindfulness is related to adolescents' stress through different trajectories involving a complex interplay between dispositional mindfulness facets, types of attentional control, and gender differences. These findings indicate that the different facets of dispositional mindfulness are not all functioning in the same way to impact students' general and academic stress. Consistent with Hölzel and colleagues' theoretical framework (2011) emphasising the role of attention regulation as a mechanism of change explaining benefits of mindfulness practice, Study 3 demonstrated that some of the dispositional mindfulness facets, like acting with awareness, describe, and non-reactivity function through attentional control to reduce adolescents' stress. Others, like non-judgment, still have a direct impact on stress but seem to be functioning through different mechanisms of action than attentional control. Therefore, these findings strongly indicate that further research is needed to understand what facets of dispositional mindfulness are being impacted by different types of mindfulness strategies and that it is critical to ensure that the mindfulness strategies being taught in mindfulness-based programs are targeting different aspects of dispositional mindfulness. It may be that some mindfulness strategies target specific aspects or facets of dispositional mindfulness and they may not all be equivalent.

**Implications for Practice**

Overall, the findings from this dissertation research contribute important implications for the use of mindfulness-based interventions in educational settings by helping clarify what aspects

of mindfulness instruction need to be specifically targeted or adapted to provide optimal student support. The main implications for practice are that mindfulness instruction *can* be effective when implemented in schools, but *how* it is being taught, *what* is being taught, and *who* is being taught are all important factors to consider.

**Implication considerations 1: *How* to teach mindfulness.** *How* mindfulness instruction is implemented can have a significant impact on both whether it will be (a) used by students and (b) effective. For example, who teaches mindfulness matters. Consistent with recommendations in the mindfulness literature (e.g., Crane et al., 2017), successful school-based mindfulness program implementation requires facilitators who have both experience and an established personal practice of mindfulness. Indeed, the meta-analytic findings in Study 1 showed that it was only experienced outside facilitators with previous mindfulness experience who had an impact on both mindfulness and school adjustment outcomes. These findings are consistent with the largest RCT of mindfulness instruction in schools, which suggested that the lack of effectiveness of the mindfulness-based program might be due to the facilitators' relatively low levels of experience with mindfulness given that it was the teachers who were rated higher in terms of ability to teach mindfulness who were also the ones whose students used the strategies more and reported greater benefits (e.g., Montero-Marin et al., 2022; Weare & Ormston, 2022). Furthermore, the importance of having experienced facilitators was again highlighted in Study 2, where the mindfulness instruction facilitators were a team who had extensive training over several months as well as a mandatory personal mindfulness practice as part of this training.

Additionally, as discussed in the second key takeaway of this dissertation, findings from Studies 1, 2, and 3 suggest dispositional mindfulness may be a key mechanism of change for students' benefits; thus, it may be critical to incorporate a form of assessment in school-based

implementation to ensure that the mindfulness instruction is targeting students' ability to be generally mindful. Furthermore, including regular assessments may also prove beneficial in ensuring the accessibility of the mindfulness instruction so that students are enjoying and engaging with the strategies being taught, which is consistent with the third key takeaway of this dissertation.

**Implication considerations 2: *What* content to teach.** Beyond who facilitates mindfulness instruction, a second implication of this dissertation's findings for successful school-based implementation is that the content of mindfulness instruction matters.

Specifically, this dissertation highlights the importance of ensuring that the way mindfulness is being taught is actually accessible to students. Thus, consistent with findings from Study 1 in which only adaptations of existing programs were effective at increasing students' dispositional mindfulness and school adjustment outcomes, mindfulness instruction needs to be adapted to the context in which it is being implemented. Additionally, based on findings from Studies 2 and 3, it may be particularly important to consider that mindfulness strategies may not all be equally effective when implemented in schools; thus, the type of mindfulness strategies being taught matters. Findings from Study 2 suggest that adolescents may be more likely to want to practice informal mindfulness, perhaps because it is more accessible to them and easier to integrate into their daily lives. Additionally, the adolescents who practiced informal mindfulness reported being more mindful in their day-to-day lives, and this in turn predicted benefits over time in terms of their stress, anxiety, depression, negative affect, school stress, and classroom attentional control. Therefore, it would be important for school-based mindfulness programs to emphasize directly teaching informal mindfulness strategies and how to integrate these in students' daily routines.

Furthermore, as discussed above, the second key takeaway from this dissertation research was the recurring importance of dispositional mindfulness as a key mechanism of change. Thus, schools need to ensure that the mindfulness instruction being provided has an impact on students' dispositional mindfulness. Indeed, findings from Study 3 demonstrated that not all facets of dispositional mindfulness impact adolescents' stress in the same way. Although current selection of mindfulness strategies in programs for youth focuses primarily on developmental adaptations such as length or ease of language (e.g., Black, 2015; Singh & Singh Joy, 2021; Zoogman et al., 2015), these findings suggest we have to be careful when selecting mindfulness strategies to include strategies that target the different components of dispositional mindfulness.

**Implication considerations 3: *Who* is being taught.** The third main area of implications drawn from this dissertation research for school-based implementation is consideration of who the mindfulness instruction is being delivered to. Findings from the meta-analysis in Study 1 showed that mindfulness-based programs were effective at impacting both dispositional mindfulness and school adjustment outcomes only in adolescence. Furthermore, even within adolescents, Studies 2 and 3 showed that we cannot assume mindfulness instruction will function the same way for everyone. In Study 2, findings revealed that even though both formal and informal mindfulness strategies were liked by the adolescents, only those who practiced informal mindfulness did better in terms of the outcomes assessed. Similarly, in Study 3, the impact of some facets of dispositional mindfulness on aspects of attentional control was particularly strong for boys, which suggests that, consistent with the principle of equifinality discussed in the theoretical frameworks (Cicchetti & Rogosch, 1996), there may be different mechanisms of action across genders despite similar overall benefits obtained. Therefore, schools need to take into account student individual differences (e.g., gender differences, attentional control

differences) when implementing mindfulness instruction; however, given that research in this area is still relatively nascent, it may be best to make sure to offer a breadth of mindfulness strategies for students to choose from.

**Limitations & Directions for Future Research**

Although this dissertation proposes novel avenues to promote accessibility of mindfulness instruction for students, much remains unknown regarding how to promote student engagement with mindfulness strategies. As discussed below, limitations of this dissertation research as a whole include lack of nuanced gender identification, the self-report nature of assessments across studies, and a need for longitudinal investigation of trajectories of change.

For instance, findings from this dissertation research highlight the importance of taking students' individual differences, such as potential gender differences, into consideration when implementing mindfulness instruction. As discussed in Chapter 1, this is a recurring concern in mindfulness research, with mixed findings in the literature thus far. Unfortunately, there is a paucity of studies reporting participants' sex or gender-based information, even within adult samples (e.g., Bluth et al., 2017; Carsley et al., 2018; Katz & Toner, 2013). Indeed, a limited examination of potential gender differences is one of the main limitations of this dissertation research. Specifically, in Study 1, it was not possible to assess gender differences due to the small number of studies reporting this information. In Studies 2 & 3, we were not allowed to collect more than basic binary gender information from students due to school board restrictions. While the relatively small sample sizes within Study 2 prohibited further exploration of gender differences, we were able to see in Study 3 that gender did have an impact on how adolescents' dispositional mindfulness facets impacted their ability to control their attention. Thus, these findings point to the need for further research to truly understand how a more complex

understanding of gender differences may play a role in mindfulness instruction's effectiveness for students.

Another limitation of this dissertation research is its lack of a long-term longitudinal investigation of the trajectories through which mindfulness instruction and dispositional mindfulness have an impact, particularly in Studies 2 and 3. However, influenced by the developmental concepts of equifinality and multifinality, this dissertation research serves as a solid foundation to support the idea that (a) there are different ways in which mindfulness instruction can be effectively delivered to students to impact their dispositional mindfulness and (b) this, in turn, has an effect on diverse school adjustment, mental health, and well-being outcomes through potentially different pathways. As Circhetti and Rogosch (1996) suggest, this type of variable-focused research serves as an important starting point to understanding pathways and, more specifically, the potential relationships between variables of interest. This also serves as a foundation for further research investigating trajectories both at the individual level using a person-centered approach and at the developmental level through longitudinal designs.

Finally, in terms of increasing student engagement, there is also a need to better understand the potential differences between the different types of mindfulness strategies being taught, both in terms of their content and of which are selected in different mindfulness-based programs. A common issue in mindfulness research in schools has been a lack of replication studies with most new studies proposing a new mindfulness-based program or developing new instruction protocols (e.g., Dunning et al., 2022; Felver et al., 2016; Schutt & Felver, 2021; Van Dam et al., 2018). There is often a lack of description of the content being included in mindfulness-based programs for students; thus, it is unclear what specific strategies are being taught (e.g., Emerson et al., 2020). Unfortunately, this contributes to great heterogeneity in the

field and makes it difficult to establish an overall picture of the relative effectiveness and potential differential impact of these strategies on student outcomes (e.g., Emerson et al., 2020; Felver et al., 2016; Greenberg & Harris, 2012). Future studies should include more in-depth descriptions of the content being taught as part of the mindfulness instruction. Additionally, further research is needed to parse out the relative effectiveness and acceptability of different mindfulness strategies.

## Conclusion & Summary

In summary, the findings in this dissertation demonstrate that mindfulness instruction can be effective in schools if we are careful about how we are providing it, if we make sure that we teach strategies that students will actually access and engage with, and if we take into account potential individual differences in the students being taught. Most importantly, it is evident that mindfulness should not be taught to students using a "one size fits all" approach; namely, what we teach, how we teach it, and to whom are all critical factors influencing the effectiveness of mindfulness instruction in schools. In the systematic review and meta-analysis conducted in Study 1, mindfulness-instruction for students tended to be effective when taught by an outside facilitator with personal mindfulness experience, using an adapted program, and when taught to adolescents in high school. Additionally, in Study 2, we saw that while adolescents found formal and informal mindfulness activities comparable in terms of acceptability, only those who practiced informal mindfulness showed an increase to their dispositional mindfulness over time, and that this change explained benefits in terms of student outcomes (e.g., stress, anxiety, depression, negative affect, school stress, and classroom attentional control). Finally, findings from Study 3 demonstrated the complex relationships between components of dispositional

mindfulness and attentional control in adolescence and the importance of taking gender differences into account.

Overall, these findings highlight the need to go beyond a simplistic understanding of mindfulness as a unitary construct and practice that is beneficial for all. Rather, the versatility of mindfulness instruction is one of its strengths in that it can be tailored to different contexts and populations to maximise accessibility and effectiveness in building students' coping capacity.

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# Appendices

## Appendix A: REB Approval Certificates for Studies 2 & 3

McGill

**Research Ethics Board Office** Tel: (514) 398-6831 James
Administration Bldg.
845 Sherbrooke Street West. Rm 325 Website:
www.mcgill.ca/research/researchers/compliance/human/ Montreal, QC H3A 0G4

**Research Ethics Board III**
**Certificate of Ethical Acceptability of Research Involving Humans**

**REB File #:** 40-0617
**Project Title**: Mindfulness and school adjustment in adolescence
**Principal Investigator:** Prof. Nancy Heath
**Department:** Educational Counselling and Psychology
**Co-Investigators:** Jessica Mettler, PhD Student; Dana Carsley, PhD Student in Human Development, Department of Educational and Counselling Psychology
**Funding:** SSHRC

**Approval Period: September 7, 2017 –September 6, 2018**

The REB-III reviewed and approved this project by delegated review in accordance with the requirements of the McGill University Policy on the Ethical Conduct of Research Involving Human Participants and the Tri-Council Policy Statement: Ethical Conduct For Research Involving Humans.

Lynda McNeil
Associate Director, Research Ethics

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* Approval is granted only for the research and purposes described.
* Modifications to the approved research must be reviewed and approved by the REB before they can be implemented.
* A Request for Renewal form must be submitted before the above expiry date. Research cannot be conducted without a current ethics approval. Submit 2-3 weeks ahead of the expiry date.
* When a project has been completed or terminated, a Study Closure form must be submitted.
* Unanticipated issues that may increase the risk level to participants or that may have other ethical implications must be promptly reported to the REB. Serious adverse events experienced by a participant in conjunction with the research must be reported to the REB without delay.
* The REB must be promptly notified of any new information that may affect the welfare or consent of participants.
* The REB must be notified of any suspension or cancellation imposed by a funding agency or regulatory body that is related to this study.
* The REB must be notified of any findings that may have ethical implications or may affect the decision of the REB.

McGill

**Research Ethics Board Office**
James Administration Bldg.
845 Sherbrooke Street West. Rm 325
Montreal, QC H3A 0G4

Tel: (514) 398-6831

Website: www.mcgill.ca/research/researchers/compliance/human/

**Research Ethics Board III**
**Certificate of Ethical Acceptability of Research Involving Humans**

**REB File #:** 131-0818

**Project Title**: Mindfulness and school adjustment in adolescence - Intervention (Year 2)

**Principal Investigator:** Prof. Nancy Heath

**Department:** Educational & Counselling Psychology

**Co-investigator(s):** Prof. Jens Pruessner; Jessica Mettler

**Funding:** SSHRC

**Approval Period: August 20, 2018 to August 19, 2019**

The REB-III reviewed and approved this project by full board review in accordance with the requirements of the McGill University Policy on the Ethical Conduct of Research Involving Human Participants and the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans.

Lynda McNeil
Associate Director, Research Ethics

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* Approval is granted only for the research and purposes described.
* Modifications to the approved research must be reviewed and approved by the REB before they can be implemented.
* A Request for Renewal form must be submitted before the above expiry date. Research cannot be conducted without a current ethics approval. Submit 2-3 weeks ahead of the expiry date.
* When a project has been completed or terminated, a Study Closure form must be submitted.
* Unanticipated issues that may increase the risk level to participants or that may have other ethical implications must be promptly reported to the REB. Serious adverse events experienced by a participant in conjunction with the research must be reported to the REB without delay.
* The REB must be promptly notified of any new information that may affect the welfare or consent of participants.
* The REB must be notified of any suspension or cancellation imposed by a funding agency or regulatory body that is related to this study.
* The REB must be notified of any findings that may have ethical implications or may affect the decision of the REB.

## Appendix B: Study 2 Oral Script for Recruitment

Hi, I'm [insert research assistant name], from McGill University, and I'm here today to tell you about a project we will soon be doing in your school.

As you probably know, adolescents are in the final years of high school and, as they get ready to figure out what they are going to do next, they often feel more stress and worries. In our study of over 900 high school students here in Montreal, more than ¼ of them said they were feeling a moderate or high level of stress. So, we know this is a very stressful time and that these years can be very challenging. We also know that mindfulness programs, which get you to repeatedly become aware of things like sound, physical sensation, or even thoughts, can be a helpful technique to manage stress for adults. But we don't really know which parts of mindfulness work best, or whether they're effective to manage stress for adolescents. So that's why we're inviting you today to participate in our project!

If you agree to do our project, you will be randomly assigned to one of three groups: either one of two mindfulness program groups or a comparison group. Students in all three groups will fill out questionnaires on stress, well-being, focus, and mindfulness. These questionnaires will be completed in a 45 min session in week 1, again in week 6, and finally once more 3 months later to evaluate change in your stress, well-being, focus, and mindfulness in response to the program. However, students in either of the two mindfulness programs will also learn and practice the mindfulness strategies in four additional weekly sessions (in weeks 2-5) of 45 min. All sessions will take place in school during the lunch period. So, no classroom time will be missed. Importantly, all participants will have the option of doing an additional 1-hour stress management program following the completion of the project.

The kinds of questions we would be asking in the questionnaires would be things like: "In the last week, how often have you felt that things were just not working out for you?" Or "Thinking of the last week, have you been happy with the way you are?"

It's important for you to know that all your answers in the questionnaires are confidential, which means that they won't be shared with your parents, teachers, or friends. Also, whether or not you participate in this project will in no way affect your classroom work and grades.

As I mentioned, at the end of the project, everyone who participates will have the option of doing the StressOFF program, which is a stress management program that has been delivered to over 5000 teens in Montreal. Over 85% of students who evaluated this program rated it as good to excellent. Everyone who participates will also receive a package with materials and instructions used in the mindfulness program so they may continue to use the strategies if they wish. This package will also include a list of school, community, and online resources and strategies that you can use to help improve well-being and reduce stress.

As you will see, these are forms for your parents to read [*show consent form*], which contain detailed information about this project. If your parents give permission for you to participate in the project they will need to sign the consent form and check yes. Whether or not your parents give permission for you to participate in the study, we ask that you return the signed consent form (with either a yes or no and your parent's signature). **Everyone** who returns the completed

consent forms with either yes or no from your parents will be entered in your class draw for a chance to win a $25 gift certificate to Cineplex, Starbucks, Tim Hortons, or Subway per class.

Also, everyone who participates in this project will receive a $60 gift card to Cineplex, Starbucks, Tim Hortons, or Subway for participating in the study.

Any questions?

Please bring back your consent forms by next Wednesday. There will be a box at the main office for you to drop them off.

**Remember**, whether or not you want to participate, if you return the signed parent consent form with a yes or a no checked and your parent's signature, you will be entered in a raffle for 25$ per class.

Thank you!

## Appendix C: Study 2 Parent Consent
## Mindfulness and School Adjustment in Adolescence

Dear Parent/Legal Tutor,

As adolescents prepare to transition from high school, they report increasing stress and worries. In our study of over 900 high school students in Montreal, 27% reported moderate to high levels of stress. Recently, a lot of schools have begun to try secular mindfulness programs, which encourage students to develop their attentional focus by repeatedly bringing their attention to sensory experiences such as sound, physical sensation, or even thoughts to help manage stress. While this approach has been shown to be helpful, these programs tend to be lengthy and hard to use in schools, and we are not sure which aspects actually work. We are interested in better understanding what aspects of mindfulness programs work, so that is why we are asking you if you would allow your son/daughter to participate in this project!

**Project activities:** All students who agree to participate will be randomly assigned to one of three groups: either one of two mindfulness programs (group 1: formal mindfulness, or group 2: informal mindfulness) or a comparison group (group 3). All three groups will fill out measures on stress, well-being, classroom focus, and mindfulness which will be completed in one 45 min session in week 1, again in week 6 and finally once more 3 months later to evaluate change in response to the program. However, students in either of the two mindfulness programs will also learn and practice the mindfulness strategies during four additional weekly sessions (in weeks 2-5) of 45 min. All sessions will take place in school during the lunch period; therefore, no classroom time will be missed. Importantly, all participating students will have the option of doing an additional 1-hour stress management program following the completion of the project (see Compensation below for details).

**Compensation:** All students who return this consent form, regardless of agreement to participate in the study, will be entered in a draw for a $25 gift certificate to Cineplex, Starbucks, Tim Hortons, or Subway per class. All students will receive a $60 gift card to Cineplex, Starbucks, Tim Hortons, or Subway for participating in the study.

At the end of the project, students in all 3 groups will have the option of participating in StressOFF, a classroom-based stress management program that has been delivered to over 5000 high school students in Montreal. Over 85% of students who evaluated this program rated it as good to excellent. Many students made positive comments about StressOFF such as: “I really enjoyed it, it really made me realize things clearly and it was fun.” All students who participate will also receive a package with materials used in the mindfulness program so they may use the strategies. This package will also include a list of school, community, and online resources and strategies that your child can use to help improve well-being and reduce stress as he/she transitions from high school into further education or the workforce.

**Benefits and Dissemination of Results:** Results from this project will provide essential early information that could guide our use of mindfulness in schools as well as contribute to our understanding of mindfulness during adolescence. Results will only be presented in group format with no individual identifying information whatsoever in academic conferences and journals, as well as to the school. We will also make available to you and your son/daughter a summary of the results of the project for all students as a group, either through website access or as an email summary. Students often find this quite interesting.

**Potential risks:** Some students may feel possible discomfort when answering the questionnaires related to stress. *Your son/daughter is free to choose not to answer any question, or to withdraw from the study at any time.* Whether or not your child participates in this project will in no way affect his/her classroom work and grades.

**Confidentiality:** All information collected from the students is confidential. Questionnaires will be kept separate from consent forms, both in locked cabinets or rooms, which only the researchers from McGill University can use. Also, all data will be coded to ensure confidentiality. Although all information will be kept confidential, in the event a student may be at risk of harm to themselves or others, or a possible victim of abuse, then we are required to report this to the principal and appropriate mental health professional within the school.

Agreeing to participate in this study does not waive any of your rights or release the project team from their responsibilities. A copy of this consent form will be given to you and the project team will keep a copy. To

ensure the study is being conducted properly, authorized individuals such as a member of the Research Ethics Board, may have access to your study information. By signing this consent form, you are allowing such access.

**Please sign below, indicating whether or not you would like your son/daughter to participate in this project, and return the attached form to school.** If you have any questions or concerns about your child's rights or welfare as a participant in this research study, please contact the McGill Research Ethics Officer at (514) 398-6831 or lynda.mcneil@mcgill.ca. If you have any questions, please feel free to contact me at the coordinates listed below.

Thank you!

Jessica Mettler, M.A., (PhD student)
Project coordinator
McGill University, Faculty of Education
jessica.mettler@mail.mcgill.ca
(514) 398-1232

Nancy Heath, Ph.D.
James McGill Professor
McGill University, Faculty of Education
nancy.heath@mcgill.ca
(514) 398-3439

**Funding Agency:** Social Sciences and Humanities Research Council

❑ **YES** ❑ **NO** ⇢ I consent to my son/daughter's participation in this project.

Parent Signature: _____ Date: _____

Name of **parent/legal tutor** (please print): _____

Name of **student** (please print): _____

**Parent telephone number(s):** _____

Has your son/daughter ever practiced any type of mindfulness activity (e.g. meditation, yoga, breathing exercises)? ❑ **YES** ❑ **NO**

If YES, what type of activities have they practiced? (List all here)

_____

**Appendix D: Study 2 Student Assent**
**Mindfulness and School Adjustment in Adolescence**

Dear Student,

As adolescents prepare to transition from high school, they report increasing stress and worries. In our study of over 900 high school students in Montreal, 27% reported moderate to high levels of stress. Recently, a lot of schools have begun to try using mindfulness programs, which encourage students to develop their attention by repeatedly becoming aware and focusing on things like sound, physical sensation, or even thoughts. While this approach has been shown to be helpful with stress, these programs tend to be too long for use by schools and we are not sure which parts of these programs actually work. So, we are interested in better understanding what parts of mindfulness programs work. That is why we are asking you if you would be willing to participate in our project.

**Project activities:** If you agree to participate, you will be randomly assigned to one of three groups: either one of two mindfulness program groups or a comparison group. All three groups will fill out measures on stress, well-being, classroom focus, and mindfulness which will be completed in one 45 min sessions in week 1, again in week 6 and finally once more 3 months later to evaluate change in response to the program. However, students in either of the two mindfulness programs will also learn and practice the mindfulness strategies in four additional weekly sessions (in weeks 2-5) of 45 min. All sessions will be take place in school during the lunch period; so, no classroom time will be missed. Importantly, all participants will have the option of doing an additional 1-hour stress management program following the completion of the project (see Compensation below for details).

**Compensation:** To thank you for your time in participating in this study, you will receive a $60 gift card to Cineplex, Starbucks, Tim Hortons, or Subway for participating in the study.

At the end of the project, participants in all 3 groups will have the option of doing StressOFF, a classroom-based stress management program that has been delivered to over 5000 high school students in Montreal. Over 85% of students who evaluated this program rated it as good to excellent. Many students made positive comments about StressOFF such as: “I really enjoyed it, it really made me realize things clearly and it was fun.” All students who participate will also receive a package with materials used in the mindfulness program so you may use the strategies. This package will also include a list of school, community, and online resources and strategies that you can use to help improve well-being and reduce stress as you transition from high school into further education or the workforce.

**Benefits and Dissemination of Results:** Results from this project will provide essential early information that could guide our use of mindfulness in schools as well as contribute to our understanding of mindfulness during adolescence. Results will only be presented in group format in academic conferences and journals, as well as to the school. No identifying information will ever be used. Finally, we will also make available to you a summary of the results of the project for all students as a group, either through website access or as an email summary. Students often find this quite interesting.

**Potential risks:** Some students may feel possible discomfort when answering the questionnaires related to stress. *You are free to choose not to answer any question, or to withdraw from the study at any time.* Whether or not you participate in this project will in no way affect your classroom work and grades.

**Confidentiality:** All information collected is confidential so this means that your answers will not be shared with your teachers, parents, or school personnel. No identifying information about you will be used in any way when presenting results. Also, your name will not appear on any of the questionnaires. All questionnaires will be kept separate from these consent forms, and both will be kept in locked cabinets or rooms, which only the researchers from McGill University can use. Although all information will be kept confidential, in the event a student may be at risk of harm to themselves or others, or a possible victim of abuse, then we are required to report this to the principal and appropriate mental health professional within the school.

Agreeing to participate in this study does not waive any of your rights or release the project team from their responsibilities. A copy of this consent form will be given to you and the researcher will keep a copy. To ensure the study is being conducted properly, authorized individuals such as a member of the Research Ethics Board, may have access to your study information. By signing this consent form, you are allowing such access.

**Please sign below to confirm whether you would like to participate in this project**. Should you have any questions, please feel free to contact me at the coordinates listed below. If you have any questions or concerns about your rights or welfare as a participant in this research study, please contact the McGill Research Ethics Officer at (514) 398-6831 or lynda.mcneil@mcgill.ca

Thank you!
Sincerely,

Jessica Mettler, M.A., (PhD student)
Project coordinator
McGill University, Faculty of Education
jessica.mettler@mail.mcgill.ca
(514) 398-1232

Nancy Heath, Ph.D.
James McGill Professor
McGill University, Faculty of Education
nancy.heath@mcgill.ca
(514) 398-3439

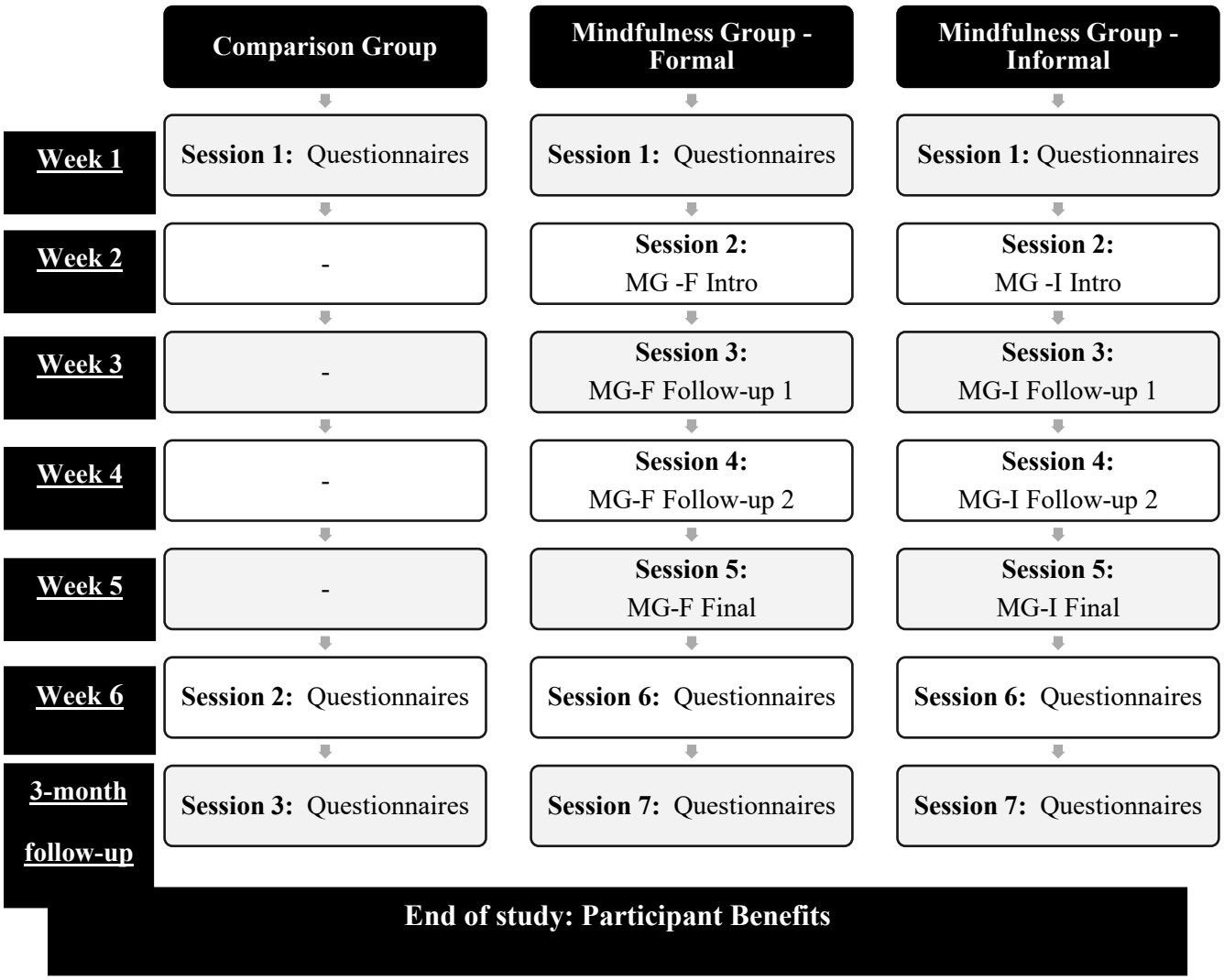
**Funding Agency:** Social Sciences and Humanities Research Council

❑ **YES** ⇢ I consent to participate in this project, although I know I can change my

Student Signature: _____ Date: _____

Name (please print): _____

## Appendix E: Study 2 Sessions Timeline



## Appendix F: Study 2 Session Descriptions

- Students were randomly assigned to a mindfulness group (formal or informal) or to a comparison group.
- Students were brought to a designated classroom in groups of approximately 12 students for each session.
- Each session was held during lunch hours and was about 45 minutes long.

**Week 1**

**Baseline Data Collection: All students fill out self-report questionnaires** -

**Week 2-5**

**Mindfulness program groups:** weekly group sessions (4 sessions total per group)

- **Session 1:**
  - ***Psychoeducational content:*** introduction; what mindfulness is and is not; challenges of mindfulness practice
  - ***Presentation & practice of strategies & group discussion:***
    - *Formal*: Breath awareness; Body scan
    - *Informal*: Breath awareness; Awareness of the five senses
  - ***Homework assignments***
- **Session 2:**
  - ***Homework review & discussion***
  - ***Psychoeducational content:*** mindfulness & the stress response; reacting vs responding; dealing with comfortable and uncomfortable emotions
  - ***Presentation & practice of strategies:***
    - *Formal*: Sitting meditation – awareness of emotions
    - *Informal*: Awareness of uncomfortable and comfortable emotions
  - ***Homework assignments***
- **Session 3:**
  - ***Homework review & discussion***
  - ***Psychoeducational content:*** the chattering mind; interrelationship between thoughts, emotions, and actions; rumination, avoidance, and tendency to evaluate thoughts
  - ***Presentation & practice of strategies & group discussion:***
    - *Formal*: Sitting meditation – awareness of thoughts
    - *Informal*: Awareness of thoughts in difficult academic and social situations
  - ***Homework assignments***
- **Session 4:**
  - ***Homework review & discussion***
  - ***Discussion of challenges and problem-solving related to mindfulness practice***
  - ***Commitment to practice***

**Comparison group:** no weekly group meetings

**Week 6 & Week 10**

**Post and Follow-up Data Collections**

- Program evaluations will also be completed during the questionnaire sessions

## Appendix G: Study 3 Oral Script for Recruitment

Hi, I'm [insert research assistant name], a student at McGill University, and I'm here today to tell you about a project we are doing in your school.

Adolescents in our schools today are reporting **higher levels of stress** than ever before. And recently, **a lot of schools have begun to try new mindfulness programs** which encourage students to focus on their present moment experiences (e.g., sound, breath) **to help manage their stress and improve their well-being**. This has been very helpful when used with adults; **but we aren't sure how or if this actually works to help adolescents**. So, we are interested in **better understanding if and how mindfulness may help students** with their well-being and help them feel less stressed.

To do this, we are inviting you to participate in a **couple of 1-hour long periods**, one in the **next week or so** and **the second one a few weeks after that.** You can choose to participate in both times, just the first time, or not do either. These sessions will be held **during school hours**, and will be done in **large groups of students**, not individually. **We will take students out of class to do it**, but we will be sure to schedule the time by speaking with your teacher, to make sure we only take students out at a time where you won't miss important information. Also, if you feel that you cannot be removed from class when the data collection will be scheduled, you can let us know and we will reschedule. Those students who choose not to participate will do regular work as assigned by your teacher. **Please note that if you are under 14 years of age, you cannot consent to participate in this project.**

During each time point, you will be asked to complete some questionnaires **asking you about your stress**, **your general well-being, your mindfulness, your thoughts about school and how you are doing, as well as your ability to concentrate in class**. For example, you would see questions like "In the last month, how often have you felt nervous and 'stressed'?" Another example of a question you would see would be something like "Thinking about last week, have you been in a good mood?"

It's important for you to know that **all your answers in the questionnaires are confidential**, which means that they **won't be shared with your parents, teachers, or friends**. However, if a student's responses indicate they may be at risk for serious harm or a potential serious harm to others, we have to bring this to the attention of a mental health professional within the school. Also, whether or not you participate in this project will in **no way affect your classroom work and grades**.

If you participate, you will also be entered in a **raffle for one of thirty-three $50 gift cards Cineplex, Tim Hortons, or Subway** at **each time point** in which you participate. So, that means you will have a **1/30 chance of winning at this time**, and then **another 1/30 chance of winning next time**. Finally, at the end of completing the questionnaires, we will give you **information about what the questions and your answers might mean for your own well-being.** We will **also** provide some **information, resources, and strategies for different types of answers so you can better understand yourself**. Students often find this **quite interesting**. And we are always happy to answer any questions!

As you can see, we have handed out these **consent forms** [*show consent form*] which contain detailed information about this project. Please take a few minutes to read through it. **If you agree to participate in this project, you then need to sign the form at the bottom and check the "Yes" boxes at the bottom**.

If you have any questions at any point, please just raise your hand and we'll come to you! Thank you!

**Appendix H: Study 3 Student Consent**

McGill

**Mindfulness and School Adjustment in Adolescence**

Dear Student,

Adolescents in our schools today are reporting higher levels of stress than ever before. Recently, a lot of schools have begun to try new mindfulness programs. These programs encourage students to focus on present moment experiences (sound, breath) to help manage stress and improve well-being. This approach has been shown to be very helpful for adults; but we are not sure about how or if this approach actually works in adolescence to help with stress. So, we are interested in better understanding if and how mindfulness may help students with their stress, well being, and even possibly improve how they feel about and do in school. That is why we are asking you if you would be willing to participate in our project.

**Project activities:** If you agree to participate, you will be asked to complete some questionnaires in a couple of 1-hour long group periods, one in the next week or so **(Time 1)** and the second one a few weeks later **(Time 2)**. You can choose to participate in both times, just the first time, or not do either. This will be done during school hours, and will be done in large groups or classes of students, not individually. Although you will be missing regular scheduled class to do this, we will be sure to schedule the time by speaking with your teacher to make sure we only do this at a time where you won't miss important information. Also, if you feel that you cannot be removed from class when the data collection will be scheduled, you can let us know and we will reschedule. Those students who choose not to participate will do regular work as assigned by your teacher.

The questionnaires will ask you about your stress, general well-being, mindfulness, thoughts about school and how you are doing, and your ability to concentrate in class. For example, you would see questions like "In the last month, how often have you felt nervous and 'stressed'?" Another example of a question you would see would be something like "Thinking about last week, have you been in a good mood?"

**Compensation:**
If you participate, you will also be entered in a raffle for one of thirty-three $50 gift cards to Cineplex, Tim Hortons or Subway at each time point in which you participate. So, that means you will have a 1/30 chance of winning at Time 1, and then another 1/30 chance of winning at Time 2. The winners will be announced at each session as soon as the questionnaires have been completed.

**Benefits:** This project will help us better understand whether students' ability to be mindful is important in their stress, well-being, and school adjustment as school progresses through the year. It can also help us better understand how to help students when they are dealing with stress or school challenges. Finally, for you personally, at the end of completing the questionnaires, we will give you information about the questions you answered and what your answers might mean for your own well-being. We will also provide some information, resources, and strategies for different types of answers so you can better understand yourself. You will receive a list of school, community, and online resources and strategies to help improve your well-being and reduce stress. At the end of the year, we will make available to you a summary of the results of the project for all students as a group, either through website access or as an email summary. Students often find this quite interesting. And we are always happy to answer any questions!

**Potential risks:** There are no expected risks involved in participation in this research project although some people may feel uncomfortable answering questions about their feelings. *You are free to choose not to answer any item you don't want to, or to withdraw from the study at any time.* Whether or not you participate in this project will in no way affect your classroom work and grades.

**Confidentiality:** All information collected is confidential so this means that your answers will not be shared with your teachers, parents, or school personnel. No identifying information about you will be used in any way when presenting results. Also, your name will not appear on any of the questionnaires. All questionnaires will be kept separate from these consent forms, and both will be kept in locked cabinets or rooms which only the researchers from McGill University can use. Although all information will be kept confidential, in the event a student may be a possible victim of child abuse, neglect, or at serious risk of harm, the research team must report this to the appropriate mental health professional within the school.

Agreeing to participate in this study does not waive any of your rights or release the researchers from their responsibilities. A copy of this consent form will be given to you and the researcher will keep a copy. To ensure the study is being conducted properly, authorized individuals such as a member of the Research Ethics Board, may have access to your study information. By signing this consent form, you are allowing such access.

Please sign below, indicating whether or not you would like to participate in **one or both of the time points** in this project. Should you have any questions, please feel free to contact me at the coordinates listed below. If you have any questions or concerns about your rights or welfare as a participant in this research study, please contact the McGill Research Ethics Officer at (514) 398-6831 or lynda.mcneil@mcgill.ca

Thank you!
Sincerely,

Jessica Mettler, M.A., (PhD student)
Project coordinator
McGill University, Faculty of Education
jessica.mettler@mail.mcgill.ca
(514) 398-1232

Nancy Heath, Ph.D.
James McGill Professor
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**Funding Agency:** Social Sciences and Humanities Research Council

**CONSENT TO PARTICIPATE IN PROJECT**

***Please note that in order to provide consent you need to be 14 years or older.***

❑ **YES** ⇢ I am 14 years of age or older and consent to participating in **both Time 1 and Time 2**, although I know I can change my mind and withdraw anytime.

**Signature**: _____ Date: _____

**Name** (please print): _____

**Appendix I: Five Facets of Mindfulness Questionnaire (FFMQ-24)**

*The following statements are about your everyday experience. Please indicate how frequently or infrequently you have had each experience in the **LAST MONTH**. Please answer on what really best shows your experience rather than what you think your experience should have been. Please treat each item separately from every other item.*

| | | | | | |
|---|---|---|---|---|---|
| **1. I'm good at finding the words to describe my feelings.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **2. I can easily put my beliefs, opinions, and expectations into words.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **3. I watch my feelings without getting carried away by them.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **4. I tell myself that I shouldn't be feeling the way I'm feeling.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **5. It's hard for me to find the words to describe what I'm thinking.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **6. I pay attention to physical experiences, such as the wind in my hair or sun on my face.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **7. I make judgments about whether my thoughts are good or bad.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **8. I find it difficult to stay focused on what's happening in the present moment.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **9. When I have distressing thoughts or images, I don't let myself be carried away by them.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **10. Generally, I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **11. When I feel something in my body, it's hard for me to find the right words to describe it.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **12. It seems I am "running on automatic" without much awareness of what I'm doing.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |

| | | | | | |
|---|---|---|---|---|---|
| **13. When I have distressing thoughts or images, I feel calm soon after.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **14. I tell myself I shouldn't be thinking the way I'm thinking.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **15. I notice the smells and aromas of things.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **16. Even when I'm feeling terribly upset, I can find a way to put it into words.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **17. I rush through activities without being really attentive to them.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **18. Usually when I have distressing thoughts or images I can just notice them without reacting.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **19. I think some of my emotions are bad or inappropriate and I shouldn't feel them.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **20. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **21. When I have distressing thoughts or images, I just notice them and let them go.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **22. I do jobs or tasks automatically without being aware of what I'm doing.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **23. I find myself doing things without paying attention.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |
| **24. I disapprove of myself when I have illogical ideas.** | Never or very rarely true | Not often true | Sometimes true sometimes not true | Often true | Very often or always true |

**Appendix J: Attention Control Scale (ACS)**

| **ACS Study 2** | | | | |
|---|---|---|---|---|
| *For each of the items in this section, please rate how often the following has happened to you over the* ***past week:*** | | | | |
| **1. In class, it's very hard for me to concentrate on a difficult task when there are noises around.** | Almost never | Sometimes | Often | Always |
| **2. In class, when I need to concentrate and solve a problem, I have trouble focusing my attention.** | Almost never | Sometimes | Often | Always |
| **3. When I am working hard on something in class, I still get distracted by events around me.** | Almost never | Sometimes | Often | Always |
| **4. My concentration is good in class even if there is music in the room around me.** | Almost never | Sometimes | Often | Always |
| **5. When concentrating in class, I can focus my attention so that I become unaware of what's going on in the room around me.** | Almost never | Sometimes | Often | Always |
| **6. When I am reading or studying in class, I am easily distracted if there are people talking in the same room.** | Almost never | Sometimes | Often | Always |
| **7. When trying to focus my attention on something in class, I have difficulty blocking out distracting thoughts.** | Almost never | Sometimes | Often | Always |
| **8. I have a hard time concentrating in class when I'm excited about something.** | Almost never | Sometimes | Often | Always |
| **9. When concentrating in class, I ignore feelings of hunger or thirst.** | Almost never | Sometimes | Often | Always |
| **10. In class, I can quickly switch from one task to another.** | Almost never | Sometimes | Often | Always |
| **11. In class, it will take me a while to get really involved in a new task.** | Almost never | Sometimes | Often | Always |
| **12. It is difficult for me to coordinate my attention between the listening and writing required when taking notes in class.** | Almost never | Sometimes | Often | Always |

| | | | | |
|---|---|---|---|---|
| **13. In class, I can become interested in a new topic very quickly when I need to.** | Almost never | Sometimes | Often | Always |
| **14. In class, it is easy for me to read or write while I'm also talking to other people.** | Almost never | Sometimes | Often | Always |
| **15. When working on projects with fellow students, I have trouble carrying on two conversations at once.** | Almost never | Sometimes | Often | Always |
| **16. In class, I have a hard time coming up with new ideas quickly.** | Almost never | Sometimes | Often | Always |
| **17. If I am interrupted or distracted in class, I can easily shift my attention back to what I was doing before.** | Almost never | Sometimes | Often | Always |
| **18. When a distracting thought comes to mind in class, it is easy for me to shift my attention away from it.** | Almost never | Sometimes | Often | Always |
| **19. In class, it is easy for me to alternate between two different tasks.** | Almost never | Sometimes | Often | Always |
| **20. In class, it is hard for me to break from one way of thinking about something and look at it from another point of view.** | Almost never | Sometimes | Often | Always |

| ACS Study 3 | | | | |
|---|---|---|---|---|
| *For each of the items in Section D, please rate how often the following happens to you:* | | | | |
| **1. It's very hard for me to concentrate on a difficult task when there are noises around.** | Almost never | Sometimes | Often | Always |
| **2. When I need to concentrate and solve a problem, I have trouble focusing my attention.** | Almost never | Sometimes | Often | Always |
| **3. When I am working hard on something, I still get distracted by events around me.** | Almost never | Sometimes | Often | Always |
| **4. My concentration is good even if there is music in the room around me.** | Almost never | Sometimes | Often | Always |
| **5. When concentrating, I can focus my attention so that I become unaware of what's going on in the room around me.** | Almost never | Sometimes | Often | Always |
| **6. When I am reading or studying, I am easily distracted if there are people talking in the same room.** | Almost never | Sometimes | Often | Always |
| **7. When trying to focus my attention on something, I have difficulty blocking out distracting thoughts.** | Almost never | Sometimes | Often | Always |
| **8. I have a hard time concentrating when I'm excited about something.** | Almost never | Sometimes | Often | Always |
| **9. When concentrating I ignore feelings of hunger or thirst.** | Almost never | Sometimes | Often | Always |
| **10. I can quickly switch from one task to another.** | Almost never | Sometimes | Often | Always |
| **11. It takes me a while to get really involved in a new task.** | Almost never | Sometimes | Often | Always |
| **12. It is difficult for me to coordinate my attention between the listening and writing required when taking notes during lectures.** | Almost never | Sometimes | Often | Always |
| **13. I can become interested in a new topic very quickly when I need to.** | Almost never | Sometimes | Often | Always |
| **14. It is easy for me to read or write while I'm also talking on the phone.** | Almost never | Sometimes | Often | Always |
| **15. I have trouble carrying on two conversations at once.** | Almost never | Sometimes | Often | Always |

| | | | | |
|---|---|---|---|---|
| **16. I have a hard time coming up with new ideas quickly.** | Almost never | Sometimes | Often | Always |
| **17. After being interrupted or distracted, I can easily shift my attention back to what I was doing before.** | Almost never | Sometimes | Often | Always |
| **18. When a distracting thought comes to mind, it is easy for me to shift my attention away from it.** | Almost never | Sometimes | Often | Always |
| **19. It is easy for me to alternate between two different tasks.** | Almost never | Sometimes | Often | Always |
| **20. It is hard for me to break from one way of thinking about something and look at it from another point of view.** | Almost never | Sometimes | Often | Always |

**Appendix K: Perceived Stress Scale (PSS)**

| *In the **last month**, how often have you…* | | | | | |
|---|---|---|---|---|---|
| **1. …been upset because of something that happened unexpectedly?** | Never | Almost never | Sometimes | Often | Very often |
| **2. …felt that you were unable to control the important things in your life?** | Never | Almost never | Sometimes | Often | Very often |
| **3. …felt nervous and "stressed"?** | Never | Almost never | Sometimes | Often | Very often |
| **4. …questioned your ability to handle your personal problems?** | Never | Almost never | Sometimes | Often | Very often |
| **5. …felt that things were just not working out for you?** | Never | Almost never | Sometimes | Often | Very often |
| **6. …found that you could not cope with all the things that you had to do?** | Never | Almost never | Sometimes | Often | Very often |
| **7. …felt unable to control irritations in your life?** | Never | Almost never | Sometimes | Often | Very often |
| **8. …felt that you were overwhelmed by things?** | Never | Almost never | Sometimes | Often | Very often |
| **9. …been angered because of things that were outside of your control?** | Never | Almost never | Sometimes | Often | Very often |
| **10. …felt difficulties were piling up so high that you could not overcome them?** | Never | Almost never | Sometimes | Often | Very often |

**Appendix L: Adolescent Stress Questionnaire (ASQ)**

| | | | | | |
|---|---|---|---|---|---|
| *For each of the items in Section G, please rate how stressful you have found each of the following **over the past year.*** | | | | | |
| **1. Getting up early in the morning to go to school** | Not at all stressful (or irrelevant to me) | A little stressful | Moderately stressful | Quite stressful | Very stressful |
| **2. Compulsory school attendance** | Not at all stressful (or irrelevant to me) | A little stressful | Moderately stressful | Quite stressful | Very stressful |
| **3. Going to school** | Not at all stressful (or irrelevant to me) | A little stressful | Moderately stressful | Quite stressful | Very stressful |
| **4. Having to study things you do not understand** | Not at all stressful (or irrelevant to me) | A little stressful | Moderately stressful | Quite stressful | Very stressful |
| **5. Teachers expecting too much from you** | Not at all stressful (or irrelevant to me) | A little stressful | Moderately stressful | Quite stressful | Very stressful |
| **6. Difficulty with some subjects** | Not at all stressful (or irrelevant to me) | A little stressful | Moderately stressful | Quite stressful | Very stressful |
| **7. Keeping up with schoolwork** | Not at all stressful (or irrelevant to me) | A little stressful | Moderately stressful | Quite stressful | Very stressful |
| **8. Having to study things you are not interested in** | Not at all stressful (or irrelevant to me) | A little stressful | Moderately stressful | Quite stressful | Very stressful |
| **9. Having to concentrate too long during school hours** | Not at all stressful (or irrelevant to me) | A little stressful | Moderately stressful | Quite stressful | Very stressful |
| **10. Pressure of study** | Not at all stressful (or irrelevant to me) | A little stressful | Moderately stressful | Quite stressful | Very stressful |

## Appendix M: School Satisfaction (MSLSS)

*We would like to know what thoughts about life you've had during the **past several weeks**. Think about how you spend each day and night and then think about how your life has been during most of this time. Here are some questions that ask you to indicate your satisfaction with life. Circle the statement that indicates the extent to which you agree or disagree with each statement. It is important to know what you **REALLY** think, so please answer the question the way you really feel, not how you think you should. This is NOT a test. There are NO right or wrong answers.*

| | | | | | | |
|---|---|---|---|---|---|---|
| **1. I look forward to going to school.** | Strongly disagree | Moderately disagree | Mildly disagree | Mildly agree | Moderately agree | Strongly agree |
| **2. I like being in school.** | Strongly disagree | Moderately disagree | Mildly disagree | Mildly agree | Moderately agree | Strongly agree |
| **3. School is interesting.** | Strongly disagree | Moderately disagree | Mildly disagree | Mildly agree | Moderately agree | Strongly agree |
| **4. I wish I didn't have to go to school.** | Strongly disagree | Moderately disagree | Mildly disagree | Mildly agree | Moderately agree | Strongly agree |
| **5. There are many things about school I don't like.** | Strongly disagree | Moderately disagree | Mildly disagree | Mildly agree | Moderately agree | Strongly agree |
| **6. I enjoy school activities.** | Strongly disagree | Moderately disagree | Mildly disagree | Mildly agree | Moderately agree | Strongly agree |
| **7. I learn a lot at school.** | Strongly disagree | Moderately disagree | Mildly disagree | Mildly agree | Moderately agree | Strongly agree |
| **8. I feel bad at school.** | Strongly disagree | Moderately disagree | Mildly disagree | Mildly agree | Moderately agree | Strongly agree |

## Appendix N: Patient Health Questionnaire (PHQ-4)

| | | | | | |
|---|---|---|---|---|---|
| *Over the last 2 weeks, how often have you been bothered by the following problems?* | | | | | |
| **1.** | **Feeling nervous, anxious or on edge** | Not at all | Several days | More than half the days | Nearly everyday |
| **2.** | **Not being able to stop or control worrying** | Not at all | Several days | More than half the days | Nearly everyday |
| **3.** | **Little interest or pleasure in doing things** | Not at all | Several days | More than half the days | Nearly everyday |
| **4.** | **Feeling down, depressed, or hopeless** | Not at all | Several days | More than half the days | Nearly everyday |

**END OF STUDY, THANK YOU**