Interventions based on Mindfulness for Socio-emotional Skill Building in Children on the Autism Spectrum: A Systematic Review

Nethnie Thilakna Nandadasa, Western University

Supervisor: Lee, Gabrielle, The University of Western Ontario
A thesis submitted in partial fulfillment of the requirements for the Master of Arts degree in Education
© Nethnie Thilakna Nandadasa 2023

Follow this and additional works at: https://ir.lib.uwo.ca/etd

Part of the Accessibility Commons, Early Childhood Education Commons, Educational Psychology Commons, and the Special Education and Teaching Commons

Recommended Citation
https://ir.lib.uwo.ca/etd/9381

This Dissertation/Thesis is brought to you for free and open access by Scholarship@Western. It has been accepted for inclusion in Electronic Thesis and Dissertation Repository by an authorized administrator of Scholarship@Western. For more information, please contact wlswadmin@uwo.ca.
Abstract

Children on the autism spectrum are characterized by deficits in socioemotional skills. Previous research suggests that mindfulness is effective in improving social, emotional, and behavioural skills in a wide variety of populations. This review systematically investigated the efficacy of mindfulness-based interventions (MBIs) in improving social, emotional, and behavioural functioning in children on the autism spectrum (0-12 years of age). Furthermore, the current review discussed adaptations to traditional MBIs when implemented to children on the autism spectrum. MBIs as a potential evidence-based practice for the target population was also investigated. Eleven studies met inclusion criteria. Results indicated that MBIs led to improvements in social communication, social motivation, externalizing and internalizing behaviors and executive functioning in children on the autism spectrum. MBIs were also assessed to be an established evidence-based practice for children on the autism spectrum. The significance of these findings for clinicians, parents and educators are discussed.
Key Words

Mindfulness, mindfulness-based interventions, autism spectrum disorder, children, socioemotional skills, social functioning, behavioural functioning, emotional functioning, systematic review
Summary for the Lay Audience

Children on the autism spectrum lack skills in expressing emotions, interpreting social cues, and empathizing and recognizing others’ perspectives. These skills are defined as socioemotional skills. The lack of socioemotional skills can lead to negative social interactions, less communicative abilities, more externalizing and internalizing behaviors, and reduced perspective taking. Current evidence-based practices in socioemotional skill building for children on the autism spectrum are effective, however, rely on specific external cues and factors in a child’s environment that points to less generalization and maintenance of learned skills. Mindfulness is a process that leads to a mental state of being present and more aware of one’s emotions, sensations, bodily states and social cues. This increased awareness can help children on the autism spectrum to recognize triggers and divert attention from negative thoughts and coping mechanisms to ones that are more adaptive. Past research done in the field of mindfulness-based interventions for autism spectrum disorder has focused on adolescents, adults, and caregivers of people on the autism spectrum. However, early implementation of interventions is crucial for the ASD population. Therefore, the current study looks to understand the effect of MBIs on socioemotional skill development in children on the autism spectrum (0-12 years) through a thorough systematic search. Furthermore, adaptations made to traditional MBI for children on the autism spectrum, and mindfulness training as an evidence-based practice is discussed. Eleven articles were chosen after review. I found that children on the autism spectrum had improved skills in social responsiveness, social motivation, externalizing and internalizing behaviors and emotion regulation after training in mindfulness. Furthermore, we found that when implementing to children on the autism spectrum traditional interventions adapt to provide explicit and direct instruction, utilize transition and visual schedules, and demonstrate concepts multimodally. Mindfulness training was also found to be an established evidence-based practice for children on the autism spectrum. Implications of mindfulness training for clinicians, teachers and parents are also discussed.
# Table of Contents

Abstract ........................................................................................................................................... ii
Keywords ........................................................................................................................................... iii
Summary for Lay Audience ................................................................................................................ iv
Table of Contents ............................................................................................................................... v
List of Figures ...................................................................................................................................... viii
List of Tables ......................................................................................................................................... ix
Introduction ......................................................................................................................................... 1
  Evidence Based Practices for ASD .................................................................................................... 3
    Social Skills Training ...................................................................................................................... 4
    Social Narratives ............................................................................................................................ 5
    Peer-mediated interventions ........................................................................................................... 6
Mindfulness ........................................................................................................................................ 8
  Mechanisms of Mindfulness ............................................................................................................ 9
Types of Mindfulness-based Interventions ......................................................................................... 10
  Mindfulness-based stress reduction .................................................................................................. 10
  Mindfulness-based cognitive therapy ................................................................................................ 11
  Dialectical Behavioral therapy ......................................................................................................... 12
    Dialectical Behavioural Therapy for ASD ...................................................................................... 13
  Mindfulness based interventions for ASD ....................................................................................... 15
The Present Study ............................................................................................................................. 17
Methods .............................................................................................................................................. 17
  Study Selection Criteria ................................................................................................................... 18
  Search Strategy ............................................................................................................................... 19
  Study Selection and Review Process ............................................................................................. 20
  Data Extraction ............................................................................................................................... 21
  Quality Assessment .......................................................................................................................... 22
Results ............................................................................................................................................... 25
Participants ................................................................................................................. 25
Study Design .................................................................................................................. 27
Intervention Details ...................................................................................................... 27
   Dosage and Frequency of Intervention ................................................................. 27
   Implementation Details .......................................................................................... 28
   Setting and Trainer Details ................................................................................. 29
   Parent Involvement in MBI .................................................................................. 32
   Type of Intervention ............................................................................................... 33
   Content Covered in Intervention ........................................................................ 34
Adaptations for children on the autism spectrum ...................................................... 46
Outcome measures ...................................................................................................... 46
   Social/emotional measures .................................................................................. 46
   Behavioural measures .......................................................................................... 48
   Executive functioning measures ......................................................................... 48
Quality Assessment ..................................................................................................... 49
Discussion .................................................................................................................... 51
Summary of Evidence .................................................................................................. 51
Suggested Practices for MBI Implementation .............................................................. 51
   Frequency and Duration of Intervention .............................................................. 51
   Trainer Details ....................................................................................................... 52
   Setting Details ........................................................................................................ 55
   Content Covered During Implementation .......................................................... 56
Effectiveness of MBIs for children on the autism spectrum ....................................... 60
   Effect of MBIs on social functioning ................................................................. 60
   Effect of MBIs on emotional functioning .......................................................... 62
   Effect of MBIs on behavioral functioning .......................................................... 63
   Effect of MBIs on executive functioning ............................................................ 64
Modifications made for children on the autism spectrum ......................................... 66
Mindfulness training as an Evidence Based Practice ........................................67
Limitations .............................................................................................................70
Future Directions ...................................................................................................71
Implications for Practice .........................................................................................74
  Implications for clinicians ....................................................................................74
  Implications for parents .......................................................................................75
  Implications for teachers .....................................................................................75
Conclusions .............................................................................................................76
References ..............................................................................................................77
Curriculum Vitae ...................................................................................................91
List of Figures

Figure 1. Literature search results................................................................. 22
List of Tables

Table 1. Characteristics of Included Studies .............................................................................. 39
Table 2. Quality Assessment Results for Group Research .......................................................... 49
Table 3. Quality Assessment Results for Single Subject Research .............................................. 50
Table 4. Mindfulness Elements Found in Studies Included In The Review .................................. 59
Introduction

Recent prevalence data indicates that globally, approximately 1 in 100 children (aged 0-12 years of age) are diagnosed with autism spectrum disorder (ASD; Zeidan et al., 2022). ASDs encompass autism, Asperger’s Disorder, and pervasive developmental disorder – not otherwise specified (American Psychiatric Association, 2013). ASD is a neurodevelopmental disorder that is characterized by deficits in social communication and social interaction across multiple situations. It is manifested in low socioemotional reciprocity, lack of an understanding of nonverbal communicative behaviors and a difficulty in developing, retaining, and understanding relationships with others (Li et al., 2022). As such, children on the autism spectrum frequently experience challenges in complex social situations and in identifying contextual information relevant to their own emotions, as well as others (Moyal et al., 2014). These discrepancies affect the way children with ASD interpret, express, and regulate emotions and their ability to have successful social interactions (Bauminger et al., 2003; Li et al., 2022). Deficits in social interactions point to a lack of socioemotional skills in children on the autism spectrum.

Socioemotional skills include the ability to express, manage and regulate all emotions, especially when one is overwhelmed (Reid, 2020). Examples of socioemotional skills include interpreting social cues and non-literal language, social attention, social motivation, maintaining eye contact, and empathizing and recognizing others’ perspectives (Lordo et al., 2017). Children on the autism spectrum who lack these skills do not send clear social messages and are difficult to read and respond to appropriately. This can lead to fewer positive interactions with others, and they are more likely to be deemed socially incompetent by their peers. Socioemotional skill building aids in developing interpersonal relationships and interacting with the outside world by helping those on the autism spectrum understand their own and others’ emotions and social cues.
Furthermore, socioemotional skills are deeply interconnected to communication skills in ASD since understanding others’ feelings and thoughts helps one interact with others effectively (More, 2018; Reid, 2020). Therefore, a deficit in socioemotional capabilities can affect the communicative abilities of children on the autism spectrum.

Challenges in maintaining socioemotional skills can also lead to higher externalizing and internalizing behaviors. Externalizing behaviors include problems with attention, self-regulation, aggressive behaviors, and other noncompliant behaviors. When children on the autism spectrum have a hard time recognizing and regulating their emotions, this leads to an increase in externalizing behaviors as a way of calming down (Hartley et al., 2019). Internalizing behaviors include depression, withdrawal, self-consciousness, and hypersensitivity. In fact, there is a higher incidence of child anxiety, depression, aggression, hyperactivity, and self-injurious behaviors in children on the autism spectrum (Bauminger & Kasari, 2000; Bornstein et al., 2010; Hartley et al., 2019; Li et al., 2022). Therefore, the lack of socioemotional skills can increase maladaptive behaviors in children on the autism spectrum.

Deficits in socioemotional capacities can also mingle with lower executive functioning in children on the autism spectrum. Executive functioning is defined as the ability to engage in higher order thinking and decision making and defines skills such as inhibitory control and executive attention (Olsson & Ochsner, 2008). These skills are associated with teamwork, leadership, critical thinking, adaptability, and emotional awareness (Madjar et al., 2019; Riggs et al., 2006). Higher effortful thinking correlates strongly with empathy, perspective taking and theory of mind, which are all crucial in social interactions. Furthermore, previous research indicates that executive functioning is strongly related to understanding of oneself and others, as well as emotion regulation. Socioemotional skills are deeply correlated with executive
functioning, where deficits in one will lead to decreased capacity in the other, which is emphasized in children on the autism spectrum (Olsson & Ochsner, 2008).

Overall, challenges in socioemotional skills can lead to deficits in socioemotional competence, behavioural functioning, executive functioning, and the development of comorbid disorders in later childhood (Bauminger & Kasari, 2000; Tantam, 2003). Furthermore, the lack of these skills can make everyday life even more taxing for those with ASD. To prevent future negative implications, early intervention in socioemotional skills is therefore crucial in helping children on the autism spectrum achieve subjective wellbeing to understand how to identify, express, and regulate their emotions. (Hartley et al., 2019; Luhmann et al., 2012; MacNeil et al., 2009).

**Evidence Based Practices for ASD**

Evidence Based Practices (EBP) are interventions that have an acceptable level of research that shows the practice produces positive outcomes for deficits faced by people on the autism spectrum (Reichow et al., 2008; Waligorska et al., 2019).

Most evidence-based practices typically used to target skill development in children with ASD have utilized principles of applied behavioural analysis, which is the gold standard of EBPs and is based on making behavioral changes using assistive prompts, external reinforcements, and practice opportunities (Beck et al., 2020). In particular to socioemotional development, established EBPs for children on the autism spectrum include, but are not limited to, social skills training (Soares et al., 2021), social narratives (Thomas & Nix, 2017), and peer mediated interventions (Zhang et al., 2022).
Social Skills Training

Social skills training/package is one of the most commonly used interventions to address social deficits in ASD. The training helps children on the autism spectrum to interact with their peers and other social situations by providing face-to-face live instruction on conversation skills, interpersonal skills, critical thinking and problem-solving skills (Soares et al., 2021). Social skills training sessions usually start with an assessment of specific skill deficits that can be targeted for improvement. Usually, large topics of instruction will need to be broken down and handled one at a time. Social skills training sessions follow the following format: 1) check-in; 2) introduction and teaching of new skill; 3) practice of new skill; 4) feedback; and end off with 5) opportunities to practice new skills in a naturalistic setting. A range of instructional strategies can be used for social skills training, such as modelling of skills, role play, reinforcement, and the use of visual cues. To reinforce the learner to increase the use of target skills, external reinforcements such as a food the child likes, a break or verbal praise are used (Griffin et al., 2015).

Dekker et al. (2019) investigated the effectiveness of a fifteen-session social skills group training for children with ASD. Skills included “asking something to someone”, “responding to bullying”, etc. They utilized external reinforcements such as verbal praise or the promise of an activity the child liked and found significant improvement in social skills and social functioning in daily life. They also found that teacher and parent involvement intensified the effects of social skills group training. These findings were replicated in both Soares et al. (2017) and Szumski et al. (2019).

Overall, there is much evidence speaking to the benefits of social skills training in improving socioemotional skills for children on the autism spectrum. However, research in social skills training also shows unclear evidence wherein the generalizability of the skills taught are
less applicable to daily life and settings (Berrgren et al., 2018; Jonsoon et al., 2016; White et al., 2007). Past reviews on social skills training found that there were little observable instances or discernible measures that were used to test the generalizability of social skills training (Berrgren et al., 2018; White et al., 2007).

**Social Narratives**

Another established EBP for social skill development includes social narratives where people with ASD are provided with relevant cues and explanations of feelings and thoughts to help navigate social situations. Social narratives are individualized based on specific needs and are short and written from a first-person perspective (Collet-Klingenberg & Franzone, 2008). Social narratives describe familiar social situations to children on the autism spectrum. For instance, a social narrative could be written to ask help from a parent to grab a food item from a top shelf. They help learners to adjust to changes in routine and adapt their behaviors based on social and physical cues in their environment. Studies investigating the effectiveness of social narratives have mostly been in the school and home environment (Collet-Klingenberg & Franzone, 2008).

The introduction of a social narrative follows five steps: 1) identifying the social situation; 2) defining the target behaviour or skill; 3) writing the social narrative and teaching it to the child; 4) generalizing and maintaining the skill. An example of a social narrative would be: “I will tap the teacher on the shoulder when I want their attention”. This narrative is then used as a regular part of the learners’ daily routine and is externally reinforced to maintain the behavior. This narrative is then generalized to other peers, educators and parents. Social narratives have an implementation checklist, data collection sheets and a parent guide to help with implementation (Thomas & Nix, 2017).
A study by Golzari et al. (2015) investigated the effectiveness of a social narratives' intervention on social skill development and found improvements in perspective taking, initiating interactions, and maintaining interactions. However, they did find that generalizability of social narratives to additional settings was lacking since the narrative is written for a specific situation and location. This finding was also found in Leah et al. (2015) who reviewed 41 studies that evaluated social narratives and found that majority of the studies showed only a partial demonstration that social narratives were responsible for long-term behavior change.

**Peer-mediated interventions**

Peer mediated intervention or peer modelling is another established EBP that teaches typically developing peers to help children on the autism spectrum to actively participate in social situations. This practice can help to involve children on the autism spectrum in areas where their peers frequent, and also can help to reduce the stigma surrounding ASD (Zhang et al., 2022). Common social skills that are targeted using peer modelling can be responding to others, increased reciprocity, interacting within groups, etc (Neitzel, 2008).

In peer modelling a teacher or an educator would select peers that exhibit good social skills, kindness and a general positive attitude. They will then train peers in recognizing differences and identifying areas where they can help the child on the autism spectrum. Peer models will also be trained in specific strategies that they can use to facilitate and engage their peers in play. Peers will practice these skills in a structured play setting before applying it to the general classroom setting.

A study done by Zhang et al., (2022) investigated the effectiveness of peer-mediated intervention on social skill development. They found that children with ASD had increased
social motivation and effective social communication with others following the intervention. They also reported that peer interactions were more meaningful and wholesome due to skills learned in peer training with teachers. However, previous studies have also shown that with time, serving as a peer model for children on the autism spectrum may owe to various difficulties and pressures for the peer model, which can lead to burnout (Locke et al., 2012). It is also the case that peer models may lose their willingness and enthusiasm over time leading to negative consequences for the child on the autism spectrum (Ferraioli & Harris, 2011; Locke et al., 2012; Reiter & Vitani, 2007).

The current look into available EBPs for social skills showcases some difficulties: 1) the long-term retention of the learned skills; 2) a reliance on specific cues in the external environment to trigger good behavior; 3) and a heavy reliance on external motivators to maintain and improve the skill. For instance, in social skills training, for every correct behavior in a specific social situation, the child is externally reinforced through a snack or verbal praise (Berrgren et al., 2018; Jonsoon et al., 2016; White et al., 2007). Similarly, in social narratives, the generalization of the behaviour is difficult as the behaviour taught is confined to a specific person or place (Golzari et al., 2015). In peer modelling, children on the spectrum are dependent on a peer for social support and social skill development (Ferraioli & Harris, 2011; Locke et al., 2012; Reiter & Vitani, 2007). Though these practices have shown much success, none of these EBPs work to directly target the internal thoughts and emotions of the child on the autism spectrum. Helping a child to identify their internal bodily and emotional cues during an overwhelming situation could help them to identify the need to redirect their attention to react deliberately, instead of reactively.
Recent studies have showcased the benefits of mindfulness in targeting socioemotional skill development in children on the autism spectrum (Cachia et al., 2016; Hartley et al., 2019; Hoursten & Atchley, 2017). Mindfulness teaches ways to identify, redirect and regulate overwhelming emotions by bringing awareness to bodily, emotional and social cues. By doing so, people are able to self-regulate their own behavior to reduce both externalizing and internalizing symptoms, especially those associated with ASD (Hartley et al., 2019; Shah et al., 2022; Zhang et al., 2019). Stressful and negative emotions have specific cues and triggers that can be identified through bringing attention to oneself. This awareness can help reduce emotionally driven unhealthy behaviors and bring awareness to the available healthy behaviors in children on the autism spectrum, which can help in the long-term retention and generalization of these behaviors (Schuman-Olivier et al., 2020). The current review looks to investigate the effectiveness of mindfulness-based interventions for socioemotional skill development in children on the autism spectrum.

**Mindfulness**

Mindfulness stems from Buddhist traditions and refers to a process that leads to a mental state of being in the present moment, and being aware of one’s sensations, emotions, bodily states, and environments (Hofmann & Gomez, 2017; Zhang et al., 2021). It is an umbrella term that covers several practices, processes and characteristics that are empirically associated with psychological and physical wellbeing (Keng et al., 2011; Van Dam et al., 2019; Zhang et al., 2021). Mindfulness is defined in relation to attention, awareness, memory, acceptance, and emotional and behavioral functioning (Keng et al., 2011; Van Dam et al., 2019). There is no confirmed definition of mindfulness, however, operationally, it has been defined as “the self-
regulation of attention so that it is maintained on immediate experience...characterized by curiosity, openness, and acceptance” (Bishop et al., 2004, p. 232).

**Mechanisms of Mindfulness**

Mindfulness practices can help with emotional and social regulation by working on attention and awareness (Bishop et al., 2004). Mak et al. (2018) talk about four types of regulation involving mindfulness: (a) sustained attention on the present moment (i.e. by focusing on the current emotion felt); (b) monitoring the present moment (I.e., what antecedents led to this emotion and what are my bodily and environmental cues); (c) executive functioning such as attentional switching (i.e. disengaging from a distracting/negative thought without further involvement); and (d) selective attention (I.e., the ability to redirect focus promptly back to a target response without being distracted by negative emotion).

For children with ASD, mindfulness can help with emotional and attentional regulation by bringing sustained attention to social cues and internal bodily cues that can help them to interact better with themselves and others (Ho et al., 2021; Mak et al., 2018; Schuman-Olivier et al., 2020). Monitoring interactions between mind, emotions, behaviors and body can help children with self-control and with diverting attention from distracting/negative thoughts or emotions to more adaptive coping strategies (Hofmann & Gomez, 2018; Mak et al., 2018). Children on the autism spectrum can then bring selective attention back to the present/target by incorporating mindfulness practices (Mak et al., 2018; Schuman-Olivier et al., 2020). Mindfulness also helps to promote self-reflection in consideration with externalizing and internalizing symptoms associated with ASD (Ho et al., 2021; Hofmann & Gomez, 2018).
For instance, an anger-provoking situation elicits certain bodily, emotional and social cues. By teaching the child to be aware of these cues, they are able to recognize their triggers and emotions much easier. This reduces the stress felt and can help the child to bring awareness to adaptive patterns of coping so that they are able to react deliberately. The continued use of these practices will help with generalization, since emotional cues are similar across situations and settings.

Common mindfulness practices can be formal (breathing, sitting, walking), or informal (mindfulness in everyday life) (Zhang et al., 2020). Mindfulness has been shown to be extremely beneficial in improving socioemotional skills in children with ASD (Hartley et al., 2019; Zhang et al., 2020).

**Types of Mindfulness-based interventions (MBIs)**

**Mindfulness-based Stress Reduction (MBSR).** MBSR is the most common mindfulness-based therapy and was founded by John Kabat-Zinn for stress management in individuals with chronic pain. It has evolved to treat a variety of illnesses such as depression, anxiety, chronic pain, diabetes, hypertension, etc (Niazi & Niazi, 2011). MBSR training increases individuals’ ability to accept and understand positive and negative emotions and monitor mind, body and behavioral cues that are associated with emotions so that they are able to find more beneficial patterns of response (Fuchs et al., 2017).

MBSR consists of a group-based course that lasts 2.5 hours per week for 8 weeks in total, where participants receive direct instruction in formal mindfulness meditation techniques involving simple stretches and postures (Fuchs et al., 2017; Mak et al., 2018). Most of the course content is focused on learning how to mindfully attend to bodily cues, sitting meditation, and
yoga and how to apply these practices to handle daily stressors adaptively (Mak et al., 2018). Many of the programs that have been adapted for school-aged children focus on breathing awareness, body scans and simple yoga poses (Fuchs et al., 2017). Breathing awareness facilitates mindfulness by helping the participant focus on their breath to ground themselves. Body scans help to bring awareness to the sensations associated with your body in feeling certain emotions. They also help to bring awareness to physiological responses associated with negative emotions. Guided yoga stretches help to bring awareness away from a negative event by focusing your mind on simple stretches that can help individuals ground themselves (Fuchs et al., 2017; Semple et al., 2010).

A study done by Fuchs et al. (2017) looked at the current literature in MBSR for children with disabilities and found that mindfulness programs help with developing coping skills and alleviated daily stressors that inhibit social and emotional functioning. A study completed by Semple et al. (2010) reported decreased symptoms of anxiety, depression, and somatic distress and improved self-esteem and efficacy and sleep quality following a MBSR training program in five children with disabilities. MBSR appears to be a safe and effective treatment for the reduction of emotional dysregulation (Fuchs et al., 2018; Hofmann & Gomez, 2017).

**Mindfulness-based Cognitive Therapy (MBCT).** Mindfulness-based cognitive therapy is an extension of Cognitive Behavioral Therapy, an established EBP for ASD symptoms. Cognitive behavioral therapy helps children with ASD to examine their own thoughts and emotions and recognize negative and escalating thoughts. Cognitive behavioral therapy also provides strategies to change individuals’ thinking and behavior (Perihan et al., 2021). As an extension of cognitive behavioral therapy, MBCT incorporates elements of mindfulness to additionally control bodily and emotional reactions to stresses associated with negative thoughts.
and feelings. This enhanced internal awareness is then combined with principles of cognitive therapy that teach individuals to disengage from negative thought patterns (Hartmann et al., 2012; Hofmann & Gomez, 2017; Sipe & Eisendrath, 2012).

MBCT was initially founded as an intervention for relapse prevention with recurrent depression (Sipe & Eisendrath, 2012). It consists of an eight-session group program, with each session about two hours in length. Mindfulness practices such as meditation, mindful movement, awareness of daily routines is incorporated with a focus on varying strategies to manage distressing situations by learning how to develop action plans (Sipe & Eisendrath, 2012). Mindfulness-based cognitive therapy focuses on self-awareness, others’ emotional-awareness, selective attention, increased acceptance, and regulation of emotions (Sipe & Eisendrath, 2012).

Conner & White (2017) investigated the feasibility and efficacy of a modified MBCT for improving emotion regulation for adults with ASD. They found improvements in impulse control, increased application of taught emotion regulation techniques and emotional acceptance.

**Dialectical Behavioural Therapy (DBT).** Dialectical behaviour therapy (DBT) is also an evidence-based subset of cognitive behavioural therapy (CBT), much like MBCT, that focuses more on socioemotional aspects such as interpersonal relationships and emotion skills, rather than thought patterns and their redirection that CBT focuses on. DBT is an approach based on mindfulness and acceptance therapies (Mazefsky et al., 2014). The current study acknowledges DBT’s focus on mindfulness to investigate whether DBT is effective in increasing socioemotional skills in children with ASD. Furthermore, there is a lack of research on DBT’s effectiveness in improving socioemotional skills for children on the autism spectrum. The current study looks to add to the research by investigating the efficacy of DBT for children on the autism spectrum.
DBT was first developed to treat people with borderline personality disorder, specifically, to treat the extreme self-injurious behaviors associated with the disorder (Linehan et al., 1991). DBT helps people regulate extreme or unstable emotions and harmful behaviours and work on interpersonal relationship skills (Chapman, 2006). DBT has four major treatment modules: mindfulness, distress tolerance, emotion regulation and social/interpersonal effectiveness. The mindfulness module, individuals are taught about being present and acknowledging thoughts, and using these skills to cope during crises while maintaining self and emotion regulation. Interpersonal effectiveness involves interacting with others and working on getting what you want, gaining and maintaining interpersonal skills and relationships, and understanding your role in a relationship. Emotion regulation works on identification and labelling emotions after distressing situations. Distress tolerance works on building up strategies to make moments of crisis more bearable for the individual (i.e., distraction skills, coping mechanisms) (Haney, 2017; Hartmann et al., 2012; Linehan, 1991).

Though DBT was developed and is recommended for the use of treatment of borderline personality disorder (BPD), there is evidence that DBT can be adapted for the treatment of other disorders and conditions (Hartmann et al., 2014; McNair et al., 2016). For instance, DBT has been recognized as being effective for treatment of substance misuse (Cavicchioli et al., 2019; Dimeff et al., 2008), eating disorders (Bankoff et al., 2012; Ritschel et al., 2015; Reilly et al., 2020), and anxiety disorders (Gratz, 2015; Malivoire et al., 2020).

**Dialectical Behavioural Therapy for ASD.** DBT focuses more on interpersonal relationships and emotional regulation compared to its’ larger counterpart CBT. Unlike CBT, DBT is not an identified EBP for ASD.
Similar to individuals with borderline personality disorder suffer from extreme emotional dysregulation, and often engage in impulsive, self-destructive and suicidal behaviors. They also have very low social skills and emotional awareness. A study by Dudas and colleagues (2017) looked at the overlap between ASD and BPD and found that there were similar systemizing and empathizing behaviors between the two, where in there were higher systemizing behaviors compared to empathizing behaviors. They also found that often females diagnosed with BPD, might be overlooked, and treated for ASD. People with ASD, like those with BPD, can have deficits in having effective emotion recognition, emotional self-awareness, emotion recognition, and with creating and retaining interpersonal relationships (Li et al., 2022; Moyal et al., 2014), making DBT an effective intervention for teaching socio-emotional skills (Haney, 2017; Hartmann et al., 2012, 2019).

Research has found that DBT for ASD populations in most cases encompasses the DBT skills group training, which includes the skills mindfulness, emotion regulation, interpersonal effectiveness, and distress tolerance (Hartmann et al., 2012). The group skills can help to provide opportunities and a naturalistic environment for social interaction for those on the autism spectrum.

A study by Bemmouna et al. (2022) investigated the effectiveness of DBT for improving emotion regulation in adults with ASD that experience self-harm or suicidal behaviors. They found improved application of emotion regulation techniques and decreased levels of self-reported depression, hopelessness, and quality of life. Another study by Ritschel et al. (2021) evaluated the feasibility of DBT skills training for adults with ASD. They found that DBT was well received in this population, and reported an increase in emotion regulation, social communication, and higher order benefits for adults on the autism spectrum. A study by
Hartmann et al. (2019) investigated the effectiveness of a DBT-based emotion regulation intervention for young adults (age 18 and older) on the autism spectrum. They found notable improvements in social behavior, social communication, social awareness, and decreased repetitive behaviors at the group level. Overall, there is an established basis of evidence on the benefits and effectiveness of DBT for ASD populations.

Though there is a push towards adapted DBT being effective in helping individuals with ASD, there is an identified need for more extensive and concrete appraisal of DBT for individuals with ASD. Furthermore, there is a need for more review for DBT, in particular to children with ASD as most studies have focused on adult populations. The following study looks to add to the research by reviewing the available evidence for DBT for children on the autism spectrum (aged 0-13), since DBT holds a heavy mindfulness component and works to improve socioemotional skills.

*Mindfulness based interventions for ASD*

Though research in the field of MBIs, including DBT for ASD is still preliminary, it has increased dramatically in the recent decade. MBI research is starting to be more comparable to publications on cognitive behavioural therapy or acceptance-commitment therapy for ASD (Zhang et al., 2021). It should be noted that MBIs are not considered an evidence-based practice for ASD. However, there is much research that has shown its effectiveness in reducing distress, anxiety, violence, and aggression in individuals with ASD, resulting in a myriad of positive changes (Cachia et al., 2016; Hartley et al., 2019). Research on MBIs has also focused on interventions for reducing psychological distress and anxiety in caregivers of people with ASD and has shown to have positive results in both populations (Cachia et al., 2016; Hartley et al.,
2019). However, for the purposes of the current review, caregiver-focused interventions will not be considered.

Cachia et al. (2016) reviewed six studies on MBI for individuals of all ages on the autism spectrum. They found that mindfulness training led to a reduction in thought problems and externalizing behaviours in children on the autism spectrum. Furthermore, they reported reduced anxiety, depression, and rumination in adults on the autism spectrum. They also found an increase in social responsiveness and psychological well-being in adults. Another metanalysis conducted by Hartley et al. (2019) investigated mindfulness for individuals on the autism spectrum and their caregivers. They identified ten independent studies that fostered a primary target of increasing mindfulness in participants. The study found that children and adults with ASD, as well as their caregivers, had increased subjective wellbeing that were maintained at 3-month follow-up. The findings provide preliminary evidence for the effectiveness of MBSR and MBCT with this population, with significant short-term improvements. Hourston & Atchley (2017) reviewed sixteen studies on mind-body therapy for people on the autism spectrum and reported improved mental and emotional health in people on the autism spectrum. In specific to children on the autism spectrum, they found some improvement in maladaptive and aggressive behaviors. They did note that more research is needed to make conclusive statements on the effectiveness of mindfulness-based interventions for the ASD population.

Though mindfulness training has been shown to be effective, most mindfulness-based interventions focus on ASD populations in relation to reducing parent stress (Hartley et al., 2019) and are often aimed towards adolescents and adults (Cachia et al., 2016; Hourston & Atchley, 2017). Research shows that early implementation of interventions for autism are more likely to
have major long-lasting positive effects on symptoms and later skills (Helt et al., 2008), showcasing the importance of early implementation of MBIs. However, there is a lack of focus and understanding of their effect on children on the autism spectrum, which the present study looks to further investigate.

**The Present Study**

Though research has emerged showing some evidence towards the effectiveness of mindfulness-based interventions for ASD, there is a lack of research focusing solely on children with ASD. A systematic review of mindfulness and ASD research would help to consolidate the current evidence to inform a comprehensive picture of MBIs aimed at improving socioemotional skills in children on the autism spectrum.

The current study looks to conduct a systematic review on MBIs, including DBT for improvement of socioemotional skills in children with ASD. The first aim of this review is to investigate whether MBIs (including DBT) are effective and assess the quality of previous research in developing socioemotional skills in children with ASD. The second aim is to understand the adaptations to traditional MBIs that are employed for practice with children with ASD. The final aim is to identify whether MBIs, including DBT, can be considered as an evidence-based practice for ASD.

The research questions the current study poses are as such: 1) Do MBIs lead to effective improvements in socioemotional skills for children with ASD? 2) What are the adaptations to traditional MBIs when the target group is children with ASD? 3) Are MBIs a promising EBP for children with ASD?

**Methods**
The following review is conducted according to Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (Page et al., 2021).

**Study selection criteria**

The components Population, Intervention, Comparison, Outcome and Study (PICOS; Tacconelli, 2010) were used to formulate the eligibility criteria. Studies were included if:

1. The study included participants that were children (aged 0-12) diagnosed with autism spectrum disorder (ASD)
2. The study conducted an evaluation of an intervention that included mindfulness (MBCT, MBSR, MBI) or DBT where the primary focus was fostering increased socioemotional skills (social, emotional, behavioural and executive functioning) in children on the autism spectrum
3. The study contained a detailed description of intervention design, methodology, implementation procedures and analyzed the effectiveness of the intervention.
4. The study conducted empirical research that utilized experimental methodology randomized control trials, quasi-experimental, single subject designs) that investigated the effectiveness of interventions utilizing DBT or MBIs to teach socio-emotional skills for children with ASD.
5. The study was published between Jan 2017 to November 2022 to investigate the most recent literature available. This date range was chosen based on past reviews completed by Cachia et al. (2016) and Hoursten & Atchley (2017) on mindfulness-based interventions to ensure periodic up-to-date searching for new evidence to retain the credibility of the review (Smith, 2022).
6. The intervention had to be delivered by a trained practitioner (e.g., mindfulness masters, psychologists) or it provided training to parents/teachers to become competent in delivering a full-fledged program.

Studies were excluded if:

1. The focus of the study was not specific to ASD or symptoms related to ASD; and/or that studies did not investigate an intervention that directly benefit the child with autism (e.g., mindfulness-based interventions for parents of children with ASD; Rayan & Ahmad, 2016).

2. Studies utilized mindfulness-based or DBT-based practices, however outcomes measured were not related to emotional or social skill improvement in children with ASD, for example, repetitive behaviors, fine motor skill development, physical development, etc.

3. The study included most individuals that were over the age of 12 (i.e., the study included an age range of 8-17 and the mean age was 15.1; Salem-Guirgis, 2019)

4. The study included non-experimental data collection methods.

Search Strategy

A systematic search of ten electronic databases was completed in December 2022. The databases included: psycINFO (Ovid), EMBASE, ERIC, PubMed, Cochrane, EBSCO, Education Database, Scopus and OMNI and were systematically searched for articles. These databases were chosen based on availability and a past review by Cachia et al. (2016). A filter restricted articles to the date range of January 2017 to December 2022, to ensure the most recent available data after similar reviews completed (Cachia et al., 2016; Hoursten & Atchley, 2017).

The search strategy with the included search terms was as such:
1. ("Mindfulness based interventions" OR "mindfulness based cognitive therapy" OR
"mindfulness based stress reduction" OR “MBSR” OR “mindfulness” OR “MBI” OR
“MBCT” OR “mindfulness based”) AND ("autism” OR “ASD” OR “autism spectrum
disorder” OR “Asperger’s” OR “PDD” OR “pervasive developmental disorder” OR
“autistic” OR “Asperger’s syndrome”) AND ("children” OR “young person”, OR
“toddler”, OR “elementary school” OR “preteens” OR “early age” OR “school age” OR
“kids” OR “students” OR “child” OR “toddler” OR preadolescent”)

2. ("dbt” OR “DBT” OR “dialectical behaviour therapy” OR “DBT skills training”) AND
("autism” OR “ASD” OR “autism spectrum disorder” OR “Asperger’s” OR “PDD” OR
“pervasive developmental disorder” OR “autistic” OR “Asperger’s syndrome”) AND
("children” OR “young person”, OR “toddler”, OR “elementary school” OR “preteens”
OR “early age” OR “school age” OR “kids” OR “students” OR “child” OR “toddler” OR
preadolescent”)

To identify additional relevant studies, the reference lists of related systematic reviews
(Hartley et al., 2019) and the reference lists of all eligible studies (after screening) included in the
current review were hand searched.

Study selection and Review Process

To maintain consistency and to ensure credibility in the evidence, two reviewers
independently assessed the identified records for eligibility, and disagreements were resolved
through discussion and consensus. Following removal of duplicate articles by Covidence and
manual searches, initial screening was completed by sifting through titles and abstracts.
Covidence is the primary screening and data extraction tool for conducting systematic reviews.
The software assisted in title, abstract, and full text screening between the two reviewers and helped to resolve disagreements easily.

Title and abstract screening eliminated studies that failed to meet eligibility criteria, and the full text of the remaining studies was reviewed to determine whether eligibility criteria were met, and reasons for exclusion of studies were recorded.

Inter-rater reliability between the two raters for the title and abstract screening was 90% prior to discussion and indicated high agreement. Inter-rater reliability for full-text screening was 85% agreement prior to discussion and indicated high agreement.

**Data extraction**

Once screening was completed, data from the articles included were extracted by the primary investigator using a spreadsheet. Inter-rater reliability was not collected for data extraction processes due to time constraints.

Data were extracted on 1) participant characteristics (including mean age, age range, percentage of males and females of all participants and percentage of diagnosed children of ASD in sample), 2) type of intervention utilized and details about the intervention (including type of intervention: MBI or DBT, duration of intervention, control/comparison, content covered in the intervention, instructors who taught intervention, length of baseline and follow-up), outcomes measured (including improvement in autism symptoms, improvements in mindfulness, quality of life, parent/teacher /self-reported improvements), 3) type of adaptations made during intervention to make it more accessible for children with ASD; 4) findings.

Refer to Figure 1 for a full view of the literature search results.
Quality assessment

The current study utilized a method founded by Reichow et al. (2008), named the Evaluative Method for Determining EBP (EMDEBP) in Autism to determine whether
Mindfulness Based Interventions are EBPs for ASD and to assess the quality of included studies. The EMDEBP is rigorous as it is developed specifically for research in autism. The EMDEBP also has a strict rubric and guidelines for the determination of research report strength and EBPs (Reichow et al., 2008). The EMDEBP evaluates on three different criteria: 1) rubrics for the evaluation of research report rigor on a three-point scale of high quality, acceptable quality and unacceptable quality; 2) rubrics for the evaluation of research report strength on a three-point scale of strong, adequate and weak; and 3) the aggregation of research report rigor and strength across studies to determine whether a study can be labelled as an established EBP or a promising EBP.

An established EBP is shown to be effective across multiple high-quality studies conducted by at least two different research groups and can showcase confidence in the treatment’s efficacy. Established EBPs must meet at least one of the following criteria (Reichow et al., 2008): (a) at least five strong single subject studies conducted by at least three different research teams in three different locations with a total sample size of 15 participants across studies; (b) at least ten adequate single subject studies conducted by at least three different research teams in three different locations with a total sample size of 30 participants across studies; (c) at least two strong group experimental design studies conducted in at least two different locations and research teams; (d) at least four adequate group experimental design studies conducted in at least two different laboratories by separate research teams; (e) One group experimental design study of strong research report strength and three single subject studies of strong research report strength; (f) Two group experimental design studies of at least adequate research report strength and three single subject studies of strong research report strength; (g) One group experimental design study of strong research report strength and six single subject
Promising EBPs are also shown to be effective across multiple studies, however, they do not showcase a plethora of high-quality studies unlike an Established EBP. These EBPs should be implemented with caution, monitored closely and more research is needed. Promising EBPs must meet at least one of the following criteria (Reichow et al., 2008): (a) at least three adequate single subject studies conducted by at least two different research teams and locations with a total sample size of nine participants across studies; (b) At least two group experimental design studies of at least adequate research report strength.

EMDEBP includes criteria for both group research and single subject research. The strength of an article lies on a trichotomous scale of high quality, acceptable quality or unacceptable. The strength of group research included was evaluated by both (a) primary quality indicators (participant characteristics, comparison condition, independent variable, dependent variable, use of statistical tests, link between research question and data analysis), and (b) secondary quality indicators (random assignments, interobserver agreements, fidelity checks, effect size, social validity). Based on these ratings, the quality of the research was rated as strong, adequate, or weak.

Similarly, to group research, single subject research was evaluated, on a trichotomous scale (high quality, acceptable, unacceptable), on both (a) primary quality indicators (participant characteristics, comparators, independent variable, dependent variable, baseline condition, visual analysis and experimental control), and (b) secondary quality indicators (kappa, interobserver
agreements, fidelity checks, blind raters, social validity). Based on these ratings, the quality of
the article was rated as strong, adequate, or weak.

Quality assessment was completed for all of the included articles (12 articles). Each study
was independently evaluated by two members of the review team who then discussed each
criterion until agreement was met. Inter-rater reliability was 100% and agreement was met for all
articles assessed.

**Results**

The initial search yielded 111 results once duplicate articles were removed. After title and
abstract screening, twenty-seven articles were included for full-text review. Finally, there was a
total of eleven studies selected for final inclusion and discussion for the current review (see
Figure 1).

Two studies were excluded because the intervention outcomes were more related to
caregivers of children. Six studies were excluded since the majority of participants were over the
age of twelve, determined by mean age, even though the population included children between
the ages of 0-12. Four studies were excluded because the study employed non-experimental
and/or qualitative methodology. Three studies were excluded because MBIs (Mindfulness Based
Interventions) were considered to be an insignificant component of the intervention. One study
was excluded as study outcomes were not related to social or emotional skill development in
children on the autism spectrum.

**Participants**

Sample sizes ranged from 4-61 children on the autism spectrum (M=32.6, median = 32).
Ages ranged from 8 – 23 years. Five studies investigated wider age ranges than 0-12 years
which was the target group of the current review. Ridderinkhof et al. (2020) included an age range of 9-20, however, the mean age of participants was 12.9, indicating that majority of participants fall within the age range targeted by the current review. Similarly, Ho et al. (2021), Juliano et al. (2020), Katz et al. (2020), and Ridderinkhof et al. (2018) had wider age ranges than targeted, however, mean ages fell within 12.2-12.9 indicating a majority of participants falling within the age range the current review targeted. Since the mean ages in the following studies were in the target age range, these studies were included in the current review.

All studies included children with a diagnosis of ASD. For studies falling within age range, Clifford et al. (2022), Drusdeau (2020) and Drusdeau (2022) diagnosed eligible participants using the Autism Diagnosis Observation Schedule or the Autism Diagnostic Interview Revised administered by verified psychologists. Three studies had inclusion criteria that required a clinical diagnosis of ASD (Hatfield et al., 2022; Shah et al., 2022; Singh et al., 2018). Clifford et al. (2022) also utilized developmental histories, child psychology assessment reports, interviews with parents and school- site observations to diagnose ASD in eligible participants.

For studies wider than the age range targeted, Katz et al. (2020) included participants with fetal alcohol syndrome disorders and intellectual disabilities in addition to participants on the ASD. ASD diagnosis for participants were verified via educational records collected. Since Katz et al. (2020) was included in the current study as it had a representative sample of 26% of children on the autism spectrum. Ho et al. (2021), Juliano et al. (2020), Ridderinkhof et al. (2020) and Ridderinkhof et al. (2018) required a clinical diagnosis of ASD.

Of those studies that reported DSM criteria, one study used the DSM-V criteria (Hatfield et al., 2022) and two studies used the DSM-IV-TR (Ridderinkhof et al., 2018, 2020).
Four mindfulness-based studies involved parents of children on the autism spectrum (Hatfield et al., 2022; Ridderinkhof et al. 2018, 2020; Singh et al., 2018). In all studies, parents and children were taught mindfulness simultaneously in separate sessions. In two studies, parents were taught the mindfulness-based curriculum so that they were able to implement the intervention at home. And one study included a comparison of a mindfulness-based intervention with typically developing children vs. children with autism (Ridderinkhof et al., 2020).

**Study Design**

There was a total of three randomized control trials (Clifford et al., 2022; Ho et al., 2021; Katz et al., 2020), two multiple baseline/single subject studies (Shah et al., 2022; Singh et al., 2018) and six quasi-experimental studies within the included studies (Drusdeau et al., 2020, 2022; Hatfield et al., 2022; Juliano et al., 2020; Ridderinkhof et al., 2018, 2020).

**Intervention Details**

**Dosage and Frequency of Intervention**

The frequency and duration of sessions for the interventions varied. For group research studies that fell within the targeted age range for the review, interventions lasted from 8-12 weeks. Drusdeau et al. (2020) conducted weekly sessions that were ninety minutes each for a total of 12 weeks. Drusdeau et al. (2022) had a total of 20 sessions that were conducted as biweekly 90-minute sessions for a total of 10 weeks. Clifford et al. (2022) conducted 9 weekly 60-minute sessions; each session taught a new topic. Hatfield et al. (2022) administered their intervention in weekly 75-minute sessions for a total of 10 weeks.

For group research studies that had a wider age range, interventions lasted 8-9 weeks. Ridderinkhof et al. (2018) and Ridderinkhof et al. (2020) conducted weekly 90-minute sessions
for a total of 9 weeks with one additional booster session 9 weeks after the end of intervention. Ho et al. (2021) conducted an MBI that totaled nine weekly 90-minute sessions. Katz et al. (2020) was implemented school wide and was incorporated into the classroom and the intervention stage lasted a full school year (October to June). Juliano et al. (2020) implemented their training in two 30-minute weekly sessions for a total of 8 weeks (about two months).

For single subject studies conducted, baseline interventions occurred for 3-5 sessions within 3–11 weeks across all participants and interventions. Singh et al. (2018) conducted baseline sessions for 4 –11 weeks. Intervention sessions consisted of 3 teaching/training sessions in the first week, and an additional weekly two 30-minute sessions across 3 weeks to practice learned MBI techniques in daily life. Intervention sessions continued for another 15-22 weeks where children were instructed to continue using intervention independently and interventionist checked up every 3 weeks. Shah et al. (2022) held baselines sessions for 3-9 sessions, and there were five 20-30 minutes intervention sessions that lasted for five consecutive days. Follow up happened 6-8 weeks after end of intervention sessions.

Implementation Details

For studies within the age range targeted, three were implemented in groups (Drusdeau et al., 2022; Drusdeau et al., 2020; Hatfield et al., 2022). Drusdeau et al. (2020) and Drusdeau et al. (2022) implemented the TuTASS intervention to four groups of five to eight children and six groups of five children, respectively. Hatfield et al. (2022) implemented their intervention to a group of 14 children on the autism spectrum.

For studies outside of the age range targeted, all (five studies) were implemented in groups (Ho et al., 2021; Juliano et al., 2020; Ridderinkhof et al., 2018; Ridderinkhof et al.,
Ho et al. (2021) implemented to groups of 6-12 children, they failed to mention the number of groups formed. It can be extrapolated from the data that there were between 3-5 groups in total. Juliano et al. (2020) performed the intervention on groups of 9-12 students. Ridderinkhof et al. (2018) and Ridderinkhof et al. (2020) implemented their intervention to both a child group (age 8-23) and parent group. In the child group, they had one group for children (8-12) and adolescents (13-23). The majority of participants were situated in the child group. However, they did not specify how many groups or individuals per group. Katz et al. (2020) implemented a school-based intervention where 61 children were allocated to 20 classrooms within 4 schools, approximating 3 children per group. However, this approximation was not mentioned in the article.

Three of the included studies’ interventions were implemented individually, face-to-face (Clifford et al., 2022; Shah et al., 2022; Singh et al., 2018).

**Setting and Trainer Details**

There were three studies that were conducted in school settings (Juliano et al., 2020; Katz et al., 2020; Shah et al., 2022).

Juliano et al. (2020) implemented the Mindful Schools curriculum with mindfulness educators who would come in to provide the intervention. Depending on the needs of the group, there would be two to five educators per group. Mindfulness educators were trained in the MBI, however, there was no mention of how or when the training was provided. Katz et al. (2020) implemented a school wide tier-1 intervention where teachers were provided with lesson plans for the mindfulness curriculum. Teachers were trained in MBI and attended a 2-day workshop (10 hours total) at the beginning of the school year, October. They also attended two follow-up
sessions in February and April. Teachers were taught how to implement the curriculum and incorporate it into their lesson plans diversely. Teachers were encouraged to refer to MBI lesson plan during daily instruction. Two check ins were done during the study for teachers to discuss strengths and challenges in implementation with one another. Shah et al. (2022) was implemented individually in a school setting by a mental health counsellor and the children’s designated special education teacher. The mental health counsellor and teachers were trained by primary author who had prior experience on the deliverance of the MBI. The mental health counsellor was deemed fit to train after achieving 100% on the fidelity checklist after role-play practice with an adult. Special education teachers were required to attend an eight-hour small group workshop. During the workshop they were taught mindful breathing, open awareness, verbal instructions, and modelling. The trainers implemented the intervention one-on-one in a designated room.

Three of the included studies were conducted in treatment centers (Clifford et al., 2022; Ridderinkhof et al., 2018, 2020). Clifford et al. (2022) conducted their intervention in two centers for child mental health in Amsterdam, Netherlands. Participants were children diagnosed with ASD and referred by a physician to either of the centers. The intervention was administered by psychologists trained in the MBI. They were trained in the program by the senior clinical psychologists of the 2-treatment centers, who had gone through training with the first author. Trainers also attended supervision sessions during the intervention to ensure treatment fidelity. Trainers also went to children's schools and trained the children’s teachers on time-out procedures incorporated in the MBI. Ridderinkhof et al. (2018) recruited and delivered their MyMIND intervention at an academic treatment center for parents and children. Ridderinkhof et al. (2020) recruited and implemented the MyMIND intervention in one of two mental health
centers. In both studies, trainers for the intervention were child and family mental health professionals with experience in ASD. Professionals were those who had experience in MBSR or MBCT prior to the start of the study and had a year of experience in mindful practices. They also attended an eight-hour teacher training for MyMIND and a 4-day meditation retreat to familiarize themselves with the content.

Three studies were conducted at outpatient sites (Drusdeau et al., 2020, 2022; Hatfield et al., 2022). Drusdeau et al. (2020) and Drusdeau et al. (2022) conducted an outpatient group therapy at the local university hospital. Two group leaders for each group of six implemented the intervention. There was no information provided on how implementers were trained for the MBI. Hatfield et al. (2022) delivered their intervention at a community-based space of a non-profit disability service provider. The group-based intervention was delivered by two occupational therapists, one of whom was a qualified yoga and mindfulness teacher, and the other was also qualified in teaching yoga to children. They were both involved in the development of the Mindful Movers intervention; therefore, no additional training was required.

One intervention was conducted in the home (Singh et al., 2018). An experienced mindfulness trainer attended sessions in the child’s home and provided face-to-face training. The specific training provided for the mindfulness trainer was not specified in the study.

One intervention did not specify the setting in which the intervention took place (Ho et al., 2021). The intervention was offered by trained mindfulness teachers who were either educational/clinical psychologists or social workers that had experience in treating adolescents with special needs with at least four years of experience. They also underwent an 8-week MBSR/MBCT program and completed a four-day MYmind advanced teacher training provided
by one of the developers of the intervention. They also completed a six/seven-day MBCT/MBSR teacher training.

**Parent Involvement in MBI.** It should be noted that 75% of the studies included had direct or indirect parent involvement.

Three studies included direct parent involvement strategies for MBI implementation for children on the autism spectrum (Ho et al., 2021; Ridderinkhof et al., 2018, 2020). All three studies investigated the MBI MyMIND which has a simultaneous 9-week parent training component. Parent training occurred as a standalone from the child MBI sessions. Parents were provided learning pertaining to their child on the autism spectrum, specifically in 1) dealing with parenting stress and situations; 2) awareness of automatic reactions towards child’s behaviour; 3) responding to child mindfully; 4) open-mindedness to needs of their children. They were also taught how to create boundaries, understanding and acceptance. Specific examples were provided during training (i.e., meditation that helps deal with frustration with your child throwing a tantrum in a store). Outside of coaching, parents were encouraged to apply mindfulness practices to daily situations.

Five studies included indirect parent involvement whether they had informal coaching sessions with the therapists or were involved in at-home application of MBI strategies (Clifford et al., 2022; Drusdeau et al., 2020; Drusdeau et al., 2022; Hatfield et al., 2022; Singh et al., 2018). Clifford et al. (2022) encouraged parental involvement by providing parents with an outline of each intervention session recited by their child. Parents were also informed about homework assignments and at-home strategies. There were also three parental psychoeducation groups sessions that focused on awareness of the concept of expressed emotion and their contribution to their child’s emotions and behaviour. Drusdeau et al. (2020) conducted three parent-therapist
conferences before, during and after TuTASS, the MBI. In a later study, Drusdeau (2022) added a 4-session parenting program during TuTASS. There was no information provided on concepts taught during these sessions. Hatfield et al. (2022) had therapists hold informal group sessions for parents in the final 15 minutes of intervention. They discussed concepts learned and how parents can support their children to apply these strategies outside of intervention. Singh et al. (2018) had children practice MBI daily for 15-20 minutes with a parent to encourage application in naturalistic settings.

**Type of Intervention**

The types of MBIs for studies falling within the age range targeted, included the Tubinger Training for Autism Spectrum Disorders (TuTASS) program (Drusdeau et al., 2020, 2022), mindfulness based SOBER breathing space program (Singh et al., 2018), mindfulness based SOLES of the Feet meditation (Shah et al., 2022); Anger Can Go! (based on mindfulness-based cognitive therapy; Clifford et al., 2022), a group based mindfulness program Mindful Movers (Hatfield et al., 2022).

For studies with a wider age range that that targeted by the review MBIs included, the MYMind (Ho et al., 2021; Ridderinkhof et al., 2018, 2020), a school based MBCT (Katz et al., 2020), and a school based MBI called Mindful Schools (Juliano et al., 2020).

There were two MBIs that incorporated DBTs (Clifford et al., 2022; Katz et al., 2020). It should be noted that there were no DBTs found without the incorporation of an MBI. All of the studies that incorporated DBT only utilized the DBT skills module, the full DBT curriculum was not utilized in any study.

An in-depth description of each intervention is followed in the section below.
Content Covered in Intervention

Content covered during intervention were all based around various MBI principles for all studies included.

Drusdeau et al. (2020) and Drusdeau et al. (2022) founded TuTASS that focuses on mindfulness elements in four parts: 1) improving mindful perception of emotion and body; 2) learning to characterize one’s perception of emotions and body; 3) coping with the perception of emotions and body; 4) perception of oneself and others. All sessions started with a welcoming ritual about current emotional state and ended with a closing ritual. In part one, they focused on distinguishing senses, emotions and sensations and learning the negative/positive emotions associated with sensations. Emotional and physical responses were also presented and discussed. Finally, the topic of mindfulness as attention towards oneself was introduced. In this session, archery was used to train participants to focus. In part two, children learned to characterize and sort their perceptions of emotions and body to facilitate expression and recognition of emotions. They achieved this through role plays to outline situations in which typical emotions might occur. Participants were also asked to present and describe emotions through miming and board games with the group, and the group were tasked to recognize the emotion elicited. In part three, participants focused on establishing a connection between behavior and perception of emotions and body. They discussed what dysfunctional behavior is, and learned functional behavior for coping, based on stress and stress relaxation techniques. Mindfulness exercises such as yoga exercises and progressive muscle relaxation were taught. Role play was also used where participants presented functional strategies and discussed. Archery was used again to focus on strengths and weaknesses that participants identified in themselves. In the final part, participants were trained in recalling and deepening self-perception and extending these skills to the
perception of other people’s emotions. Pictures of different emotions and pairing of group members helped with practice in emotion recognition. Children practiced giving feedback to one another using a massage exercise where they pretended to bake a pizza on their partner’s back. A summary of all the skills was trained in a game setting to conclude the intervention. Children had daily homework. The specific MBI that elements were adapted from was not mentioned, and instead multiple MBI practices were used.

Singh et al. (2018) utilized the SOBER breathing space mindfulness-based intervention. SOBER Breathing Space required the child to: 1) Stop and see what is happening; 2) Observe physical sensations and changes in the body and utilize emotion regulation techniques accordingly; 3) Breathe by deliberately focusing on attention on to your breathing until heightened emotions fall; 4) Expand awareness of the situation, their responses to the situation and longer-term consequences; and 5) Respond mindfully instead of responding reactively. To ensure SOBER breathing techniques were acquired accurately, the trainer had participants teach them back to the trainer. They also utilized role play and natural scenarios to help with practice and was repeated with various examples, demonstrations, and feedback and ended with verbal reinforcements, homework. The specific MBI that elements were adapted from was not mentioned.

Ho et al. (2021), Ridderinkhof et al. (2018) and Ridderinkhof et al. (2020) all focused on the MYmind intervention which includes elements from both MBCT and MBSR. The primary focus is to help children learn to enhance and direct their attention, increase their awareness of bodily sensations, feelings, and thoughts and to increase self-control. Sessions consist of educating and teaching theories related to mindfulness, practicing mindfulness exercises such as breathing meditation, the body scan and the 3-min breathing space and yoga practices. Applying
mindfulness in stressful situations is rehearsed associated with coping strategies. Homework is sent home to practice meditation and mindfulness practices to daily situations. Children are also asked to keep diary entries of their usage of MYmind in daily life and are discussed during sessions individually. MYmind also consists of a parent program for parents of children on the autism spectrum that parallels the children’s sessions. The parent program consists of learning to deal with stressful parenting situations, awareness of bodily reactions towards child and responding mindfully.

Juliano et al. (2020) utilized the Mindful Schools program which covered four aspects of mindfulness: 1) mindful breathing; 2) mindful bodies, 3) mindful listening; 4) mindful thoughts. Mindful breathing provided guidance on how to use breathing to center focus and attention. Students selected a spot on their bodies and learned to stay at base. Mindful bodies trained students in maintaining a mindful posture and being still and quiet to calm the mind. Mindful listening taught participants to pay close attention to the sounds in the environment. Mindful thoughts discussed body and mind awareness and noticing when one’s mind is focusing on negative or stressful thoughts and students learned how to use breathing to center their thoughts back to the present. Every session started with a transition period and a mindful tone on a gong helped participants to shift their focus. The article did not present on the games or activities presented to students to teach aspects of mindfulness. The specific MBI that elements were adapted from was not mentioned.

Hatfield et al. (2022) developed the Mindful Movers program. The program involved session activities that included mindful movement (sun salutations, group circle holds, etc.), mindful breathing (4-7-8 technique, bumble bee- bee breathing technique, etc.), mindful awareness (mindful coloring, grounding sense countdown, etc.) and guided meditation (DIY
stress ball, body scan, slow hands meditation, etc.). These activities improved children’s awareness of their bodily sensations and thought processes, and actively supported their understanding of being present in the moment and to view and calm from aggressive and stressful thoughts. Each session began with a welcome ritual and emotion check using an app. The app name was not mentioned. Homework was given to support integration of concepts outside of sessions. The specific MBI that elements were adapted from was not mentioned.

Shah et al. (2022) utilized the Soles of The Feet MBI. Soles of the Feet focused on teaching and applying mindfulness-based routines that would direct attention from a stressful event to a neutral part of the body (e.g., soles of the feet). Practical applications of the Soles of the Feet routine were applied to both pleasant and unpleasant identified situations, feelings, triggers and behaviors that were common in participant’s daily life. There was also homework assigned between sessions to further practice.

Two of the included studies incorporated both MBI and DBT-based aspects in their interventions (Clifford et al., 2022; Katz et al., 2020).

Clifford et al. (2022) focused on four phases: 1) psychoeducation and measuring and indicating anger; 2) making a functional behavioral assessment and taking time out to deal with anger in the lower end of the thermometer by engaging in mindful activities that elicit positive feelings; 3) directing attention away from low anger; 4) creating solutions to cope with anger-provoking situations using mindfulness-based techniques (e.g. foot sole meditation, drawing, separating attention). DBT skills were utilized in attention control, distraction, and shifting attention away from aversive stimuli. In the intervention, a made-up character named Bob is used as a role model and example of a person who gets angry quickly, and sessions are centered around him. Sessions are structured with workbooks, and homework assignments to practice at
home, enhanced by parent psychoeducation sessions. Therapists who implement interventions also visit student’s teachers to help with classroom implementation.

Katz et al. (2020) implemented their intervention using a combination of a mental health literacy program and education on DBT skills implemented sequentially. Mental Health Literacy were for students to develop (a) an understanding of brain structures and biological responses related to stress, (b) a personal definition of well-being, (c) strategies for maintaining well-being, (d) an understanding of mental illness, (e) respect and compassion for those who live with mental illness (including oneself), (f) knowledge of where and how to seek help, and (g) the ability to be a supportive friend to someone with mental illness. It supported the development of self-concept, coping skills, empathy, understanding and supportive peer networks. The unit challenged stereotypes related to mental illness and emotional variability. Students learn about neuroanatomy and biological responses to stress. They also focus on mindfulness-based strategies to reduce reactive responses to triggers, which they learn to identify using visual representations. Emotional literacy and the ability to put feelings and emotions into words is taught and encouraged. DBT skills were taught in four modules: 1) interpersonal effectiveness skills (assertiveness, asking for what is needed, sustaining positive relationships); 2) emotional regulation (identifying and labeling emotions, how sleep/nutrition and exercises contributes to mental health); 3) mindfulness meditations, creating non-judgmental ideas of self, awareness of self and the environment, and self-soothing skills; 4) distress tolerance and strategies for coping with acute distress.

It is important to note that when DBT was incorporated into an MBI, all the studies only utilized the skills training module of the DBT curriculum.
<table>
<thead>
<tr>
<th>Authors</th>
<th>Design</th>
<th>Participants</th>
<th>Intervention/implementation</th>
<th>Objective</th>
<th>Outcome measures</th>
<th>Content</th>
<th>Instructor</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clifford et al. (2022)</td>
<td>RCT</td>
<td>51 children on the autism spectrum; male%, age range = 8-13 years old; mean age</td>
<td>60 minutes weekly for 9 weeks</td>
<td>Whether MBI reduces aggressive behaviour and increases coping skills in children on the autism spectrum</td>
<td>QSB, CBCL, TRF, BARQ-C, PEDS-QL, SRS, NOSI-K, SCL-90</td>
<td>Anger Can GO! - a MBCT and DBT based intervention</td>
<td>Psychologists who were trained in MBI by first author</td>
<td>Significant reduction in temper tantrums (duration and frequency) and arguing, but no changes in destroying things or physical violence. Increased use of adaptive anger regulation strategies; mainly an increase in diffusion and social support seeking. No changes in avoidance, direct anger-out and rumination</td>
</tr>
<tr>
<td>Drusdea et al. (2020)</td>
<td>Quasi-experimental</td>
<td>25 participants – 92% male, mean age = 10.08, age range= 7-12 years</td>
<td>12 weekly sessions for 90 mins</td>
<td>Training would lead to an improvement of ASD and associated socioemotional symptoms</td>
<td>SRS, CBCL, SDQ, ILK, DIKJ</td>
<td>TuTASS focused on mindfulness-based training elements mindful perception of, characterizing and coping with ones and others' emotions and body</td>
<td>Two therapists as group leaders</td>
<td>Social motivation, social communication, external problems, thought problems, social problems, attention problems, and emotional symptoms showed positive changes. Internalizing symptoms were not affected Children enjoyed treatment and profited very much, and topics were close to their daily life and relevant</td>
</tr>
<tr>
<td>Authors</td>
<td>Design</td>
<td>Participants</td>
<td>Intervention/implementation</td>
<td>Objective</td>
<td>Outcome measures</td>
<td>Content</td>
<td>Instructor</td>
<td>Findings</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------------</td>
<td>-------------------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>----------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Drusdea (2022)</td>
<td>Quasi experimental</td>
<td>27 participants with ASD; 85% male; age range = 7-12 years old; mean age = 11.07</td>
<td>90 mins biweekly sessions for 10 weeks</td>
<td>An improvement in core autistic symptoms, external and internal behaviors, and social skills after MBI implementation</td>
<td>SRS, CBCL, SDQ, ILK, KINDL, PSI, SEE, IDS-11</td>
<td>TuTASS focused on mindfulness-based training elements</td>
<td>Two therapists as group leaders</td>
<td>Social motivation, social communication, external problems and internal problems, social problems and attention problems showed positive changes. Positive changes in emotional overload, body-related symbolization of emotion, and experience of self-control. Improvements in theory of mind, perspective taking and recognizing emotions (IDS-II)</td>
</tr>
<tr>
<td>Hatfield et al. (2022)</td>
<td>Quasi-experimental</td>
<td>14 children on the autism spectrum, 80% male; age range = 10-14 years old Participants were in a group together</td>
<td>75 mins weekly for 10 weeks (about 2 and a half months)</td>
<td>Feasibility of MBI for children on the autism spectrum</td>
<td>MAAS-A, ASC-ASD, WHO-5</td>
<td>Mindful Movers – group-based mindfulness intervention</td>
<td>Two occupational therapists who were qualified in yoga and mindfulness</td>
<td>Children felt calmer, differences in anxiety, mindful breathing and yoga helped. Externlizing behaviors decreased and they did not last long, much more aware of triggers and able to calm down. Improvements maintained at 2-month follow-up.</td>
</tr>
<tr>
<td>Authors</td>
<td>Design</td>
<td>Participants</td>
<td>Intervention/Implementation</td>
<td>Objective</td>
<td>Outcome measures</td>
<td>Content</td>
<td>Instructor</td>
<td>Findings</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Ho et al. (2021)</td>
<td>RCT</td>
<td>37 children with ASD, 76% male and age range = 10-18; mean age = 12.3 (+/- 2.3) - parents included</td>
<td>9 weekly 90-minute sessions</td>
<td>Children – improvements in social responsiveness; attention problems; internalizing and externalizing behaviours</td>
<td>Feasibility and acceptability of MBI; For child: SRS; CBCL; BRIEF; For parent: PSI, PS, IM-P; WHO-5, RRS</td>
<td>MYmind – mindfulness training for children on the autism spectrum</td>
<td>trained mindfulness teachers who were either educational/clinical psychologists or social workers that had experience working with children with special needs</td>
<td>Improvement in social and behavioural functioning (SRS, CBCL). No changes in attention problems</td>
</tr>
<tr>
<td>Juliano et al. (2017)</td>
<td>Quasi-experimental Within subjects: pre-post design</td>
<td>27 children on the autism spectrum, 78% males; age range = 10-17 years; mean age= 12.6 +/- 1.66</td>
<td>30 minutes daily; 2 times a week for 8 weeks</td>
<td>Improvements in executive functioning (inhibition and attention) for children on the autism spectrum</td>
<td>CWIT, D-KEFS, W/W from TEACCH, CN from WISC-IV</td>
<td>Mindful Schools – school-based mindfulness program</td>
<td>Mindfulness educators and special needs teachers as needed</td>
<td>Significant improvements in response inhibition, switching and orienting attention and interference control</td>
</tr>
</tbody>
</table>

continued...
<table>
<thead>
<tr>
<th>Authors</th>
<th>Design</th>
<th>Participants</th>
<th>Intervention/implementation</th>
<th>Objective</th>
<th>Outcome measures</th>
<th>Content</th>
<th>Instructor</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Katz et al. (2020)</td>
<td>Cluster RCT</td>
<td>treatment group characteristics = n = 61 (20 classrooms in 4 schools) 55% male, 26% ASD diagnosis = 16 students with ASD (additionally 54% FASD and 20% ID); 40% in elementary schools (mean grade level = 7.64 (age = 11-12))</td>
<td>Intervention carried out October – February of school year</td>
<td>DBT-based school mental health programs’ effect in socioemotional learning for students in 3-12th grade</td>
<td>Self-concept – self-description questionnaire</td>
<td>Coping Skills – resilience inventory (self-efficacy subscale)</td>
<td>Teachers trained to adapt intervention to curriculum</td>
<td>Positive change in self-concept, coping skills and social support when compared to control schools Most gains made when majority of program content was delivered Mindfulness module in DBT specifically addressed and improved upon self-judgement, self-compassion and self-blame</td>
</tr>
<tr>
<td></td>
<td></td>
<td>control group characteristics = n = 52 (20 classrooms in 4 schools) 55% male, 29% ASD diagnosis = 15 students with ASD (additionally 52% FASD/19% ID); 45% in elementary schools (mean grade level = 7.23 (age = 11-12))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Authors</td>
<td>Design</td>
<td>Participants</td>
<td>Intervention/implementation</td>
<td>Objective</td>
<td>Outcome measures</td>
<td>Content</td>
<td>Instructor</td>
<td>Findings</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------------</td>
<td>---------------------------------------------------</td>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Ridderinkhof et al. (2017) | Quasi-experimental | 45 children on the autism, 80% male, age range = 8-23 years; mean age=13.02 +/- 2.72 | 9 weekly 90 minute sessions + 1 booster session 9 weeks later | Effects of MBI on internalizing and externalizing symptoms, social communication problems, emotional and behavioral functioning, mindful awareness in children on the autism spectrum and their children | SRS, ASEBA, CBCL, YSR, CSQ-CA, CSRQ, WHO-5, CAMM, SRS-A, ASR, PSS, PSI, IM-PS, SCS-SF; RRS | MYmind – mindfulness training for children on the autism spectrum | Child and family mental health professionals with experience in ASD and completed training in MBCT/MBSR and MYmind | For children - Overall decrease in social communication problems, emotional and behavioral problems and changes maintained at 2-month follow-up
Rumination decreased but not maintained at 1-year follow-up
Increase in emotional well-being post-test but not maintained at follow-up
No changes in attention problems, stress or sleep
Six most frequently occurring subcategories of mindfulness children learned were: 1) awareness; 2) applying meditation; 3) acceptance; 4) pause before acting; 5) decentering; 5) better concentration
Parent-
Decreases in social communication problems, internalizing and externalizing behaviors, parenting stress

continued...
<table>
<thead>
<tr>
<th>Authors</th>
<th>Design</th>
<th>Participants</th>
<th>Intervention/implementation</th>
<th>Objective</th>
<th>Outcome measures</th>
<th>Content</th>
<th>Instructor</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ridderinkhof et</td>
<td>Quasi experimental</td>
<td>45 children on the autism spectrum; age range = 9-20 years; mean age = 12.9</td>
<td>90 mins weekly for 9 weeks + 1 additional booster session 9 weeks later 2 month and 1 year followup</td>
<td>MBI’s effects on attention systems (alerting, orienting, executive attention) in children with ASD and compared effects to typically developing children</td>
<td>ANT</td>
<td>MYmind – mindfulness training program for children on the autism spectrum and their parents</td>
<td>Child and family mental health professionals with experience in ASD and completed training in MBCT/MBSR and MYmind</td>
<td>Children on the autism spectrum no different reaction times or ANT scores than TD Children on the autism spectrum had messier styles of attention Children with ASD had weaker executive accuracy before MyMIND training, but scores were similar to typically developing children after Children on the autism spectrum better at orienting attention after MyMIND</td>
</tr>
<tr>
<td>al. (2020)</td>
<td>Pre-post design</td>
<td>51 typically development children; age range = 9-20; mean age = 12.98</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Parents also participated in MyMind Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Children were separated into groups of 4-6 children</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shah et al.</td>
<td>Single subject</td>
<td>3 children on the autism spectrum aged 9,9 and 10 years old; 100% male</td>
<td>Baseline – 3-9 sessions Intervention – 5 sessions of 20-30 mins for 5 days. follow-up 6-8 weeks post-treatment</td>
<td>Whether MBI reduced challenging behaviour in children on the autism spectrum</td>
<td>SEBSI-R, observed student challenging behaviour during the context in which each child would most likely display challenging behaviour (15-25 minute by first author and research assistant)</td>
<td>Soles of The Feet – a mindfulness-based program to reduce aggression, conduct and behaviour issues in children on the autism spectrum</td>
<td>Mental Health Counsellor and special education teachers at respective schools</td>
<td>Reduced student’s challenging behaviour both during observations and teacher reported, maintained at post-treatment.</td>
</tr>
<tr>
<td>Authors</td>
<td>Design</td>
<td>Participants</td>
<td>Intervention/implementation</td>
<td>Objective</td>
<td>Outcome measures</td>
<td>Content</td>
<td>Instructor</td>
<td>Findings</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>-------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Singh et al.</td>
<td>Single Subject</td>
<td>4 children on the autism spectrum aged 10,11,12 and 12 years old 100% male</td>
<td>Baseline sessions – 4-11 weeks Training sessions (with trainer) – 4 weeks; Practice sessions (individually) - 2 X 30 mins for 3 weeks; Dependent on needs of the child</td>
<td>children on the spectrum - Self-management of aggression will be improved after SOBER; Parents - decreased used of physical restraints</td>
<td>Target behaviors observed and parent/teacher interviews - Verbal aggression – yelling, cursing, threatening, physical harm Physical aggression – hitting, biting, punching, Physical restraints – parents holding their child’s arms/legs to stop child from physical aggression</td>
<td>SOBER Breathing Space Program – mindfulness-based relapse prevention program – effectively regulate one’s emotions, thoughts, feelings and behaviors to respond mindfully to situations</td>
<td>An experienced mindfulness trainer Parents were involved with required daily practice for 15-20 mins</td>
<td>Verbal aggression decreased in both home and school, and was maintained at 12-month follow-up Physical aggression decreased in both home and school, and was maintained at 12-month follow-up Parental use of physical restraints used decreased rapidly and eliminated at 12-month follow-up Observations showed children being able to control their verbal and physical aggression, and respond mindfully to emotionally arousing situation</td>
</tr>
</tbody>
</table>

Note: RCT = randomized control trial; SRS = social reactivity scale; CBCL = Child Behaviour Checklist; SDQ = Strengths and Difficulties Questionnaire; ILK = The Inventory for Assessment of Quality of Life in Children and Adolescents; DIKJ = Depression Inventory for Children and Adolescents; BRIEF – the behaviour rating inventory of executive function; PSI – parenting stress index; PS = parenting scale; IM-P = the interpersonal mindfulness in parenting; WHO-5 = WHO Well-being Index; RRS = Rumination response scale; CWIT= color word interference test; D-KEFS = Delis-Kaplan's Executive Function System; ASEBA = Achenbach System of Empirically Based Assessment; YSR= Youth Self-Report; CSQ-CA = Chronic Stress Questionnaire for Children and Adolescents; CAMM= Children’s acceptance and mindfulness measure; SRS-A= Social responsiveness Scale Adult Form; ASR = adult self-report; PSS= Perceived stress scale; IM-P = Interpersonal Mindfulness in Parenting Scale; MBCT = Mindfulness based cognitive therapy; MBSR = mindfulness based stress reduction; MAAS-A – Mindful Attention Awariness Scale – Adolescents; ASC-ASD – Anxiety scale for children – Autism Spectrum Disorder; SEBSI-R = Teacher-reported student challenging behaviour; QSB = The Questionnaire Social Behaviour; TRF = Teacher Rating Forms of CBCL; BARQ-C = Behavioural anger response questionnaire; PEDS QL = Pediatric Quality of Life; NOSI-K = Nijmeegse Ouderlijke Stress Index Parent Domain; SCL-90 = Symptom Checklist-90; ANT = Attention Network Test; KINDL = Questionnaire for measuring the health-related quality of life in children and adolescents; SEE = experiencing emotions scale; IDS-II – Socioemotional competence task of the Intelligence and Development Scales for Children and Adolescents
Adaptations for children on the autism spectrum

Six of the included studies did not specify adaptations made for the use of MBI based interventions for children on the autism spectrum (Clifford et al., 2022; Drusdeau et al., 2020, 2022; Hatfield et al., 2022; Ho et al., 2021; Juliano et al., 2020; Singh et al., 2018).

Adaptations made for children on the autism spectrum utilized multimodal methods of presentation (e.g., social stories, role playing, video modelling, etc.; Ridderinkhof et al., 2018, 2020). Studies also utilized visual schedules to keep students engaged and on track (Ridderinkhof et al., 2018, 2020; Shah et al., 2022). Verbal praise and reinforcement plans were implemented to increase behavior and engage children on the autism spectrum (Shah et al., 2022). Less verbal instruction and more direct language was utilized during implementation (Ridderinkhof et al., 2018, 2020). Practiced MBI and DBT skills were generalized to other settings in all studies, however Ridderinkhof et al. (2018) and Ridderinkhof et al. (2020) identified this as a specific strategy for interventions with children on the autism spectrum.

Trainers for interventions had ASD training and experience or was provided basic education for working with children on the autism spectrum to ease implementation (Ridderinkhof et al., 2018, 2020; Shah et al., 2022). These adaptations were seen similarly across studies that fell within and wider than the study's targeted age range.

Outcomes measures

All studies focused on socioemotional skill development in children on the autism spectrum. However, there were studies that were specific to the socioemotional skill tested.

Social/emotional outcomes
Regarding socioemotional skills, social reactivity/responsiveness specific to ASD, was measured in four studies (Clifford et al., 2022; Drusdeau et al., 2020; Drusdeau et al., 2022; Ho et al., 2021). Social responsiveness measures the social ability of children from 2-18 years old and is primarily used for children on the autism spectrum (Clifford et al., 2022). Emotional functioning or dysregulation was measured in three studies (Clifford et al., 2022; Drusdeau et al., 2022; Ridderinkhof et al., 2018). Self-concept, coping skills and social support was measured in three studies (Drusdeau et al., 2022; Katz et al., 2020; Ridderinkhof et al. 2018).

Regarding social functioning, Drusdeau et al. (2020) and Drusdeau et al. (2022) mentioned an increase in social motivation and a decrease in overall social problems. Drusdeau et al. (2022) found an improvement in theory of mind, specifically in the perception of friendship and emotion, and dealing with conflicts. Clifford et al. (2022) reported an increase in social support seeking and iterated that children on the autism spectrum utilized this as a rule when they were experiencing heightened emotions. Ridderinkhof et al. (2018) found an improvement in social communication which was maintained at 2-year follow-up. Ho et al. (2021) also found an improvement in social functioning, namely engaging with others.

Regarding emotional functioning, Drusdeau et al., 2022 reported an increase in emotion regulation along with emotional acceptance (i.e., dealing with feelings). Ridderinkhof et al., 2018 found that emotional wellbeing in children on the autism spectrum improved, while rumination increased, and a higher incidence of coping with difficult situations. With increased emotional functioning, outbursts were also reported to decrease (Clifford et al., 2022; Ridderinkhof et al., 2018). These results were maintained at 2 month and 1 year follow-up. Clifford et al. (2022) reported an increase in diffusion (deflecting anger) and an increase in adaptive anger coping strategies.
**Behavioral measures**

Externalizing and internalizing behaviors such as aggression and temper tantrums were measured in Clifford et al., (2022), Shah et al. (2022), and Singh et al. (2018). Behavior difficulties and functioning were outcomes in five studies (Clifford et al., 2022; Drusdeau, 2020, 2022; Ho et al., 2021; Ridderinkhof et al., 2018).

Drusdeau et al. (2020) and Drusdeau et al. (2022) both reported decreased externalizing behaviors, conduct problems and aggressive behaviors. Shah et al. (2022) reported decreased challenging behaviors. Singh et al. (2018) found reduced verbal and physical aggression and reduced use of physical restraints by parents. These results were maintained at 12-month follow-up and generalized from home to school. Other studies reported a decrease in externalizing behaviors and aggression (Clifford et al., 2022; Ho et al., 2021; Ridderinkhof et al., 2018). In the case of Ridderinkhof et al. (2018), these results were maintained at 1 year follow-up.

**Executive Functioning**

Executive functioning and skills related to attention and retention were measured in three studies (Ho et al., 2021; Juliano et al., 2020; Ridderinkhof et al., 2020).

Ho et al. (2021) reported no increase in executive functioning skills for children on the autism spectrum after engaging in MYMind, and MBI. However, Juliano et al. (2020) reported executive functioning increased. Ridderinkhof et al. (2020) found that children on the autism spectrum had weaker executive function scores compared to typically developing children before MYMind.
The child’s ability to engage in mindfulness was measured in two studies (Hatfield et al., 2022; Ridderinkhof et al., 2018). Children reported no improvements in mindful awareness in both studies.

**Quality Assessment**

Quality Assessment was conducted using the Evaluative Method for Determining Evidence Based Practice (EMDEBP; Reichow et al., 2008). Table 2 represents the results of the quality assessment. Two evaluators conducted the quality assessment for all of the studies included. Nine of the studies included group research studies (Clifford et al., 2022; Drusdeau et al., 2020, 2022; Hatfield et al., 2022; Ho et al., 2021; Juliano et al., 2020; Katz et al., 2020; Ridderinkhof et al., 2018, 2020), while 2 studies were single subject studies (Shah et al., 2022; Singh et al., 2018). Agreement was met 100% for both evaluators.

For group research studies, there were two research reports of adequate strength (Clifford et al., 2022; Katz et al., 2020), two strong research reports (Ho et al., 2021; Ridderinkhof et al., 2020) and five weak research reports (Drusdeau et al., 2020, 2022; Hatfield et al., 2022; Juliano et al., 2020; Ridderinkhof et al., 2018). Refer to Table 2 for quality assessment results for group research. Amongst single subject studies assessed, Singh et al. (2018) was a strong research report, while Shah et al., (2022) was weak. Refer to Table 3 for quality assessment results for group research.

**Table 2**

*Quality Assessment Results for Group Research Included in Review*

<table>
<thead>
<tr>
<th>Study</th>
<th>Primary Quality Indicators</th>
<th>Secondary Quality Indicators</th>
<th>Overall quality rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PC</td>
<td>IV</td>
<td>CC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

49
<table>
<thead>
<tr>
<th>Study</th>
<th>Primary Quality Indicators</th>
<th>Secondary Quality Indicators</th>
<th>Overall quality rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PV</td>
<td>IV</td>
<td>DV</td>
</tr>
<tr>
<td></td>
<td>HQ</td>
<td>HQ</td>
<td>HQ</td>
</tr>
<tr>
<td>Clifford et al. (2022)</td>
<td>HQ</td>
<td>HQ</td>
<td>UQ</td>
</tr>
<tr>
<td>Drusdeau et al. (2022)</td>
<td>HQ</td>
<td>HQ</td>
<td>AQ</td>
</tr>
<tr>
<td>Hatfield et al. (2022)</td>
<td>HQ</td>
<td>HQ</td>
<td>AQ</td>
</tr>
<tr>
<td>Ho et al. (2021)</td>
<td>HQ</td>
<td>HQ</td>
<td>HQ</td>
</tr>
<tr>
<td>Juliano et al. (2019)</td>
<td>HQ</td>
<td>HQ</td>
<td>AQ</td>
</tr>
<tr>
<td>Katz et al. (2020)</td>
<td>HQ</td>
<td>AQ</td>
<td>AQ</td>
</tr>
<tr>
<td>Ridderinkhof et al. (2017)</td>
<td>HQ</td>
<td>HQ</td>
<td>AQ</td>
</tr>
<tr>
<td>Ridderinkhof et al. (2020)</td>
<td>HQ</td>
<td>HQ</td>
<td>HQ</td>
</tr>
</tbody>
</table>

*Adapted from Reichow et al. (2008)

Note. b/w = between, PC = participant characteristics, IV = independent variable, CC = comparison condition, DV = dependent variable, LBR = link between research question and data analysis, ST = use of statistical tests, RA = random assignment, IOA = interobserver agreement, G/M = generalization and maintenance, SV = social validity, HQ = high quality, AQ = acceptable quality, UQ = unacceptable quality, YES = meets criteria, NO = does not meet criteria

Table 3

Quality Assessment Results for Single Subject Research Included in the Review
<table>
<thead>
<tr>
<th>Singh et al. (2018)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HQ</td>
</tr>
</tbody>
</table>

Note. b/w = between, PC = participant characteristics, IV = independent variable, CC = comparison condition, DV = dependent variable, IOA = interobserver agreement HQ = high quality, AQ = acceptable quality, UQ = unacceptable quality, YES = meets criteria, NO = does not meet criteria

*Adapted from Reichow et al. (2008)

**Discussion**

**Summary of Evidence**

The goal of this review was to summarize the current literature on MBIs for socioemotional skill development in children on the autism spectrum. Eleven studies were examined, where there were three randomized control trials, two single-subject designs and six quasi-experimental studies. Overall, we found preliminary evidence that MBIs are effective in improving socioemotional skills in children on the autism spectrum. The study also reviewed adaptations made to traditional MBIs when implementing them to children on the autism spectrum. Some adaptations to note were the utilization of multimodal methods of presentation (such as videos, role play, board games, etc.), the implementation of visual schedules and routines, and the use of direct and explicit instruction without metaphors or nuances. Furthermore, mindfulness training was also found to be an established evidence-based practice for autism according to EMDEBP criteria. The present study’s findings also suggest that MBIs for children on the autism spectrum should be developed based on similar characteristics found in all eleven studies.

**Suggested Practices for MBI Implementation**

*Frequency and Duration of Intervention*
78% of MBIs included in the review lasted 8-9 weeks, and sessions were done weekly for a max of 60-90 minutes. This was the case in studies that fell within and out of the targeted age range of the current review. These findings are aligned with past reviews, who also found that mindfulness training, specifically for children on the autism spectrum fell within 8-9 weeks, and sessions were held for 90 minutes weekly (Cachia et al., 2016; Hourston & Atchley, 2017). This finding also adds to research that shows that one hour of weekly therapy can result in significant changes in children with autism (Rogers et al., 2006; Stahmer & Gist, 2001; Vismara et al., 2020).

It is important to note that though most training occurred for an hour and a half weekly, practice in a natural environment was encouraged daily in all studies, and often involved parents and teachers. For instance, Singh et al. (2018) had parents encourage 15-20 minutes of mindfulness skills, especially during overwhelming situations for children on the autism spectrum. This is aligned with other systematic reviews on MBIs for ASD where daily independent use of mindfulness techniques, especially during overwhelming situations was encouraged (Cachia et al., 2016; Hartley et al., 2019). When children are able to utilize these processes independently, the skills are generalized to more situations and settings (Ridderinkhof et al., 2018).

The preliminary evidence points to future MBIs pertaining to 90 minutes weekly lasting for at most 8-9 weeks. It is also suggested that mindfulness techniques are encouraged to be utilized daily by parents, teachers and other caregivers, especially during overwhelming situations.

_Trainer Details_
For all studies included, whether in the age range targeted or beyond, trainers already had mindfulness training or were provided training on the respective MBI prior to the start of the intervention. Implementers were trained in the MBI mostly by the principal investigator of the study. Training was commonly done in group workshops and initial training lasted anywhere from 5-8 hours per day and included check-ins during the intervention. Training was provided in concepts related to MBI, mindfulness practices, awareness, demonstrations of MBI exercises, explicit and direct instruction and modelling. A particular MBI, MYmind, did have a notable training regimen where trainers were required to attend an eight-hour teacher training session, a five-day MBCT or MBSR training, and a 4-day yoga retreat (Ridderinkhof et al., 2018, 2020). However, this was not the case for most studies.

Trainers included teachers (Katz et al., 2020) and special education teachers (Shah et al., 2022), mindfulness educators (Juliano et al., 2020; Singh et al., 2018) mental health counsellors and professionals (Clifford et al., 2022; Drusdeau et al., 2020, 2022; Ho et al., 2021; Ridderinkhof et al., 2022; Shah et al., 2022) psychologists (Clifford et al., 2022; Ho et al., 2021), and occupational therapists (Hatfield et al., 2022). Training on the MBI to these individuals was provided by primary researchers most of the time. Other times, there was a manual that was provided for the trainers to follow. For instance, Katz et al. (2020) provided a manual for teachers to follow and incorporate into their curriculum.

Trainers were individuals that had experience working with individuals on the autism spectrum and were trained in MBI strategies and the adaptations to be made when implementing to children on the autism spectrum. This is aligned with findings in other systematic reviews (Cachia et al., 2016; Hoursten & Atchley, 2017).
Parents were also involved in MBIs either directly or indirectly. Parents were trained directly through parent-training sessions that paralleled children’s MBI sessions (Ho et al., 2021; Ridderinkhof et al., 2018, 2020). These sessions were a standalone and parents learned concepts related to dealing with parental stress, openness to the needs of their children on the autism spectrum, creating boundaries and responding mindfully. Parents were also involved indirectly through informal discussions after children’s intervention sessions ended, parent-therapist conferences, or parent-coaching sessions (Clifford et al., 2022; Drusdeau et al., 2020, 2022; Shah et al., 2022; Singh et al., 2018). Parents were taught how to apply the concepts their child learned during training in the home environment. Parenting stress, openness to their child and mindful parenting were also found to be improved after MBI, which once again aligns with findings found in previous research (Cachia et al., 2016; Hartley et al., 2019).

Parent involvement emphasized the positive changes found in children on the autism spectrum after MBI. This is aligned with Hartley et al. (2019) who found that involving at least one caregiver increases the efficacy and effectiveness of MBI implementation for children on the autism spectrum. An explanation for this finding could be that parents are more likely to engage in mindful parenting and practice learned MBI techniques with their child at home. This could lead to increased use and generalization of skills (Hartley et al., 2019; Ridderinkhof et al., 2018). Furthermore, parent coaching can also help the flow of the intervention from the clinical setting to a more naturalistic environment (Hartley et al., 2019; Singh et al., 2018).

Overall, successful interventions provided mindfulness training to interventionists. Trainers were most commonly taught concepts related to the specific MBI, and its implementation to children on the autism spectrum in small group workshops. All trainers had experience of working with children, and specifically children with special needs. Parent
involvement led to more emphasized changes and a smooth flow of learned techniques from training to naturalistic settings in children on the autism spectrum.

Setting Details

Training was provided in various settings including schools, mental health treatment centers, children’s homes, and outpatient sites. The choice of settings in most studies was because of resource availability. However, the variety in locations shows the ability of MBIs to be delivered in multiple settings.

Notably, schools are a major site in which socioemotional skill development occurs. One study by Katz et al. (2020) incorporated the intervention into school curricula. Teachers were provided with the key MBI practices and were given the flexibility to teach however they deemed fit. This showcases the ability for MBIs to be incorporated into current school curriculum, consistent with past research findings (Albrecht et al., 2012; Kielty et al., 2017). Incorporation of MBIs into school is important as it plays a critical role in developing socioemotional skills in all students, especially in children on the autism spectrum. Schools provide a naturalistic environment where practice and attainment of social and coping skills, self-concept and the development of social supports occur (Albrecht et al., 2012; Katz et al., 2020).

Studies found that socioemotional skills learned in clinical settings were generalized to other settings and maintained in 2-month and later 1-year follow-up in more 50% of the studies (Hatfield et al., 2022; Juliano et al., 2020; Katz et al., 2020; Ridderinkhof et al., 2018; Shah et al., 2022; Singh et al., 2018). Through this finding, mindfulness addresses some of the difficulties found in other EBPs (i.e., social skills training, social narratives and peer modelling) for socioemotional skill development in children with ASD such as 1) the long-term retention of
the learned skills; 2) a reliance on specific cues in the external environment to trigger good behavior; 3) and a heavy reliance on external motivators to maintain and improve the skill.

Mindfulness brings awareness to social, emotional and bodily cues that arise from a heightened emotion or situation. The child is taught how to recognize and monitor these triggers and interactions so that when they occur, they are able to limit the physiological and psychological stress. This can help them to calm down and reduce access to negative externalizing behaviors and increase access to more adaptive regulation strategies (Poquérusse et al., 2021; Roemer et al., 2015; Schuman-Olivier et al., 2020). Mindfulness does not rely on specific external cues for skill development, but instead relies on bringing awareness to internal bodily and social cues that are associated with emotions felt. Emotions elicit similar reactions in most situations; therefore, these skills are easily accessible and not specific to the place or person, helping with generalization and maintenance (Poquérusse et al., 2021; Roemer et al., 2015).

Content covered in mindfulness-based interventions

Overall, there were seven MBI-centered interventions, including two that incorporated DBT therapy covered in the current review. Each intervention had similarities in the content that was covered. However, 90% of MBIs for children on the autism spectrum covered topics pertaining to: 1) bringing awareness to the physical sensations and thought patterns caused by certain emotions; 2) observing and altering action; 3) breathing and centering oneself without responding reactively to overwhelming/negative emotions; 4) working with emotions and coping strategies; 5) mindfulness exercises to help calm down and center oneself; 6) mindful movement and exercises. See Table 3 for a contrast of the elements included in each MBI covered.
These concepts are aligned with past research on MBIs for children on the autism spectrum (Cachia et al., 2016; Hartley et al., 2019; Hoffman & Gomez, 2018; Mak et al., 2018). These concepts were taught using multiple different demonstrations and presentations. Role play, pictures, diary entries and verbal discussions were some tools used to train children on the autism spectrum. Homework was provided in all studies so that children were able to apply the learned skills to other familiar environments. Homework was rated poorly in some studies by children on the autism spectrum when asked for feedback for the MBI (Drusdeau et al., 2020, 2022; Shah et al., 2022).

The process in which all concepts learned during an MBI work together can be explained as such. Mindfulness training helps to explore one’s mental states and emotions through teaching individuals how to observe and alter action. This enhanced awareness improves an individual’s ability to attend to specific aspects of a situation or emotion and their own and others’ bodily and social cues related to it. Mindfulness training can teach children what pleasant and unpleasant reactions to certain emotions (Bishop et al., 2004; Schuman-Olivier et al., 2020). MBIs can also help children to shift and orient their attention (Juliano et al., 2020; Ridderinkhof et al., 2018; Roemer et al., 2015; Schuman-Olivier et al., 2020). Altogether, this can improve their detection of the need to shift attention from familiar maladaptive reactions and coping mechanisms to adaptive regulation strategies associated with these overwhelming situations (Roemer et al., 2015; Schuman-Olivier et al., 2020). These strategies can be enhanced by partaking in mindful breathing and mindful movement to ground oneself.

The increased use of mindfulness techniques can help to improve exposure where previous negative behaviors associated to internal experiences (i.e., I am angry, I don’t know what to do, so I am going to throw everything everywhere) are linked with new learned reactions
that are non-threatening (i.e. I am angry, and I am aware of that I can use count-down to calm down). This process is more likely to be generalized to more settings and people. As already mentioned, mindfulness brings an awareness to internal sensations and experiences associated with emotions elicited. Emotions are common and universal to a variety of situations and settings, and does not rely on external motivation or factors, such as social narratives or social skills training (Ridderinkhof et al., 2018; Schuman-Olivier et al., 2020; Roemer et al., 2015).

For studies that incorporated both MBI and DBT (Clifford et al., 2022; Katz et al., 2020) the module including DBT skills group training was most frequently used. DBT skills in emotion regulation, interpersonal effectiveness, mindfulness, distress tolerance and coping strategies were heavily emphasized in both studies. This is well aligned with past findings by Hartmann et al. (2012) and Haney (2017), where these skills were emphasized as they were crucial to combat the communication, social and emotional deficits found in children on the autism spectrum. The two DBT-based interventions found a reduction in aggression, and improvement in social motivation and social support seeking. This is aligned with past research in Hartmann et al. (2012) who also found that each module holds varying benefits for individuals on the autism spectrum in individuals on the autism spectrum.

The interpersonal effectiveness module helps the individual work on problem solving, which can involve social support seeking (Clifford et al., 2022). Distress tolerance helps with tolerating inner stress and turmoil associated with a stressful situation. Mindfulness helps to bring awareness to triggers and cues so that the individual is able to pay attention to the adaptive coping strategies available. This can lead to a reduction in negative behaviors, and thus an increase in positive social interactions and social motivation (Hartmann et al., 2019; Katz et al., 2020). However, it is important to note that DBT-based interventions were lacking, and most
were not found alone without a significantly incorporated MBI. Therefore, the current review does not have enough research to make comments on DBT alone and its effectiveness for children on the autism spectrum.

Table 4

Contrast of mindfulness elements found in studies included in the review

<table>
<thead>
<tr>
<th>Study</th>
<th>Mindfulness Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Contact with present moment</td>
</tr>
<tr>
<td>Clifford et al. (2022)</td>
<td>x</td>
</tr>
<tr>
<td>Drusdeau et al. (2020)</td>
<td>x</td>
</tr>
<tr>
<td>Drusdeau et al. (2022)</td>
<td>x</td>
</tr>
<tr>
<td>Hatfield et al. (2022)</td>
<td>x</td>
</tr>
<tr>
<td>Ho et al. (2021)</td>
<td>x</td>
</tr>
<tr>
<td>Juliano et al. (2019)</td>
<td>x</td>
</tr>
<tr>
<td>Katz et al. (2020)</td>
<td>x</td>
</tr>
<tr>
<td>Ridderinkhof et al. (2017)</td>
<td>x</td>
</tr>
<tr>
<td>Ridderinkhof et al. (2020)</td>
<td>x</td>
</tr>
<tr>
<td>Shah et al. (2022)</td>
<td>x</td>
</tr>
<tr>
<td>Singh et al. (2018)</td>
<td>x</td>
</tr>
</tbody>
</table>

Note. This table indicates similar concepts covered in the eleven studies included in the current review. Adapted from Cachia et al. (2016)

*x = found in MBI
Effectiveness of MBIs for socioemotional skill development

The primary aim of the current review is to evaluate the effectiveness of MBIs in improving socioemotional skills in children (0-12 years) on the autism spectrum. Socioemotional skills included emotional functioning, behavioral functioning, social responsiveness and functioning, executive functioning, and communication. The eleven studies reviewed had outcomes that measured in many of these categories. Overall, preliminary evidence was found that MBIs led to improvements in all categories.

Effect of MBIs on Social Functioning

Social functioning was measured through social reactivity, social responsiveness, social communication, social support seeking and social skills improvement. Overall, mindfulness training showcased an improvement in all areas of social functioning in the reviewed studies. These findings were aligned with past reviews where Cachia et al. (2016) also found improvement in social functioning in children on the autism spectrum following MBIs.

Two identified explanations for this improvement were recognized: 1) mindfulness increases perception and understanding of own and others’ emotions and bodily cues to make it easier for engaging in social connections (Bishop et al., 2004; Poquérusse et al., 2021; Schuman-Olivier et al., 2020; ); 2) the benefits of group engagement (Cachia et al., 2016; Drusdeau et al., 2022).

Mindfulness helps an individual increase their awareness of the environment, and their own and others’ emotions, triggers, and sensations to it. This can help individuals with ASD to readily tune into contextual cues and understand others’ perspectives (Poquérusse et al., 2021). Mindfulness can bring attention to subtle variations in story details, facial expressions, and
vocalization variations that can showcase shifts in emotional states. This makes it easier to understand other people, react to others, and relate to them, which is crucial in building social skills and support (Bishop et al., 2004). For instance, some MBIs in the review taught children on the autism spectrum specifically how to identify facial expressions and non-verbal communicative methods in themselves and others (Clifford et al., 2022; Drusdeau et al., 2020, 2022). The more children on the spectrum utilize these skills, the more positive social interactions they will experience, which increases social motivation, and thus social support seeking. Furthermore, these processes are activated internally dependent on the emotions elicited, and therefore can be generalized to multiple settings and situations (Bishop et al., 2004; Poquérusse et al., 2021).

Another possible explanation for the improvement in social functioning is the incorporation of groups in multiple MBIs (Drusdeau et al., 2020, 2022; Hatfield et al., 2022; Ho et al., 2021; Juliano et al., 2020; Katz et al., 2020; Ridderinkhof et al., 2020). This is aligned with Cachia et al. (2016), who also found that group engagement in MBIs for individuals on the autism spectrum led to improved social skills. Group engagement provides children with opportunities to practice their skills, normalize experiences and engage in positive relationship building (Shaffer et al., 2022). Children were given the task of teaming up, taking responsibility for and supporting each other in various tasks. Furthermore, the positive experiences in interacting with a group minimizes negative associations that children on the autism spectrum might have with other people (Drusdeau et al., 2022). This can lead to increased social motivation to build connections. Furthermore, the interactions between group members do not create stress or burden on each other unlike in peer modelling.
It is also important to note that improvements in social functioning were also found during one-on-one intervention implementation (Shah et al., 2022; Singh et al., 2018). This showcases the ability for MBIs to be generalized into more social settings and situations.

**Effect of MBIs on Emotional Functioning**

Emotional functioning was measured through the ability to manage emotions after a heightened emotion or situation. Overall, mindfulness led to better emotion regulation, diffusion of emotions, and improved use of coping skills during emotional outbursts (Clifford et al., 2022; Drusdeau et al., 2022; Ridderinkhof et al., 2018). This is aligned with findings from Cachia et al. (2016) and Hoursten & Atchley (2017), who also found an improvement in emotion regulation in individuals on the autism spectrum after implementation of MBIs.

An explanation for this finding is that mindfulness provides heightened awareness where negative emotions can be redirected, and more adaptive strategies can replace them (Poquérusse et al., 2021; Roemer et al., 2015).

Mindfulness practices bring forth more awareness to physical and social cues and sensations associated with emotions. MBIs such as TuTASS (Drusdeau et al., 2020, 2022), Anger Can GO! (Clifford et al., 2022), Mindful Movers (Juliano et al., 2020), and MYMind (Ridderinkhof et al., 2018) all have a component where the child needs to identify the emotions they are feeling and what bodily and environmental functions are associated with it. This helps children to become more aware of their triggers and the negative emotions and bodily processes associated with them. Due to this intensified awareness, they are less caught up with negative emotions and can redirect their attention away from the automatic negative response, and readily use adaptive coping strategies (Roemer et al., 2015). Here, the child is self-motivated to calm
down, since they are aware of the emotion elicited and the strategies available. Hayes & Feldman (2004) and Roemer et al. (2015) speak to the generalization of these skills. They suggest that the continued use of mindfulness practices promotes new emotional learning which replaces maladaptive emotion regulation strategies with adaptive non-reactive strategies.

**Effect of MBIs on Behavioral Functioning**

Behavioural Functioning was measured through temper tantrums, arguing, use of parental physical restraints, and internalizing and externalizing behaviors. Drusdeau et al. (2020; 2022) both reported decreased externalizing behaviors, conduct problems and aggressive behaviors. Shah et al. (2022) reported decreased challenging behaviors. Singh et al. (2018) found reduced verbal and physical aggression and reduced use of physical restraints by parents. These results are aligned with Cachia et al. (2016) who also found improvements in behavioural functioning in children with ASD.

However, these results contradict findings from Hourston & Atchley (2017), who found that the lack of homogeneity in measures used for behavioural problems led to inconclusive results. The current study incorporates studies with some homogeneity in the measure of behavioral functioning. For instance, the Child Behavior Checklist (CBCL; Hoffmann et al., 2016) was utilized as a common measure of behavioral difficulties in five of six studies directly measuring behavioural functioning in the current review (Clifford et al., 2022; Drusdeau et al., 2020, 2022; Ho et al., 2021; Ridderinkhof et al., 2018). The child behaviour checklist is a component of the Achenbach System of Empirically Based Assessment. The CBCL is completed by parents and measures eight behaviors: 1) anxiousness; 2) depressed; 3) somatic complaints; 4) social problems; 5) thought problems; 6) attention problems; 7) rule-breaking behaviors; 8) aggressive behavior. These eight measures are ordered into either internalizing or externalizing
behaviors (Hoffman et al., 2016). In all studies that utilized the CBCL, there were comparable improvements speaking to the effectiveness of MBIs in improving behavioural functioning in children on the autism spectrum.

Overall, when an MBI was implemented, behavioral functioning improved. An explanation for this finding is that mindfulness increases awareness of internal processes that rise due to heightened emotions and situations. Children on the autism spectrum have trouble taking many stimuli and prioritizing attention to acute details rather than the global whole (Roemer et al., 2015). This can increase stress and anxiety which can lead to aggressive or anti-social behaviors. Mindfulness training provides a buffer by reducing emotional/physiological arousal and allows children to choose how they want to respond to a trigger, which leads to less impulsive behaviors (Shaffer et al., 2022). Additionally, children are also more aware of their pleasant emotions and are readily able to attain them, which can lead to less externalizing behaviors (Roemer et al., 2015; Schumann-Olivier et al., 2016). For instance, Clifford et al. (2022) implemented a time-out procedure that is self-initiated in their “Anger Can Go!” MBI. They taught children to identify when they were having a heightened emotion. When children recognized their triggers, they would independently go to “time out” and be taught to shift attention away from overwhelming emotions. Children applied self-soothing, non-reactive strategies to calm down and approach the issue. Overall, mindfulness works to reduce emotional and physiological arousal by helping to recognize and be mindful of triggers, so that children can have space to apply adaptive strategies.

**Effect of MBIs on Executive Functioning**

Executive functioning is the ability to engage in higher order thinking, and is associated with navigating teamwork, leadership and emotional regulation and is crucial for socioemotional
skills (Riggs et al., 2006). Three studies measured the effect of executive functioning on children on the autism spectrum. Ho et al. (2021) reported no increase in executive functioning skills for children on the autism spectrum after engaging in MYMind, and MBI. However, Juliano et al. (2020) reported executive functioning increased. Ridderinkhof et al. (2020) also found that children with ASD had weaker executive function scores compared to typically developing children before MYMind. However, this difference was no longer present after children on the autism spectrum underwent MBI. They also found increased scores in orienting attention and executive attention in children on the autism spectrum.

Bishop et al. (2004) found that MBIs train to recognize and inhibit automatic tendencies to react and then respond mindfully. This can explain why children on the autism spectrum improved in executive functioning and attention. They were able to recognize mistakes or triggers, take the time to shift their attention to calm down using mindfulness exercises and inhibit the automatic negative reactive response, and respond deliberately. Improvement in executive functioning can enhance attention to social information, prevent distractions during social interactions, and improve capacities to disengage from distressing thought patterns and feelings (Schuman-Olivier et al., 2020). These findings align with a systematic review conducted by Gallant (2016) who found that mindfulness training led to a specific benefit in inhibitory improvement and shifting and updating attention in individuals.

However, due to the mixed findings on mindfulness and executive functioning for the ASD population, more evidence is needed to make conclusive results. Future research should investigate the effectiveness and mechanisms relating to executive functioning and mindfulness.

Overall, there was a positive effect on social, emotional, and behavioral functioning after the implementation of MBIs. These changes could be accounted for by the increased awareness
of one’s emotions, surroundings, and physiological sensations and the ability to shift attention to adaptive coping strategies trained through MBI practices.

**Modifications made for children on the autism spectrum**

A second aim of the following systematic review was to identify adaptations done to traditional MBIs to make them more accessible for children on the autism spectrum. Six of the studies included specified adaptations done to MBIs. The remaining studies were analyzed to find things in common with the specified adaptations.

A common adaptation implemented was the removal of metaphoric language, and the increase of more direct and explicit instruction (Hatfield et al., 2022; Ridderinkhof et al., 2018, 2020). This data is aligned with that of Cachia et al. (2016) who also found that direct language was adapted to make it easier for persons on the autism spectrum to understand and communicate. Explicit instruction has also shown promising results for children on the autism spectrum in social skills training (Cummings et al., 2017; Whitley et al., 2016) and in the acquisition of other skills such as mathematics (Root et al. 2019) and language (Bangert et al., 2019).

Another adaptation was the use of rehearsal and multimodal methods of presentation of MBI practices (Drusdeau et al., 2020, 2022; Juliano et al., 2020; Ridderinkhof et al., 2018, 2020). Such methods included role plays, video modelling, class meetings, visual scripts, board games, archery, group work, social narratives and mimicking. This was in line with findings from Cachia et al. (2016) and Stahmer et al. (2005) who found that multiple techniques provided for learning was effective for children on the autism spectrum since it encouraged rehearsal. Rehearsal was also used to improve generalization of MBI practices to multiple settings and
multiple interactions that would be familiar to the child with autism. Homework given during sessions was particularly helpful in engaging MBI to the home, school and other settings. Furthermore, as discussed, parent involvement increased rehearsal and emphasized mindfulness training in naturalistic environments.

Visual Schedules and transitions were also introduced as part of MBI implementation for children on the autism spectrum. For instance, some studies started with a welcoming ritual to ensure children on the spectrum are in the right mind space before sessions began (Shah et al., 2022; Singh et al., 2018). This helped children on the spectrum to transition into the right headspace for mindfulness training (Shah et al., 2022; Singh et al., 2018). There was a routine for children to follow so that they were not distracted or overwhelmed by sudden changes.

Mindfulness practices were also individualized to the needs and interests of the child to make it much easier for them to accustom themselves. Three areas of individualization were clear: 1) the characteristics of the individual child; 2) the likes and preferences of the child; 3) external factors (Stahmer et al., 2005). This individualization was easy to implement during one-on-one sessions, however, during group implementation this was accomplished through homework or parental contributions.

Mindfulness training as an evidence based practice

The final aim of the current study was to identify whether MBIs were considered an evidence-based practice for autism. The Evaluative Method for Determining EBP in Autism founded by Reichow et al. (2008) was utilized to determine where MBIs are EBPs for children on the autism spectrum. Based on the results obtained, mindfulness training can be considered an established EBP for autism, however, it barely meets the criteria.
Mindfulness training meets the criteria outlined in EMDEBP including: 1) at least two strong group experimental design studies conducted in at least two distinct locations and research teams. In the current review, we found two adequate group research studies, two strong group research studies, five weak group research studies, one weak single subject research studies and one strong single subject study. There was a total of 391 children on the autism spectrum across the eleven included studies, and 339 of them were treated with MBIs. It is important to note that the total number of participants includes those outside of the targeted age range. There were 8 different laboratories and research teams that carried out MBI implementation for children on the autism spectrum.

Primary quality indicators including participant characteristics, primary and secondary outcomes (independent variables, dependent variables), and appropriate statistical tests (link between research question and tests used) were reported in full, minimizing reporting bias. However, studies fell short in 1) having strong and defined comparison conditions in single subject studies; 2) studies with adequate power.

However, the majority of group research studies fell short in having acceptable comparison conditions (Drusdeau et al., 2020, 2022; Hatfield et al., 2022; Juliano et al., 2020; Ridderinkhof et al., 2018). They involved trials based on pre-post single group designs, which can increase response shift bias found in studies and awarded them weak quality ratings. Related to lack of quality comparison conditions, there was a total of two single subject studies that were included in the current study. One of these studies did not have an adequate baseline condition, or a clear experimental control with three time point demonstrations of research effects. Therefore, the effect of the MBI was not clear and the validity of the study was compromised. Future research should look into utilizing clear control conditions for comparison to increase
internal validity in MBI research. This finding is aligned with other systematic reviews who pointed to this limitation indicating a real need for this gap to be addressed.

Regarding secondary quality indicators, no studies had attrition rates higher than 30% and all studies were considered to meet the minimum criteria for social validity. However, most studies fell short in having random assignment, study blinding, interobserver agreements and fidelity. Eight of the eleven studies were not randomized and did not include a control condition, leading to a high risk of selection bias. Only one group research study included inter-observer agreement. Interobserver agreements are crucial in research to ensure observational measures are reliable (Watkins & Pacheco, 2000). Katz et al. (2020) did do a standardized fidelity measure, however, teachers reported on their own fidelity which increases response bias. Other studies included trainers doing routine checks with primary investigators, however, results from these were not measured nor reported (Katz et al., 2020; Shah et al., 2022; Singh et al., 2018). Fidelity measurements ensure that an intervention is consistently and accurately followed through by interventionists. It is important to ensure the validity of the intervention (Carroll et al., 2007). Without fidelity checks or interobserver agreements, it is possible that some of the results are confounded with individual trainers’ skills rather than the MBI itself (Cachia et al., 2016). Future researchers should look to implement interobserver agreements and fidelity checks to ensure interventions are externally and internally valid, consistent, and reliable. Study blinding did not occur in any of the studies causing a lack of a crucial method of preventing research and participants expectancies in influencing results (Hartley et al., 2019).

Though MBIs were found to be established EBPs for ASD, there is still a lot of evidence and research needed to fully support this finding. More randomized and controlled group research and single subject studies with clearly outlined comparison and baseline conditions is
necessary. Future research should also look to incorporate inter-observer agreements, fidelity checks and study blinding to increase consistency, reliability and validity in MBI research.

**Limitations**

While these results are encouraging, the current study housed a number of methodological limitations that should be addressed.

A major limitation of current review was that the targeted age range of 0-12 years old was not adhered to in five studies (Ho et al., 2021; Juliano et al., 2020; Katz et al., 2020; Ridderinkhof et al., 2018, 2020). In these studies, ages ranged from 8-23 years old, and the current review relied on the mean ages of the studies falling in the 0–12-year-old category for inclusion criteria to be met. However, this would still mean that aggregate data was still used in the reports and final results of the review. Moreover, the ages of 0-7 were underrepresented in the current review as there were no available peer-reviewed studies conducted for MBIs for this age range. This limitation leads to the current findings to be limited to children above the age of 7 and skewed towards older children. Future research should investigate implementing mindfulness training for the age group of 0-7, and particularly capping age cut-offs at 12 years old when implementing interventions targeted for children.

The current study also included one article (Katz et al., 2020) that included participants with fetal alcohol syndrome disorders and intellectual disabilities in addition to children on the autism spectrum. The study sampled 26% of the participants to be children (aged 0-12) on the autism spectrum in the treatment condition, and 25% children on the autism spectrum in the control condition. This was considered a representative sample and the study was selected to be
included in the study. However, it is important to note that 90% of the reviewed studies included participants that were solely children on the autism spectrum.

Another limitation of the current review is that we only included peer-reviewed articles written in English and conducted in English-speaking countries. Therefore, a total representation of the research available in MBIs for children on the autism spectrum is limited. Furthermore, the results are not generalizable to non-western or non-English speaking ASD populations. Therefore, it is important to recognize that the findings of the current review are only applied to western English children on the autism spectrum. Future research should report cultural variables, since none of the included papers touched on this even though mindfulness training is a Buddhist tradition at its root. It is important to understand how effective mindfulness training is when perceived by other cultures, and whether children on the autism spectrum and their parents’ openness to the intervention varies.

Furthermore, the current study excluded non-experimental studies and grey literature that may be able to provide more naturalistic and applied findings. Non-experimental research could help to make tremendous contributions when the target population is small and hard to access, and not easily randomized. This is the case for most studies in the field of ASD. Therefore, the lack of non-experimental research could lead to important insights being lost. Grey literature is evidence not published in commercial publications (i.e., theses, dissertations, research, committee reports, conference papers). It provides an important forum for disseminating studies with negative results and reduces publication bias. The inclusion of grey literature increases reviews’ comprehensiveness and provides a balanced picture of the current research (Paez, 2017). Non-peer-reviewed literature was not included in the current review which can lead to an overestimation of intervention effects (Hopewell et al. 2017).

**Future Directions**
The studies included showcased some issues that should be addressed in future research on MBIs for children on the autism spectrum.

There was a lack of strong single subject research in MBIs for children with ASD. In the current review, there were only two studies available to be included in the current review. Furthermore, one of the included single subject studies was evaluated to be weak. This limitation was also found in Cachia et al. (2016) where it was identified that there were little to no strong or adequate single subject designs. Single subject studies are advantageous when testing the effectiveness of interventions when considering a particular population, such as those on the autism spectrum. With single subject designs, we can understand the treatment's effect that does not confuse this with external factors, such as group bias. Future research should investigate implementing MBIs within single subject designs to validate MBIs as EBPs for ASD. Furthermore, researchers should refer to resources such as Reichow et al. (2008) to ensure their research design is strong (Cachia et al., 2016).

Similarly, there is also a lack of randomized controlled trials in MBIs for children with ASD, with the current study housing only three studies. Furthermore, these randomized control trials were of adequate strength. Randomized control trials are considered the gold standard of research as they minimize the risk of confounding factors that might influence results through the act of randomization. This allows researchers to establish causal associations between predictor, confounding and outcome variables. To ensure low risk of selection bias, future research on MBIs for children on the autism spectrum should incorporate more randomized controlled trials and refer to resources such as Reichow et al. (2008) to ensure their research design is strong. Randomized control trials are also particularly important to minimize potential between-group differences such as age, ASD severity or comorbidity. However, the difficulty in recruiting and working with ASD cohorts should be noted and addressed. ASD research creates a niche subpopulation that is extremely hard to recruit, especially for children on the autism spectrum.
Caregivers can also find it difficult to find time and resources to adhere to interventions because of varying demands. Therefore, future MBI research should be simplified and accommodated to meet the time and resource needs of this niche population. For example, utilizing virtual formats or video modelling software for parent coaching can be implemented.

There was also a lack of adequate treatment fidelity assessments in MBIs included in the review. In the current review, three studies addressed fidelity (Katz et al., 2020; Shah et al., 2022; Singh et al., 2018). Katz et al. (2020) administered a standardized fidelity checklist, however, teachers who were administering the intervention reported on their own fidelity. This could increase response bias and skew the results. The other studies implemented supervision sessions with primary investigators for mindfulness trainers to ensure treatment fidelity, however results were not clearly measured or reported. Most MBIs were implemented by secondary programmers such as mental health counsellors, special education teachers, general classroom teachers, clinical psychologists, and parents. Therefore, without structured or independent evaluations of fidelity, there is no way to guarantee compliance to the curriculum or MBI. Therefore, it is possible that some of the results of specific trainers’ individualization in providing therapy for children on the autism spectrum, rather than mindfulness alone. This limitation was also identified in Cachia et al. (2016), showcasing the critical need for future researchers to implement fidelity assessments to their studies on MBIs for ASD to strengthen the internal validity of their research.

Additionally, studies included did not consistently provide information on children’s ASD symptom severity. ASD severity can help a treatment team provide the most appropriate care for the person on the autism spectrum, increasing the chances for positive long-term effects (Hartley et al., 2019). MBIs included in the current study do not report on the child’s level of
autism. This limitation is also identified in Hartley et al. (2019) who find that reporting on this key parameter can help to determine the efficacy of MBIs for different ASD subgroups. Future research in the field should look at differentiating ASD severity to showcase the effectiveness of MBIs for each level of autism.

Considering these findings, it is crucial that future researchers refine investigations of MBIs for children on the spectrum to include a more refined age range, more single subject studies or randomized controlled trials with a structured or independent thorough evaluation of fidelity. This would help in the efficacy and trustworthiness of the current mindfulness-based interventions for children on the autism spectrum, and aid in the standardization of mindfulness training.

**Implications for Practice**

Mindfulness training addressing socioemotional skills in children on the autism spectrum has practical implications for clinicians, educators and parents.

**Implications for clinicians**

The current study showcases mindfulness training as an established practice for socioemotional skills for children on the autism spectrum, albeit more research is needed to confirm this finding. Clinicians will be able to apply mindfulness to children on the autism spectrum with identified needs in socioemotional skill development. Mindfulness training can be delivered in a variety of settings with a variety of trainers. Mindfulness can also be incorporated fairly easily into a child’s daily life, whether it be at school, home or on the playground. For instance, the majority of studies in the current review administered MBIs in hourly weekly sessions. Furthermore, mindfulness can also be delivered in a group or individually. This
flexibility can help clinicians to refer MBIs for children on the autism spectrum without much worry about accessibility and costs that may be associated with other services. This addresses a major issue where access to evidence-based services is lacking when children on the autism spectrum are considered. It is important for clinicians to keep in mind that training in the MBI being administered is crucial, which can lead to some added time and effort for the interventionist.

**Implications for parents**

Parents play a critical role in modelling and teaching socioemotional skills to their children. In the majority of the MBIs reviewed, there was either a simultaneous parental intervention or parent training provided for parents to incorporate MBIs for children in their homes. When parents were open and supportive of the MBI and worked together with the trainers and educators, this led to more improvements in socioemotional skills for children on the autism spectrum (Hartley et al., 2019; Ridderinkhof et al., 2018, 2020). Therefore, it is important that parents play a critical role in the implementation of mindfulness skills in the daily lives of their children. Furthermore, parents are able to teach and encourage MBI strategies in a truly naturalistic environment. For instance, when a child is angry or overwhelmed, parents are able to encourage them to bring awareness to their emotions and bodily cues and find adaptive regulation strategies instead. Continued use and practice will benefit the child to generalize these practices to their daily lives. It is important for parents to keep in mind that training in the MBI being administered is crucial and can lead to some added time and effort prior to implementation.

**Implications for teachers**

Mindfulness training was implemented in the school setting for children on the autism spectrum as a tier-1, tier-2 or tier-3 intervention. This goes to show the variety in implementation that could be achieved in mindfulness training. The flexibility in the implementation of MBI is
particularly important in schools, where resources and time are often overstretched. For instance, applying mindfulness in a tier-1 setting can benefit not only the child on the autism spectrum, but the entire classroom. These mindfulness strategies will then be able to be used by children on the autism spectrum daily and naturally with their peers without burdening or causing burnout in peers, which was found in peer modelling interventions. In tier-1 implementation, teachers are able to apply mindfulness strategies to the curriculum and this will lead to more opportunities for practice for children on the autism spectrum. Tier-2 interventions help children identified with specific needs to still engage in a group setting. It also reduces work, cost and effort for teachers who can implement intervention to a group with similar needs rather than individually. With mindfulness being able to be administered in multiple tiers, it helps reduce work, time and costs for teachers while being able to benefit many students on the autism spectrum. It is important to note that specialized training in the MBI being administered is crucial and requires additional time and effort from the teacher prior to implementation.

**Conclusion**

Mindfulness-based interventions are useful for improving socioemotional skills in children on the autism spectrum. Adaptations done to traditional MBIs include multimodal methods of presentation, transition schedules, and explicit and direct instruction. MBIs were found to be an established EBP for children on the autism spectrum. However, further research involving strong randomized control trials and single subject designs are necessary to confirm these findings, and positive effects reported in this review.
References


https://doi.org/10.1016/j.earlhumdev.2014.02.011


disorders. *Addictive behaviors*, 98, 106035.


approaches to anxiety (pp. 147-161). Springer, Boston, MA.


https://doi.org/10.1016/j.ridd.2020.103641


https://doi.org/10.1002/jclp.20237

https://doi.org/10.1007/s41252-018-0073-5

https://doi.org/10.1177/070674371205700202


Curriculum Vitae

EDUCATION

Master of Arts: School & Applied Child Psychology 2023
Western University – Faculty of Education London, ON
- Thesis: DBT and Mindfulness-based Interventions for Children with Autism: A systematic Review
- Supervisor: Dr. Gabrielle Lee

Honours Bachelor of Science in Psychology 2021
Western University London, ON
- Thesis: The Relationship between Mental Imagery & Narrative Engagement
- Supervisor: Dr. Ingrid Johnsrude

RESEARCH INTERESTS

- Understanding and creating sustainable natural supports for youth that are systemically challenged
- Parent and sibling relationships and their impacts on development in children with exceptionalities
- Diversity and equity teachings to students in helping professions and how to assess quality and fidelity of such teachings?
- The impact of teacher and caregiver stereotypes on development of children with exceptionalities

RESEARCH EXPERIENCE

Masters Graduate Student 2021 – 2023
Faculty of Education, UWO London, ON
Supervisor: Dr. Gabrielle Lee
- Conducted an extensive systematic search in “DBT and MBIs for socioemotional skill development for children with ASD” and analysed research to write a structured summary and discussion of the studies’ characteristics and findings involving statistical analysis
- Applied for project to present at conferences and attempting to submit review for publication.
- Side project: created an intervention approach for teaching socioemotional skills virtually for children with autism. Conducted an extensive literature search, completed thesis proposal for project, and applied for ethics and conducted interviews and screening for participant recruitment

Research Assistant
Faculty of Education, UWO
Advisor: Dr. Marguerite Lengyell
- Conducted extensive literature search for project “Teaching Equity and Cultural Humility in Counselling: Student Perspectives” and started on manuscript along with other lab mates
- Completed ethics forms and kept up to date with amendments that needed to be made
- Facilitated focus groups and helped thematically analyze data gathered

Honours Thesis Student
Department of Psychology, UWO
Advisor: Dr. Ingrid Johnsrude, The CoNCH Lab
- Created, implemented, and conducted all needs for project “The Relationship between Mental Imagery & Narrative Engagement”
- Analyzed and compiled the data in an organized report and assisted in implementing ethics protocol
- Attended lab meetings and learned about new data entry and analysis programs

Research Assistant (Undergrad)
Faculty of Education, UWO
Advisor: Dr. Shannon Stewart, The InteRAI Lab
- Conducted extensive and effective searches for literature reviews
- Created material for presentations and posters for seminars and conferences
- Succeeded in running graduate student’s experimental design with participants and managed data collection and distribution

Research Assistant (Undergrad)
Department of Psychology, UWO
Curriculum Vitae

Advisor: Dr. Victoria Essess, Essess Lab for the Study of Intergroup Relations
- Developed materials and methods for data collection and analysis
- Edited and reviews surveys and questionnaires for effective data collection
- Utilized various technologies such as Qualtrics and PsychoPy to design and create effective tools for data collection

Research Assistant
Department of Psychology, UWO
Advisor: Dr. John Paul Minda, The Minda Lab for Cognitive Psychology
- Worked with research team to conduct experiments efficiently
- Reported, analyzed, and inputted the relevant data for 75+ participants for relevant study
- Organized and maintained the study space and assessment tools and materials

TEACHING EXPERIENCE

Academic Upgrading Instructor 2020 – 2022
Fanshawe College St. Thomas, ON
- Taught 30+ youth and adults who are preparing for further education through learning materials and instructional practices that are in alignment with universal design principles and college values of anti-racism and inclusivity

PROFESSIONAL EXPERIENCE

Youth Engagement Lead 2021 – present
Social Planning Council – Oxford County Woodstock, ON
- Researched and analyzed primary and secondary data gathered from youth, adults, and the community to identify needs and gaps. Worked with and provided mentorship and support at individual and group level to 21+ youth volunteers and collaborated with community leaders (ex. TVDSB, CES, YMCA, United Way) to work together to build projects and initiatives to better Oxford County and increase high school graduation rates for youth in the community.

Student Support Counsellor 2021 – present
Ministry of Education – Amethyst School London, ON
- Worked with 9+ students (aged 7-13) and provided guidance, instruction and counselling in life and social skills for students with severe learning disabilities in a clinical setting

Instructor Therapist 2020 – present
Speech Associates Inc. London, ON
- Worked with 6+ children with Autism (3-12 years old), one-on-one, to implement the ABA/IBI plan developed by the Senior Therapist and the consulting psychologist and monitored and communicated client’s progress using trial-by-trial data, frequency data and communicated client’s progress using SOAP notes to Senior Therapist and other therapists

Before and After School Assistant 2020 – 2021
London Children’s Connection London, ON
- Aided in implementing a quality and evidence-based program for 10+ children aged 4-12 years of age and fostered children’s curiosity and facilitated activities & provocations based on their developmental needs, interests, and utilized the “Learning by Play” model and adhered to the CCEYA and LCC’s policies and procedures

Respite Worker | Developmental Service Worker 2018 – 2021
VON Canada London, ON
- Organized and engaged in recreational activities, and public outings for 10+ individuals (ages 6-26) and encouraged good behaviours using positive behaviour supports, positive reinforcement and enforcing person-directed care and established and enforced crisis intervention strategies and all essential activities of daily living for individuals while providing respite for their care-guardian

Instructor Therapist 2017 – 2020
Love for Needs London, ON
Curriculum Vitae

- Worked with 12 children with special needs (5-15 years old) and worked alongside senior therapist and parents to develop leisure and life-skills programs based on evidence-based ABA/IBI methods to help individuals grow and adapt. Also, researched and helped therapist create effective strategies and a healthy environment for behaviour intervention and helped conduct 4+ parent-training sessions to help child and parent work on behaviour outside of respite

**Tutor**
Above Grade Level & Tutor Doctor  
London, ON
- Gave in-person and online tutoring, mentoring and guidance for a diverse range of 30+ elementary high school, and university students to help them acquire greater knowledge for academic success

**PUBLICATIONS**

Works in progress
- Nandadasa, N. “DBT and Mindfulness-Based Interventions for Socioemotional Skill Development in Children with Autism: A Systematic Review”
- Lengyell, M., Hmidan, A., Nandadasa, N. “Teaching Equity and Cultural Humility in Counselling: Student Perspectives”

**CONFERENCES**

Submitted Poster Presentations

**RESEARCH GRANTS & FUNDING**

Grants Applied
- SSHRC Doctoral Fellowship 2023
- Ontario Graduate Scholarships 2023
- Canadian National Autism Foundation - $500 2023

**SCHOLARLY AND PROFESSIONAL ACTIVITIES**

- RMSE Conference Volunteer and Workshop Facilitator 2023

**HONOURS AND AWARDS**

- Graduate Student Assistantship 2021-2023
- Dean’s Honour Roll 2020-2021