Mindfulness Meditation–Based Interventions in Parents of Autistic Children: a Systematic Review of Effects on Children

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Abstract

The quality of life (QoL) of autistic children and their parents is a significant clinical concern and an important focus of research in the field. The well-being of autistic children and their parents can be improved through interventions based on mindfulness meditation. However, when implemented with autistic children, mindfulness-based interventions (MBIs) have certain limitations. These limitations can be overcome through the indirect positive effects on autistic children resulting from their parents' engagement in MBIs. We conducted a systematic review of the literature in this field, targeting studies on the effects of MBIs on autistic children through interventions being offered exclusively to their parents. A total of 14 studies were identified for inclusion in the review. Overall, autistic children showed a significant reduction in challenging behaviours following the implementation of MBIs aimed at their parents. Given this reduction, MBIs for parents of autistic children could be a viable option for improving the QoL of families affected by autism.

Keywords: autism, parent, mindfulness, child outcomes, challenging behaviours, systematic review

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Abstract

The quality of life (QoL) of autistic children and their parents is a significant clinical concern and an important focus of research in the field. The well-being of autistic children and their parents can be improved through interventions based on mindfulness meditation. However, when implemented with autistic children, mindfulness-based interventions (MBIs) have certain limitations. These limitations can be overcome through the indirect positive effects on autistic children resulting from their parents' engagement in MBIs. We conducted a systematic review of the literature in this field, targeting studies on the effects of MBIs on autistic children through interventions being offered exclusively to their parents. A total of 14 studies were identified for inclusion in the review. Overall, autistic children showed a significant reduction in challenging behaviours following the implementation of MBIs aimed at their parents. Given this reduction, MBIs for parents of autistic children could be a viable option for improving the QoL of families affected by autism.

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Introduction

Regardless of age, the quality of life (QoL) of autistic people is lower than that of people with typical development (Arias et al., 2018; van Heijst & Geurts, 2015). QoL is a multidimensional and subjective concept (Schalock, 2004), encompassing several dimensions, including physical, social, and psychological functioning (World Health Organization [WHO], 1946). Autism can also impact the well-being of the family (Dückert et al., 2023; National Institute for Health and Care Excellence [NICE], 2013). For example, parents of autistic children have higher stress scores (Hayes & Watson, 2013), and lower QoL levels (Vasilopoulou & Nisbet, 2016) compared to parents of typically developing children. However, the QoL (Vernhet et al., 2022) and stress levels (Hastings et al., 2005; McStay et al., 2014) of parents of autistic children are less dependent on the fundamental characteristics of their child's autism than on its clinical specifiers, such as mental, neurodevelopmental, or behavioural conditions (APA, 2013). For example, research has identified an association between autistic children's behavioural and emotional problems and their parent's psychological distress (Yorke et al., 2018). Similarly, the QoL of autistic people is less dependent on the fundamental characteristics of autism than on its clinical specifiers (van Heijst & Geurts, 2015; Kim & Bottema-Beutel, 2019).

Mindfulness-based interventions (MBIs) are interventions that teach various meditation techniques to continuously redirect attention to the present moment (Kabat Zinn, 2003). MBIs are the interventions of choice for improving QoL (Jones & Drummond et al., 2023). Despite the lack of evidence for interventions aimed at reducing the burden on parents with autistic children (Dückert et al., 2023), MBIs have been shown to improve QoL for these parents (Cachia et al., 2016a; Juvin et al., 2021). Furthermore, intervention programmes that include mindfulness meditation practices for parents of autistic children are more effective in reducing

their stress levels than programmes that do not include such practices (Anonymous et al., 2020; Li et al., 2024). MBIs can be implemented with autistic people and have been shown to improve their QoL (Benevides et al., 2020; Byrne & O'Mahony, 2020; Cachia et al., 2016b; Menezes et al., 2020; Semple, 2019). Given the heterogeneity of the autistic phenotype and co-occurring conditions, MBIs aimed directly at autistic people raise questions of adaptability (Beck, Connor, et al., 2020; Poquérusse et al., 2021). For example, autistic participants who are offered these interventions are sometimes excluded from studies for comorbid intellectual disability diagnoses (Beck, Greco, et al., 2020; Spek et al., 2013).

Some research has demonstrated that MBIs targeted at caregivers can have indirect effects on autistic people. Singh et al. (2004) and Singh, Lancioni, Winton, Curtis, et al. (2006), for example, showed that a predisposition to mindfulness among carers was positively associated with the well-being of the disabled person they support. In the same vein, Harmony and Woodard (2020) showed that mindfulness training for staff members in schools with autistic pupils was negatively correlated with pupils' challenging behaviours. Challenging behaviours are defined as a range of behaviours that people with severe learning disabilities may display to get their needs met, such as hurting others, destructive behaviours or self-injurious behaviours, which can have a negative impact on the autistic person's well-being (Carter Leno et al., 2019). The literature has identified a high prevalence rate of these behaviours among autistic people (Hattier et al., 2011; Matson & Nebel-Schwalm, 2007). Several studies have also found that children's challenging behaviours is negatively associated with parents' ability to be present in their relationship with their autistic child, otherwise known as "dispositional mindfulness" (Aydin, 2023; Beer et al., 2013; Chan et al., 2022; Raulston et al., 2021). This association has not been found with other parenting practices (Suvarna et al., 2024). Utilising emotional co-regulation strategies (Ting & Weiss, 2017) could also help parents mitigate challenging behaviours in their autistic children. Finally, studies have

identified a significant positive association between the emotional openness (or acceptance skills) of parents of preschool-aged autistic children and their child's QoL (Anonymous et al., 2023), which is considered the "gold standard" outcome for autism interventions (Ikeda et al., 2014).

Ultimately, the adaptability challenges associated with implementing MBIs with autistic individuals could be partially mitigated by the indirect effects of implementing MBIs with their parents. The aim of the present research was therefore to (1) identify studies examining the effects of MBIs on autistic children when these interventions are offered exclusively to their parents and (2) explore the variables examined in autistic individuals, especially the clinical specifiers. To the best of our knowledge, there are no other systematic reviews addressing this topic.

Methods

A systematic literature review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009; Page et al., 2021). No meta-analysis was planned.

Information sources and search strategies

An electronic search was conducted for the period 2006 to April 2024 by one of the authors (JL). To our knowledge, Singh, Lancioni, Winton, Fisher, et al. (2006) were the first to examine the indirect effects of MBIs offered to parents on their autistic children; therefore, the search was limited to the period between 2006 and April 2024. A comprehensive query of PubMed, PsycINFO via the EBSCOhost access provider, Education Resources Information Center (ERIC), PubPsych, and the Science Direct databases was conducted. We used the following keywords: autism, ASD, mindfulness, mindful, parent, and caregiver. These keywords were combined with Boolean operators and used with truncation; the algorithm used in all but the Science Direct database was: (autism* OR ASD) AND (parent* OR

caregiver) AND mindful*. Because Boolean operators and truncation are not available in Science Direct, the keywords entered into this database were “ASD”, “Mindfulness”, and “parent”. We applied this query to titles and abstracts in PubMed and PsycINFO, and full text in ERIC, PubPsych, and Science Direct. The reference lists of the articles reviewed were also consulted to identify further studies.

Eligibility criteria

We selected studies published in English or French in peer-reviewed scientific journals. The studies had to propose an MBI for parents of autistic children, utilising a protocol that included either a formal or informal mindfulness meditation practice. The former refers to a period of time, whether short or extended, dedicated to a specific meditation practice (e.g. breathing, sitting, body scan), while the latter refers to a mindfulness practice that can be flexible and integrated into everyday activities (e.g. when eating, doing the dishes, playing with one’s child). This meditation could be the focal point of the intervention or an additional component of a broader programme that includes other interventions. Children were only included if they had been diagnosed with autism according to international classification criteria: autism spectrum disorder or pervasive developmental disorder (ICD-10, DSM-IV-TR or DSM-5). The diagnosis had to be either explicitly confirmed during the research procedure, taken from the child’s medical records, or obtained from other reliable sources (e.g. parents’ reports). Included studies also had to report quantitative or qualitative measures of the indirect effects of MBI on the child, with no age limit, given that the well-being of parents of autistic adults is as much a concern as that of parents of autistic children (Herrema et al., 2017). Studies that offered MBI to both parents and children were excluded, as this study targeted the effects of mindfulness meditation practised solely by the parent.

Study selection process

After removing duplicates via the Excel software program, one of the authors (JL) reviewed the titles and abstracts of the studies identified through the database search to determine which ones met the inclusion criteria. The full texts of these studies were then reviewed independently by two of the authors (JL and MS) to confirm whether they met the inclusion criteria. This resulted in a 100% agreement rate.

Data collection process

The study characteristics and results were extracted by the lead author (JL) and verified by two co-authors (EC and MS). Omissions or discrepancies were resolved by consensus between these three authors. Data collected included the name of the first author, year of publication, country, characteristics of participating parents and their children, details of the MBI and any additional interventions, study design, measures concerning the child, any follow-up, main results concerning the effect of MBI on the child, and methodological quality and level of evidence.

Assessing the methodological quality and level of evidence of the studies

The methodological quality and level of evidence of each study were assessed independently by two of the authors (JL and MS). This resulted in agreement rates of 83% and 62% for methodological quality and level of evidence, respectively. Any discrepancies were discussed with a third author (EC) to reach a consensus.

The STrengthening the Reporting of OBservational Studies in Epidemiology (STROBE) guidelines (von Elm et al., 2008) were used to assess the methodological quality of each study, ensuring a clear presentation of what was planned, done, and found. STROBE reporting reveals the strengths and weaknesses of studies and facilitates sound interpretation and application of the results. The STROBE statement includes a checklist of 22 items related to the title, abstract, introduction, methods, results, and discussion sections of articles. The

scores were assigned as follows: 1 = all the item's criteria were met, 0.5 = the criteria were partially met, and 0 = none of the criteria were found in the study. The overall evaluation of each study was obtained by transforming the total score into the percentage of criteria met. Studies with a quality assessment below 50% should be excluded (da Costa et al., 2011).

The level of evidence was determined using the hierarchy of evidence described in the National Health and Medical Research Council (NHMRC; 1999) guidelines, with six levels ranging from the highest level of evidence (Level I) to the lowest level of evidence (Level IV): Level I (evidence obtained from a systematic review of all relevant randomised controlled trials [RCTs]), Level II (evidence obtained from at least one properly designed RCT), Level III-1 (evidence obtained from well-designed pseudo-RCTs), Level III-2 (evidence obtained from comparative studies with concurrent controls and allocation not randomised, case-control studies, or interrupted time series with a control group), Level III-3 (evidence obtained from comparative studies with historical control, two or more single-arm studies, or interrupted time series without a parallel control group), and Level IV (evidence obtained from case series, either post-test or pre-test and post-test). The most appropriate study design to answer the intervention question is Level II evidence. Level I studies are systematic reviews of the appropriate Level II studies. Study designs that are progressively less robust for answering the intervention question are shown at Levels III and IV.

Risk of bias inherent in randomised controlled trials

Two of the authors (JL and JLM) independently assessed the risk of bias inherent in each RCT using the risk of bias tool recommended by Munder and Barth (2017), which includes seven domains of bias: (1) random sequence generation, (2) allocation concealment, (3) performance bias, (4) detection bias, (5) attrition bias, (6) reporting bias, and (7) treatment implementation. For each domain, the risk of bias was assessed as low (+), high (−) or uncertain (?).

Results

Selection of studies

The PRISMA flow chart for identifying the studies is shown in Figure 1. Of the 607 abstracts identified after removing duplicates, 549 were excluded and 58 studies were evaluated in their entirety, including three additional references found through other sources and one study from updated database searches (Rojas-Torres et al. 2023). Of these 58, 44 did not meet the inclusion criteria and were excluded; therefore, 14 studies were retained for inclusion. The studies by Chan and Neece (2018) and Neece et al. (2019) were based on results obtained from the same sample, so they were combined for reporting and discussion purposes. A subsample of participants from the Chan and Neece (2018) study was also used in the Neece (2014) study, but we were unable to treat them separately.

Characteristics of included studies

All the studies included in this review measured the effects of MBIs on both the child and their parents, except Weitlauf et al. (2022), which targeted only child-related variables. Regarding the parent variables, most of the studies showed a significant reduction in parents' perceived stress following intervention (Andrews et al., 2022; Chan & Neece, 2018; Jones et al., 2018; Neece, 2014; Neece et al., 2019; Raulston et al., 2019; Rojas-Torres et al. 2023; Schwartzman et al., 2022; Singh et al., 2014; Singh et al., 2019; Singh et al., 2021). The characteristics of the included studies are presented in Table 1.

Four of the 14 studies selected for this review included not only parents of autistic children but also parents of children with other diagnoses. Neece (2014) and Neece et al. (2019) did not specify these other diagnoses, indicating only that the children had developmental delays. In addition to autism, Chan and Neece (2018) reported the following diagnoses, but without specifying the number of children involved: Down's syndrome, Prader–Willi syndrome, Fragile X syndrome, intellectual disability, learning disability, language delay,

cerebral palsy, and microcephaly. Jones et al. (2018) included 16 autistic children, one child with Down's syndrome, two children with cerebral palsy, and two children with intellectual disability. The autistic children in Singh et al. (2014) had all been diagnosed with Asperger's (autism without intellectual and language impairment).

The mean age of the children included in the studies ranged from 2.3 years (Weitlauf et al., 2022) to 16.7 years (Singh et al., 2014). For 10 of the 14 studies, the mean age of the children was less than 7 years. The remaining four studies included children with an average age of over 10 years (Jones et al., 2018; Singh et al., 2014; Singh et al., 2019; Singh et al., 2021).

In total, there were 636 parents across the 14 studies. The number of parents included in the studies ranged from three (Andrews et al., 2022; Raulston et al., 2019; Singh, Lancioni, Winton, Fisher, et al., 2006; Singh et al., 2014) to 80 (Chan & Neece, 2018; Neece et al., 2019). Five studies included only mothers (Raulston et al., 2019; Singh, Lancioni, Winton, Fisher, et al., 2006; Singh et al., 2014; Singh et al., 2019; Singh et al., 2021). The remaining studies included a smaller number of fathers compared to mothers. McGregor et al. (2020) did not specify the ratio of mothers to fathers.

Five of the included studies offered parents MBI without any additional intervention (Chan and Neece, 2018; Jones et al., 2018; McGregor et al., 2020; Neece, 2014; Neece et al., 2019). In seven of the included studies, parents received training in cognitive-behavioural educational strategies in addition to MBI (Andrews et al., 2022; Raulston et al., 2019; Schwartzman et al., 2022; Singh et al., 2014; Singh et al., 2019; Singh et al., 2021; Weitlauf et al., 2022). The parents in the Rojas-Torres et al. study (2023) received psychoeducation sessions on autism. The parents in the Singh, Lancioni, Winton, Fisher, et al. study (2006) had access to additional interventions not specified in the article.

The 14 studies included in this review proposed different types of MBI: training based on acceptance and commitment therapy (ACT; Andrews et al., 2022), an intervention inspired

by the mindfulness-based stress reduction (MBSR) protocol (Chan & Neece, 2018; McGregor et al., 2020; Neece, 2014; Neece et al., 2019; Schwartzman et al., 2022; Weitlauf et al., 2022), an intervention called mindfulness-based well-being for parents (MBW-P; Jones et al., 2018), mindfulness-based positive behaviour support (MBPBS; Singh et al., 2014; Singh et al., 2019: Singh et al., 2021), the mindfulness parenting programme (Rojas-Torres et al., 2023), and a formal meditation practice whose protocol was specially developed for the study (Raulston et al., 2019; Singh, Lancioni, Winton, Fisher, et al., 2006). All 14 included studies were manualized, and eight proposed an assessment of implementation fidelity (Andrews et al., 2022; Chan & Neece, 2018; Neece et al., 2019; Raulston et al., 2019; Singh et al., 2014; Singh et al., 2019; Singh et al., 2021; Weitlauf et al., 2022). The number of MBI sessions used in the 14 studies ranged from four (Andrews et al., 2022) to 12 (Singh, Lancioni, Winton, Fisher, et al., 2006), with durations from two days (Andrews et al., 2022) to 12 weeks (Singh, Lancioni, Winton, Fisher, et al., 2006). The sessions lasted from five minutes (Andrews et al., 2022) to one day (Singh et al., 2014; Singh et al., 2019; Singh et al., 2021) and were offered either individually (Andrews et al., 2022; Raulston et al., 2019; Singh, Lancioni, Winton, Fisher, et al., 2006; Singh et al., 2014; Weitlauf et al., 2022) or in a parent group (Chan & Neece, 2018; Jones et al., 2018; McGregor et al., 2020; Neece, 2014; Neece et al., 2019; Rojas-Torres et al., 2023; Schwartzman et al., 2022; Singh et al., 2014; Singh et al., 2019; Singh et al., 2021). Three of the MBIs were delivered remotely, either for all participants (Andrews et al., 2022), some of the participants (Singh et al., 2021), or all participants for only one session (Rojas-Torres et al., 2023). Finally, all the MBIs included a home meditation practice for parents.

Of the 14 included studies, three involved an RCT (Schwartzman et al., 2022; Singh et al., 2021; Weitlauf et al., 2022). The remaining involved a multiple baseline design (Andrews et al., 2022; Raulston et al., 2019; Singh, Lancioni, Winton, Fisher, et al., 2006; Singh et al., 2014), a wait-list control group design (Chan & Neece, 2018; McGregor et al., 2020; Neece,

2014; Neece et al., 2019; Rojas-Torres et al., 2023), a pre/post-test design (Jones et al., 2018), or an equivalent diagnostic two-group design (Singh et al., 2019). Seven studies included follow-ups from one month (Andrews et al., 2022) to three years (Singh et al., 2021), including one in which the follow-up data were not processed (McGregor et al., 2020).

Variables studied

All the studies included in this review focused on assessing challenging behaviours in autistic children, except for those by Rojas-Torres et al. (2023) and Weitlauf et al. (2022). The former assessed the perceived severity of autism signs using the autism impact measure (AIM) while the latter targeted the core features of autism, cognitive level, and adaptive behaviour, assessed using the Autism Diagnostic Observation Schedule, Second Edition (ADOS-2), Mullen Scales of Early Learning, and the Vineland-II, respectively. The challenging behaviours of autistic children were assessed using observations of behaviours targeted by the authors (Andrews et al., 2022; Singh, Lancioni, Winton, Fisher, et al., 2006; Singh et al., 2014; Singh et al., 2019; Singh et al., 2021), or using standardised tools, such as the Child Behaviour Checklist (CBCL) (Chan & Neece, 2018; McGregor et al., 2020; Neece, 2014; Neece et al., 2019; Raulston et al., 2019), the Strengths and Difficulties Questionnaire (SDQ; Jones et al., 2018; Schwartzman et al., 2022), or the Aberrant Behaviour Checklist, Second Edition (ABC-2; Schwartzman et al., 2022). All measurements were conducted solely by the parents, except in the case of Andrews et al. (2022), where the experimenter also participated in the assessment. Four studies also used the father as a second independent assessor in addition to the mother (Singh, Lancioni, Winton, Fisher, et al., 2006; Singh et al., 2014; Singh et al., 2019; Singh et al., 2021). Finally, using the Vineland-II, Jones et al. (2018) also assessed the adaptive behaviour of the children in their study, and Schwartzman et al. (2022) also assessed the children's social responsiveness, using the Social Responsiveness Scale, Second Edition (SRS-2).

Intervention-related children's outcomes

The children's behaviour showed significant improvement (see Table 3). Overall, Andrews et al. (2022) observed a decrease in the frequency and average severity of challenging behaviours between baseline, intervention, and follow-up for most children in their study. Chan and Neece (2018) and Neece et al. (2019) identified a significant decrease in withdrawal and attention problems between baseline and second assessment for children in the treatment group. In addition, the scores for somatic complaints, withdrawal, attention problems, and aggressive behaviour at the six-month follow-up were significantly lower than at baseline. In McGregor et al. (2020), children whose parents were in the treatment group showed a significantly greater reduction in challenging behaviours compared to children in the control group. In Neece (2014), at the second assessment, the children in the treatment group showed significantly fewer signs of hyperactivity compared to those in the control group. In their study, Raulston et al. (2019) observed a moderate association between the intervention and a decrease in children's challenging behaviours. The treatment group in Schwartzman et al. (2022) showed a significant decrease in children's total behavioural difficulties, emotional problems, and inappropriate speech compared with the control group; in addition, treatment-related gains in parents' perceptions of their children's behaviours were maintained at eight weeks.

In studies by Singh, Lancioni, Winton, Fisher, et al. (2006), Singh et al. (2014), and Singh et al. (2019), the average occurrence of three target behaviours decreased significantly following intervention. In all three conditions of Singh et al.'s (2021) study, the occurrence of children's aggressive and disruptive behaviours decreased significantly. Additionally, compliance increased significantly following intervention, with the most significant reductions being in the MBPBS condition, then the mindfulness (MB) and positive behaviour support (PBS) conditions. These changes were maintained three years after the intervention. Finally, following intervention, only Jones et al. (2018) found no significant reduction in behaviour

problems or increase in prosocial behaviours in the children in their study. Similarly, Weitlauf et al. (2022) observed no significant differences between the two treatment groups (P-ESDM condition and P-ESDM + MBSR condition) regarding autism signs, cognitive level, and adaptive behaviour in the children in their study. Rojas-Torres et al. (2023) did not observe changes in the perceived severity of signs across the measures.

Methodological quality and levels of evidence

Methodological quality scores and levels of evidence are presented in Table 2. The assessment of methodological quality using STROBE guidelines ranged from 71% (Rojas-Torres et al., 2023) to 95% (Schwartzman et al., 2022). The level of evidence, determined using NHMRC guidelines, ranged from Level II for the three RCTs (Schwartzman et al., 2022; Singh et al., 2021; Weitlauf et al., 2022) to Level III-3 (Andrews et al., 2022; Jones et al., 2018; Raulston et al., 2019; Singh, Lancioni, Winton, Fisher, et al., 2006; Singh et al., 2014; Singh et al., 2019).

Risk of bias assessment of RCT studies

Finally, the risk of bias inherent in the RCT studies is presented in Table 4. Weitlauf et al. (2022) had the lowest risk of bias concerns while the highest risk was found in Schwartzman et al. (2022) and Singh et al. (2021).

Discussion

This systematic review provides preliminary data on how MBIs offered exclusively to parents indirectly affect their autistic children.

Most studies included in this review (12 out of 14) targeted a particular clinical specifier of autism in children: challenging behaviours. Of these 12 studies, 11 showed a significant reduction in challenging behaviours in autistic children following the implementation of MBIs for their parents. The literature notes a high prevalence rate of challenging behaviours among

autistic individuals (Hattier et al., 2011; Matson & Nebel-Schwalm, 2007). Challenging behaviours are also negatively associated with QoL in both adults (Chiang & Wineman, 2014) and autistic children (Chuang et al., 2014; Delahaye et al., 2014; Kuhlthau et al., 2010; Kuhlthau et al., 2018). Challenging behaviours have also been identified as a factor in low QoL among parents of autistic children (Vasilopoulou & Nisbet, 2016). Such behaviours exacerbate parents' perceived stress (Barroso et al., 2017), which in turn impacts their educational abilities (Bonis, 2016) and increases the child's challenging behaviours (Hastings, 2003). For the parents of autistic children, challenging behaviours are considered the most stressful element, even more than the core signs of autism (Hastings et al., 2005). It is therefore crucial to offer interventions to families affected by autism to help parents better manage their children's challenging behaviours. However, the effectiveness of the currently available interventions remains unclear (Zwilling et al., 2022). The results of the present review suggest that MBIs aimed at the parents of autistic children provide a viable alternative that could help reduce their children's challenging behaviours and thus improve QoL for children and parents alike. The results align with those of previous studies showing the relevance of MBIs for the well-being of parents of autistic children (Chua and Shorey, 2022; Merriman et al., 2020; Yu et al., 2019).

The results of this review also complement those of previous studies showing a link between MBIs offered to both parents and their autistic children and a significant reduction in challenging behaviours in these children, as measured using the CBCL (Beck et al., 2022; Bögels et al., 2008; Hwang et al., 2015; Ridderinkhof et al., 2018; Shaffer et al., 2019) or the ABC (Shaffer et al., 2019; Shaffer et al., 2023). It would therefore seem that MBIs offered solely to parents could achieve similar results to MBIs offered to both parents and their autistic children. Comparative studies would shed further light on the added value of MBIs addressed to the parent–child dyad, compared with those offered solely to parents.

One question raised by the results of the present review concerns the appropriateness of using interventions in addition to the MBIs addressed to parents (which are aimed at decreasing their children's challenging behaviours). Five studies included in this review offered parents an MBI without any other intervention (Chan & Neece, 2018; Jones et al., 2018; McGregor et al., 2020; Neece, 2014; Neece et al., 2019) and one of these studies (Jones et al., 2018) showed no significant relationship between the MBI addressed to parents and their children's challenging behaviours. Rayan and Ahmad (2017) suggested that in addition to MBIs, parents of autistic children may need other interventions, such as skills-based training on how to deal with their child's challenging behaviours. However, other authors note that these interventions, which are mainly behavioural, are laborious to implement (Koerting et al., 2013). As a result, parents may struggle to apply them consistently, potentially leading to intervention failure and increased parental stress (Singh et al., 2014). Furthermore, these behavioural interventions, unlike MBIs, are less likely to produce substantial personal transformations in the parent (Singh, Lancioni, Winton, Fisher, et al., 2006).

Finally, the findings of this research suggest that the positive effects of MBIs on the stress levels of parents of autistic children, as measured in the included studies, could be transferred to their children by helping them reduce their challenging behaviours. These findings align with those of similar studies involving children with other conditions, such as attention deficit hyperactivity disorder (ADHD; Lee et al., 2022), conduct disorder, oppositional defiant disorder, anxiety disorder, or learning disability (Burgdorf et al., 2019). Although the interpersonal mechanisms through which the positive effects of mindfulness are transferred from parents to their children remain poorly understood (Khoury et al., 2023), several hypotheses have been proposed to explain such effects (Singh, Lancioni, Winton, Fisher, et al., 2006). For instance, the nonjudgmental acceptance of children's behaviours transforms the therapeutic environment into one that promotes positive behavioural changes

without directly targeting specific behaviours. It has been hypothesised that in typically developing children, the parents' emotional management skills may influence the children's emotional regulation abilities, notably through an observational learning mechanism (Morris et al., 2007). On the other hand, in autistic children, a supportive parenting style and less excessive involvement are associated with better emotion regulation (Ostfeld-Etzion et al., 2016).

The literature highlights the difficulties experienced by autistic children in regulating their emotions (Cai et al., 2018), which involves controlling, evaluating, and modifying their emotional responses to environmental demands (Thompson, 1994). This emotional dysregulation, which is considered more prevalent in autistic children than in typically developing children (Mallise et al., 2020), plays a central role in the adjustment difficulties faced by autistic children (Mazefsky & White, 2014). It is a key factor in triggering challenging behaviours (Korbut et al., 2020) regardless of intelligence level (Berkovits et al., 2017). These emotional difficulties provide a clearer explanation for anger, loss of control, aggression or self-mutilation than do associated psychiatric diagnoses (Mazefsky & White, 2014) or the severity of autism signs (Korbut et al., 2020). For example, the self-injury behaviours often observed in autistic people are thought to have a regulatory function for negatively valenced affective states (Moseley et al., 2019). In other words, these behaviours enable autistic people to escape certain emotional states (Chapman et al., 2006).

Better emotional regulation is associated with a reduction in challenging behaviours in autistic children (Wilson et al., 2013), leading to higher QoL (Oakley et al., 2021). Therefore, some authors recommend supporting the parents of autistic children by providing emotional scaffolding strategies to help them assist their child in better regulating their emotions (Crowell et al., 2019). This type of parental support is increasingly relevant, as emotional support is one of the most important needs expressed by parents of autistic children (Derguy et al., 2015; Boshoff et al., 2019). When confronted with challenging behaviour, parents may experience

negatively valenced emotional states that can act as antecedents to coercive reactions towards their child (Chang et al., 2003; Lindsey & Barry, 2018). This may inadvertently escalate the child's negative affect (Omer, 2017), thus influencing new escape behaviours (Maljaars et al. 2014). Mindfulness meditation, as a tool for acceptance defined as openness to emotions (Hayes et al., 2004), can help parents mitigate overreactions to their emotional states. This could potentially decrease negative parent–child interactions and reduce the risk of escalation (Singh et al., 2010). Furthermore, developing acceptance could help parents more effectively manage their apprehensions when implementing extinction procedures, such as ignoring consequence-maintained challenging behaviour (Raulston et al., 2019).

As Thomas et al. pointed out as early as 1968, an extreme temperament in a child only leads to adjustment problems when parents respond with energetic confrontation (overreaction), or conversely, capitulation (extinction failure). Finally, parental acceptance may also enable them to respond more effectively to their child's needs (Duncan et al., 2009; Parent et al., 2016). Mindfulness practice, by giving the parent a "beginner's eye" on their child's behaviour, could allow them to spontaneously intuit possibilities they had not previously envisaged (Suzuki, 1970). This could prompt them to adjust their conditioned parenting habits and engage in novel responses. Parents can come to perceive autism less as a clinical construct and more as a human variant. This shift may lead them to let go of some of their expectations of normality (Poquérusse et al., 2021).

Limitations

While the studies included in this review indicate a positive trend, these results cannot be generalised due to their varied methodological quality and low to intermediate levels of evidence. Inadequate reporting makes it difficult to synthesise data. Likewise, the risks of bias for the three RCT studies in this review are mostly high or uncertain, resulting in unconvincing evidence. The scope of this systematic review is also limited by the small number of participants

in some of the included studies, the diverse research methodologies and study designs employed, the variety of tools used to assess child-related variables, the presence of interventions additional to MBIs in more than half of the included studies, and the wide variations between the different MBIs offered to parents, which may partly explain the variability between the studies. It should also be noted that in eight studies, there is a marked absence of any implementation fidelity assessment. All 14 studies included in this review are represented by just eight research teams. Furthermore, the collection of data by the parents themselves in most of the included studies could call into question the reliability of the assessments, since parental stress can influence evaluations (Schwartzman et al., 2021). Nevertheless, this review sheds light on the quality of the child–parent relationship and the risk of dysfunctional interactions between child and parent (Duthu et al., 2008). This implies that measures taken by parents and clinicians can be complementary.

This systematic review also has several methodological limitations. Firstly, a limited number of studies were identified, all of which are written in English or French, which limits the generalisability of the results to the target population. Secondly, although the protocol registration prior to review starting is done for transparency of research methods used, the protocol was not registered, as one of the authors had already initiated literature searches. Thirdly, only one author screened the titles and abstracts during the initial phase. This shortcoming may have partially influenced the identification of articles. However, this issue is mitigated by the small number of available articles, which limits the risk of false negatives. Additionally, all the selected articles were fully read by two of the authors. Finally, although the discrepancy concerning the evaluation of the level of evidence was discussed with a third author to reach a consensus, the low rate of agreement (62%) was not improved beforehand by a reviewer's training.

Conclusion and perspectives

Mindfulness and acceptance are important parenting support processes that clinicians can offer to autistic children and their parents (Jones et al. 2014). However, clinicians must remain vigilant for the possible adverse effects (such as transient distress) of programmes drawing on these processes (Britton et al., 2021).

Further research is needed to better understand the mechanisms underlying the indirect effects on autistic children of MBIs addressed to their parents. One approach to understanding these mechanisms could involve using behavioural analytic methods to capture changes in the behaviours of both parents and children (Singh et al., 2023). More experimental studies are needed on the association between MBIs for the parents of autistic children and child outcomes. In particular, these studies should focus on the impact of MBIs on children's QoL, which is the "gold standard" outcome for autism interventions. Researchers should also be alert to the homogeneity (or lack of homogeneity) of MBIs across studies while isolating MBIs from other types of interventions. The use of challenging behaviour assessments taken by parents as well as clinicians would enable us to better understand whether the behavioural problems are objectively less significant or whether it is only the parents' perceptions of their child's challenging behaviour that are changing. Finally, researchers should also focus on measuring and adapting their intervention's implementation processes to increase the reliability of its results.

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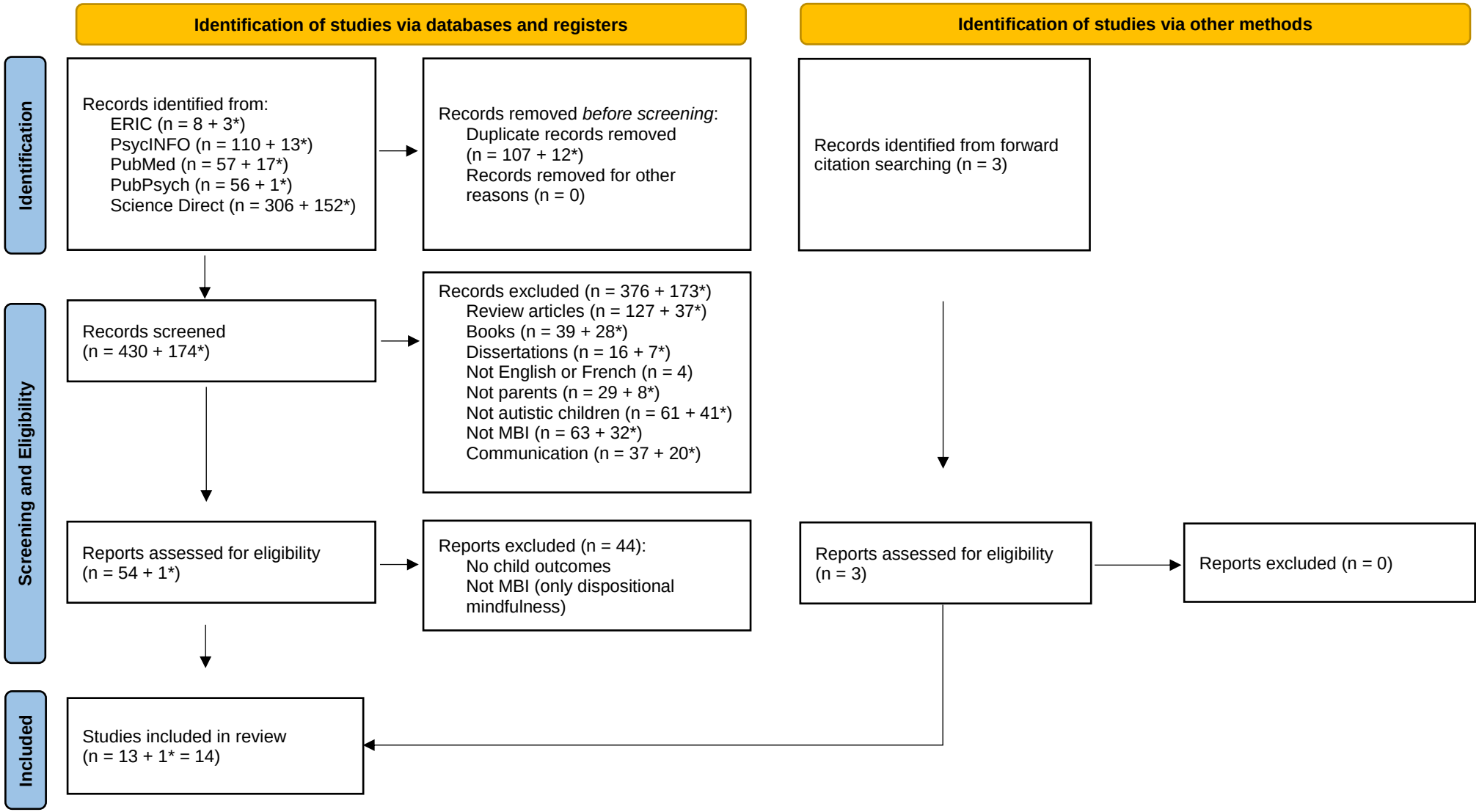

Figure 1. PRISMA 2020 flow diagram (*updated database searches limiting to the period between January 2023 and April 2024)

Table 1. Study characteristics

Citation and location	Number, gender and age range of parents, mean (SD)	Diagnostic, number, gender and age range of children, mean (SD)	Mindfulness-based interventions	Additional interventions	Study design	Implementation process assessment
Andrews et al. (2022) USA	3 mothers and 1 transgender father 35–51 years	AS[1] (n = 4) 1 girl and 3 boys 6–11 years	4 sessions of 5 minutes each over 2 days. The mindfulness activities were part of the larger overall ACT+ RUBI[2] treatment package (2-hr online individual training).	Behaviour parent training (the RUBI Autism Network).	Concurrent multiple baseline across participants (participants were randomly assigned in three tiers).	Responsiveness to ACT[3] was measured by the percentage of demonstrated objectives during the ACT portion of the training. This was scored as either a 2 (the parent correctly demonstrated the learning objective in full), 1 (the parent partially demonstrated the learning objective), 0 (the parent did not demonstrate the learning objective), or not applicable (the objective was not covered in the session). All parents demonstrated 100% responsiveness to ACT and ACT homework.

[1] Autism Spectrum.
[2] Research Units in Behavioural Intervention.
[3] Acceptance and Commitment Therapy.

Citation and location	Number, gender and age range of parents, mean (SD)	Diagnostic, number, gender and age range of children, mean (SD)	Mindfulness-based interventions	Additional interventions	Study design	Implementation process assessment
Chan & Neece (2018) Neece et al. (2019) USA	80 parents 96.3% mothers 37.21 (7.22)	Developmental delay 63.6% on the AS. 71.25% boys 2.5–5 years 4.18 (1.01)	MBSR[4]. 8 weekly 2-hr sessions, a day-long 6-hr meditation retreat after the sixth session, and daily home practice based on audio CDs with instructions.	/	Waitlist-control design (39 and 41 parents were randomly assigned respectively to the treatment or waitlist-control group).	Two trained research assistants assessed treatment fidelity each session using a treatment fidelity checklist developed for this project. Inter-rater reliability was high with 95.04% agreement between the two raters. In the treatment group, 73.27% (SD = 16.60) of the treatment content items were covered, compared to 78.03% in the control group (SD = 9.93), t(34) = −1.046, p = .305.
Jones et al. (2018) UK	18 mothers and 3 fathers (including 1 mother–father couple) 45 (6.48)	AS (n = 16) Down's syndrome (n = 1) Cerebral palsy (n = 2) Intellectual disorder (n = 2) 8 girls and 13 boys 4–16 years 10.53 (3.16)	MBW-P[5]. 8 weekly 2-hr sessions and daily home short practice from 5 to 20 min based on audio CDs instructions.	/	A pilot pre-post comparison of treatment.	/

[4] Mindfulness-Based Stress Reduction.
[5] Mindfulness Based Well-Being for Parents.

Citation and location	Number, gender and age range of parents, mean (SD)	Diagnostic, number, gender and age range of children, mean (SD)	Mindfulness-based interventions	Additional interventions	Study design	Implementation process assessment
McGregor et al. (2020) USA	Treatment group: 39 parents 37.71 (8.38) Control group: 41 parents 36.76 (6.06)	80 children with developmental delays and AS Treatment group: n = 39 (56.40% AS) 66.70% male 4.01 (0.94) Control group: n = 41 (65.90% AS) 75.60% male 4.34 (1.05)	MBSR. 8 weekly 2-hr sessions, a day-long meditation retreat, and daily home practice based on audio CDs with instruction.	/	Waitlist-control design (39 and 41 parents were randomly assigned to the immediate treatment or wait-list-control group, respectively).	/
Neece (2014) USA	46 parents 78.3% mothers Treatment group: 21 parents 34.15 (8.71) Control group: 25 parents 36.40 (8.41)	Children with developmental delays, 84.8% on the AS Treatment group: 66.70% boys 3.59 (0.88) Control group: 76.50% boys 4.12 (0.90)	MBSR. 8 weekly 2-hr sessions, a day-long 6-hr meditation retreat after the sixth session, and daily home practice based on audio CDs with instructions.	/	Waitlist-control design (21 and 25 parents were randomly assigned to the immediate treatment or wait-list-control group, respectively)	/
Raulston et al. (2019) USA	3 mothers 31–34 years	AS (n = 3) 1 girl and 2 boys 4 years 4 months – 8 years 7 months	1 weekly 1.5-hr training sessions with homework in between. Formal mindfulness meditation practice (non-judgemental awareness or attention to internal and external experiences) + homework (listening to sound meditations on a mobile app).	Behaviour parent training.	Single-case concurrent multiple baseline across mother–child dyad design.	An independent observer viewed screencasts to assess treatment fidelity using a task analysis for 33% of sessions. Mean treatment fidelity was 100%.

Citation and location	Number, gender and age range of parents, mean (SD)	Diagnostic, number, gender and age range of children, mean (SD)	Mindfulness-based interventions	Additional interventions	Study design	Implementation process assessment
Rojas-Torres et al. (2023) Spain	Group A: 7 parents Fathers: 48-51 49 (1.73) Mothers: 41-47 43.5 (2.64) Group B: 7 parents Fathers: 30-48 40.25 (7.5) Mothers: 30-48 39.57 (7.5)	AS (n = 8) 1 girl and 7 boys Group A: 36– 46 months 41 (6) Group B: 48– 58 months 51 (1.5)	8 weekly 1.5-hr Mindfulness Parenting Programme sessions with homework in between (15-30 minutes per day). Each session was divided into two parts: development and training in Mindfulness exercises, and developing psychoeducation.	Psychoeducation sessions on AS. Children were cared for by a group of volunteer students guided by a member of the research team. During this period of time the children engaged in non-directive play activities on the floor with the intention of improving communication and social interaction.	Waitlist-control group design (Parents Group A and Group B assigned to the immediate intervention or wait-list-control group, respectively. Allocation of participants to the groups was not random and was determined according to the couple's possibilities of reconciling work and work schedules)	/

Citation and location	Number, gender and age range of parents, mean (SD)	Diagnostic, number, gender and age range of children, mean (SD)	Mindfulness-based interventions	Additional interventions	Study design	Implementation process assessment
Schwartzman et al. (2022) USA	Treatment group: 17 parents 13 mothers 39.5 (3.7) Control group: 17 parents 13 mothers 42.5 (5.4)	Treatment group: AS (n = 17) 14 male 6.6 (1.8) Control group: AS (n = 17) 14 male 6.7 (1.9)	AMOR[6] Method. 8 weekly 1.5-hr group sessions (6–9 parents). The content for 2 of 8 sessions was based on treatments, including mindfulness from MBSR and values and committed actions from ACT. At the start of each session, parents engaged in a brief meditation exercise as a group and exercises included: (a) self-compassion break, (b) mindful breathing from MBSR, or (c) *Leaves on a Stream* from ACT.	The AMOR method also includes acceptance, optimism and resilience. The majority of sessions utilised principles of CBT[7], such as psychoeducation, behavioural activation, identifying cognitive distortions, cognitive restructuring, and weekly homework assignments and review.	RCT[8] of two parallel groups: immediate treatment (AMOR) and DTG[9]	/

[6] Acceptance, Mindfulness, Optimism, Resilience.
[7] Cognitive Behavioural Therapy.
[8] Randomised Controlled Trial.
[9] Delayed Treatment Group.

Citation and location	Number, gender and age range of parents, mean (SD)	Diagnostic, number, gender and age range of children, mean (SD)	Mindfulness-based interventions	Additional interventions	Study design	Implementation process assessment
Singh et al. (2006b) USA	3 mothers 24–33 years	AS (n = 3) 4 years 5 months – 6 years 1 month	Mindfulness Parent Training Programme. 12 individual 2-hr sessions (3 sessions per week at Weeks 3, 6, 9 and 12). During the initial session, the senior investigator explained the details of the training and the philosophy of mindfulness. The mothers were taught meditation methods to enhance their mindfulness, and exercises to help them practice mindfulness during their interactions with their children. Mindfulness Practice Phase: This phase immediately followed the mindfulness training phase and lasted 52 weeks. The mothers were requested to continue with all the mindfulness exercises and use all their mindfulness skills in interactions with their children (homework).	/	Multiple baseline across subjects (parent–child dyad design).	/

Citation and location	Number, gender and age range of parents, mean (SD)	Diagnostic, number, gender and age range of children, mean (SD)	Mindfulness-based interventions	Additional interventions	Study design	Implementation process assessment
Singh et al. (2014) USA	3 mothers 37–43 years	Asperger (n = 3) 3 boys 15–19 years	MB component of the MBPBS[10]. A month before the beginning of baseline, mothers were taught basic Samatha meditation during a 2-hr individual pre-training session. In addition, the mothers were taught Kinhin and insight meditations. Following the pre-training, they were instructed to develop a personal meditation practice, beginning with a few minutes each day and incrementally increasing their practice until they reached 20–30 min of daily practice. By the beginning of the baseline phase, each mother had practised the three foundational meditations daily for 4 weeks and was required to continue with these meditations during this phase. MB component training: 8 weekly 1-day individual training sessions. The training included instruction on the four immeasurables (loving-kindness, compassion, joy, and equanimity), the three poisons (attachment, anger, and ignorance), Shenpa and compassionate abiding, and meditation on the soles of the feet. MB component practice: Mothers were requested to mindfully utilise the PBS techniques in their interactions with their children.	PBS components of the MBPBS: Throughout the MBPBS training, mothers were taught how to use PBS within the context of mindfulness practices (the mothers had been taught the basics of PBS procedures when their children were between 6 and 8 years of age).	Multiple baseline design across participants, with three phases: baseline, mindfulness training, and mindfulness practice.	Teaching sessions were videotaped, and 6 randomly chosen sessions, stratified by mothers, were assessed for fidelity of training by another qualified mindfulness trainer. The fidelity of mindfulness training was rated at 100%. Training adherence: The daily logs showed that the three mothers were highly diligent in their meditation practice. On average, they engaged in 5–10 min of meditation practice, first thing in the morning, every day during the first week of pre-training. They gradually increased their meditation sessions to 30–40 min a day by the end of the MBPBS training phase. They were able to maintain and increase their daily meditations for up to an hour each day by the end of the MBPBS practice phase. On average, the mothers sat for 93% of the days during the MBPBS practice phase, for from 45–60 min.

[10] Mindfulness-Based Positive Behavior Support.

Citation and location	Number, gender and age range of parents, mean (SD)	Diagnostic, number, gender and age range of children, mean (SD)	Mindfulness-based interventions	Additional interventions	Study design	Implementation process assessment
Singh et al. (2019) USA	AS group: 47 mothers 39–59 years 47.91 ID group: 45 mothers 38–55 years 48.82	AS (n = 47) 66% male 13–17 years 15.15 ID (n = 45) 67% male 13–17 years 15.56	3-day MBPBS protocol in the intervention phase. The first day was devoted to training and practice in mindfulness procedures that included 3 basic meditations, 4 immeasurables, 5 hindrances, 3 poisons, beginner's mind, and ethical precepts. It also covered issues related to home practice, daily logs of meditation, journaling, and data collection. The second day was devoted to developing PBIS[11] plans. The third day was devoted to a review and practice of daily meditation practices for the mothers, day-to-day implementation of an integrated MB positive behavioural intervention with their child, living mindfully with their family on a daily basis, informal mindfulness practices, collection and interpretation of outcome data, and frequently asked questions. Following the 3-day training, the mothers implemented the MBPBS procedures in daily life.	PBIS plans.	Equivalent diagnostic 2-group design, with a control and intervention condition. In a 40-wk study, the first 10 weeks constituted a control phase during which no additional procedures were instituted, followed by a 3-day training in MBPBS for both groups, and 30 weeks of implementation. The training was the same for both groups.	The training was videotaped for 10–12 min per hour per day during random segments of each hour of training. 24 videotaped segments were rated for fidelity of MBPBS training by two independent raters, one a mindfulness expert and the other an expert in PBS. The fidelity of MBPBS training was rated at 100% for meditation instructions and principles.

[11] Positive Behavior Intervention and Support.

Citation and location	Number, gender and age range of parents, mean (SD)	Diagnostic, number, gender and age range of children, mean (SD)	Mindfulness-based interventions	Additional interventions	Study design	Implementation process assessment
Singh et al. (2021) USA	MBPBS condition: 65 mothers 33–49 years 40.03 (4.08) MB condition: 65 mothers 29–46 years 36.74 (4.63) PBS condition: 65 mothers 28–48 years 38.09 (4.83)	MBPBS condition: AS (n = 65) 76.92% male 9–14 years 12.17 (1.62) MB condition: AS (n = 65) 72.31% male 9–14 years 11.80 (1.65) PBS condition: AS (n = 65) 73.85% male 9–14 years 11.95 (1.68)	MBPBS condition: 3-day stepped-care version of the MBPBS protocol for teaching mindfulness, related meditation practices, and guiding principles of PBS (the training was provided in small groups at locations close to the participants or via telemedicine). MB component of the MBPBS: mothers were taught mindfulness and related meditation practices from the 3-day stepped-care version of the MBPBS protocol. Mothers were encouraged to engage in formal meditation for at least 20 min a day.	PBS components of the MBPBS: Parents learned the PBS principles by working through case examples, and by developing PBS plans for their own children.	3-arm RCT, with a 10-week pre-intervention control condition. The experimental condition included a 3-day training in each active experimental condition (i.e. MBPBS, MB, and PBS). The training in each experimental condition was followed by 30 weeks of implementation.	Training provided in all 3 experimental conditions was videotaped for 15 min each hour per day during random segments of the training. Two independent raters, trained in both mindfulness and PBS, rated 24 videotaped segments for fidelity assessment across the 3 experimental conditions. Two aspects of fidelity were assessed: structural fidelity (i.e. what is being taught) and process fidelity (i.e. how the contents are being taught). Both aspects of fidelity were assessed at 100% for all three experimental conditions.
Weitlauf et al. (2022) USA	P-ESDM[12] condition: 31 parents 87% mothers 33.79 (5.53) P-ESDM + MBSR condition: 30 parents 87% mothers 33.27 (6.24)	P-ESDM condition: AS (n = 31) 81% male 2.46 (1.64) P-ESDM + MBSR condition: AS (n = 30) 83% male 2.30 (0.45)	MBSR. 6 sessions, 1 hr per week.	P-ESDM. 12 consecutive weekly clinic-based sessions. Each lasted approximately 1 hr and included the child, one parent, and a therapist. Speech, occupational and ABA[13] therapy in a variable way depending on the child.	Longitudinal RCT of P-ESDM with and without MBSR.	Fidelity of the MBSR intervention was tracked using fidelity checklists that therapists completed at the end of each visit. The fidelity of covering the required topics across all completed sessions was 97.9%.

[12] Parent-Implemented Early Start Denver Model.
[13] Applied Behaviour Analysis.

Table 2. Methodological quality scores and levels of evidence

Citation and location	Child outcomes (measures)	Follow-up	Results	STROBE rating (%)	NHMRC level of evidence
Andrews et al. (2022) USA	Children's rate per minute of challenging behaviours (measured during target routines by the experimenter). Frequency and severity of challenging behaviours (4-point rating scale measured by parents each day).	1 week and 1 month	Children's rate per minute of CB[14] for all 4 children. During baseline: (*M* = 0.1, *SD* = 0.2); (*M* = 0.5, *SD* = 0.5); (*M* = 1.4, *SD* = 0.9); (*M* = 0.4, *SD* = 0.5). During intervention: (*M* = 0.8, *SD* = 0.5); (*M* = 0.7, *SD* = 1.1); (*M* = 0.2, *SD* = 0.3); (*M* = 0.2, *SD* = 0.2). During the 1-wk FU[15]: increased CB (Child 1); at the low end of baseline range (Child 2 and 4); zero responses (Child 3). During the 1-mth FU: zero CB (Child 1); same level of CB (Child 2 and Child 4); increase CB (Child 3). Frequency of CB. Between baseline and intervention: CB decreased for each child. Between baseline and 1-wk FU: CB decreased (Child 1, 2, 3); increased CB (Child 4). At 1-mth FU: CB decreased (Child 1, 2, 4); increased CB return to baseline (Child 3). Severity of CB. Between baseline and intervention: CB decreased (Child 2, 3, 4); CB slight increase (Child 1) At 1-wk FU: CB decreased (Child 1, 2); no change for Child 3; slight increase returning to baseline (Child 4). At 1-mth FU: CB decreased (Child 1, 2, 4); CB increased (Child 3)	89	III-3

[14] Challenging Behavior.
[15] Follow-up.

Citation and location	Child outcomes (measures)	Follow-up	Results	STROBE rating (%)	NHMRC level of evidence
Chan & Neece (2018); Neece et al. (2019) USA	Parents rated child behavioural problems (CBCL[16] for ages 1.5–5 years).	6 months	Withdrawn significantly predicted by TG[17] × TI[18], $F(1, 65) = 4.51$, $p < .05$, partial $\eta^2 = .07$. Decrease in being withdrawn from baseline ($M = 6.19$, $SD = 2.62$) to second assessment ($M = 4.84$, $SD = 2.81$) for TG. AP[19] significantly predicted by TG × TI, $F(1, 65) = 10.67$, $p < .01$, partial $\eta^2 = .14$. Decrease in AP from baseline ($M = 5.41$, $SD = 2.60$) to second assessment ($M = 4.41$, $SD = 2.28$) for TG. TG × TI effect was marginally significant for emotionally reactive, $F(1, 65) = 2.88$, $p < .095$, partial $\eta^2 = .04$. Anxious/depressed, somatic complaints and aggressive behaviour not significantly predicted by the TG × TI ($p > .05$).	93 & 91	III-1
Jones et al. (2018) UK	Child's adaptive functioning (VABS-II[20], administered as a semi-structured interview). Children's prosocial behaviour and behavioural difficulties (SDQ[21]).	/	No significant change in child's behavioural problems or prosocial behaviour.	86	III-3
McGregor et al. (2020) USA	Parents rated child's behavioural problems. (Internalising Scale of the CBCL for ages 1.5–5 years).	6 months (unprocessed data)	Greater reductions in internalising problems in the MBSR TG compared to the waitlist-control group ($b = -5.71$, 95% CI [−10.55, −.87], $sr^2 = .04$, $p < .05$).	89	III-1

[16] Child Behavior Checklist.
[17] Treatment Group.
[18] Time interaction.
[19] Attention Problems.
[20] Vineland Adaptive Behavior Scales, Second Edition.
[21] Strengths and Difficulties Questionnaire.

Citation and location	Child outcomes (measures)	Follow-up	Results	STROBE rating (%)	NHMRC level of evidence
Neece (2014) USA	Child behavioural problems (CBCL for ages 1.5–5 years).	/	Significantly fewer ADHD[22] signs in the TG in the control group at the second assessment ($t = 2.27$, $p < 0.05$, $d = 0.85$), and marginally significant difference in attention signs ($t = 1.89$, $p = 0.69$, $d = 0.71$). Clinically significant reduction in ADHD signs for 28.9% of parents. Meaningful change in attention problems for 18.4% of parents.	93	III-1
Raulston et al. (2019) USA	Interview with parent about child's challenging behaviour (Externalising subscale from the CBCL).	/	Reduction in behavioural problems for the 3 children during the intervention (Hedges' $g = 0.24$).	86	III-3
Rojas-Torres et al. (2023) Spain	Parent perception of autism signs. (AIM[23]. It is a measure of frequency and impact of behaviors and symptoms characteristic of autism)	8-week follow-up	Parents' assessment of sign severity unchanged across the measures.	71	III-1
Schwartzman et al. (2022) USA	Parent perceptions of children: Strengths/prosocial behaviours and difficulties/problem behaviours of children (SDQ). SRS -2[24]. Type and severity of problem behaviour (ABC-2[25]).	8-week follow-up for AMOR parents only	More positive ratings of child's total difficulties (SDQ; $d = 1.06$, $p = 0.032$, 95% CI [− 3.871, 0.203]) and emotional problems (SDQ; $d = 1.55$, $p = 0.003$, 95% CI [− 2.190, − 0.475]), social communication deficits (SRS-2; $d = 0.88$, $p = 0.025$, 95% CI [− 6.771, − 1.479]), and inappropriate speech (ABC- 2; $d = 0.76$, $p = 0.043$, 95% CI [− 1.264, 0.514]) for AMOR group relative to the TG. No significant changes in the remaining subscales of the SDQ, SRS-2, or ABC-2 by TG. Maintenance of treatment gains of parent perceptions of children with AS on all measures. Significant decrease in parent ratings of child hyperactivity (SDQ).	95	II

[22] Attention Deficit Hyperactivity Disorder.
[23] Autism Impact Measure.
[24] Social Responsiveness Scale, Second Edition.
[25] Aberrant Behavior Checklist, Second Edition.

Citation and location	Child outcomes (measures)	Follow-up	Results	STROBE rating (%)	NHMRC level of evidence
Singh et al. (2006b) USA	3 behaviours were targeted for observation: aggression, noncompliance, and self-injury. Data were collected during the waking hours of each child when at home with mother, between 8 and 14 hrs each day. Each child's mother recorded the occurrence of each target behaviour, in real-time, on a Palm PDA[26]. Fathers collected data on a separate Palm PDA for 5 to 10 hrs each week, typically in the evenings and on weekends, to establish inter-rater agreement.	/	First parent–child dyad: Aggressive behaviours decreased from baseline (8.8) to training (7.4) to practice (0.9). Noncompliance behaviours decreased from baseline (53.6) to training (35.7) to practice (11.2). Second dyad: Aggressive behaviours decreased from baseline (17.1) to training (16.0) to practice (4.9). Noncompliance behaviours decreased from baseline (37.2) to training (32.9) to practice (11.8). Third dyad: Aggressive behaviours decreased from baseline (8.0) to training (7.2) to practice (1.1). Self-injurious behaviours decreased from baseline (10.4) to training (8.7) to practice (4.2).	75	III-3
Singh et al. (2014) USA	Three behaviours were targeted: incidents of aggression, incidents of disruptive behaviour, and compliance with mother's requests. (Data were collected at all times when the adolescent was at home and in the presence of their mother. Each mother collected data using an iPhone app during the three phases: baseline, MBPBS training, and MBPBS practice. The fathers served as reliability raters, collecting data using the same system as the mothers, but on their own iPhones, for an average of 3 hrs each week, typically in the evenings or weekends).	/	Decreased aggressive incidents and disruptive behaviours (Phi = 0.76, $p < 0.001$ and Phi = 0.93, $p < 0.001$, respectively). Increased in compliance percentage (Phi = 0.86, $p < 0.001$).	89	III-3

[26] Personal Digital Assistant.

Citation and location	Child outcomes (measures)	Follow-up	Results	STROBE rating (%)	NHMRC level of evidence
Singh et al. (2019) USA	Aggressive behaviour, disruptive behaviour and ompliance with mother's requests. (The mothers collected data on their adolescent's behaviour using an app that allowed recording of multiple events in real-time. On average, the mothers collected data for about 5 hrs during weekdays and about 8 hrs during weekends. To establish inter-rater agreement, fathers also collected data using the same system but independently of the mothers, for an average of 2 hrs each week, usually during evenings and weekends).	/	Decreased aggressive and disruptive behaviour from control to intervention phase (aggressive behaviour: phi = 0.71, $p < 0.001$; disruptive behaviour: phi = 0.86, $p < 0.001$). Aggressive behaviour decreased from control ($M = 14.00$, $SD = 2.31$) to intervention ($M = 3.33$, $SD = 3.92$). Disruptive behaviour decreased from control ($M = 38.80$, $SD = 7.47$) to intervention ($M = 9.20$, $SD = 8.25$). Percent compliance increased (phi = 0.86, $p < 0.001$) from control ($M = 20.10$, $SD = 2.85$) to intervention ($M = 55.83$, $SD = 22.50$).	86	III-3
Singh et al. (2021) USA	Aggressive behaviour, disruptive behaviour and compliance with mother's requests. Data were collected by the mothers using an app that enabled real-time recording of multiple events. The mothers collected event data when their children were at home or in community settings and in their presence. On average, data collection occurred for 4–6 hrs during the week and 7–9 hrs during weekends. Fathers independently collected data for an average of 2 hrs per week, during evenings and weekends to establish interobserver agreement.	3 years of post-intervention follow-up (variables monitored each year for 3 years)	Aggression and disruptive behaviour most to least significant reductions in MBPBS, MB, and PBS, respectively. Significant increases in compliance largest in the MBPBS, followed by MB, and PBS. Changes were maintained for 3 years post-intervention. When accounting for the effects of time and MBPBS, both MB and PBS were not significant predictors. Meditation time explained 29% of the reduction in the children's aggressive behaviour ($R^2 = 0.29$; $\beta = -0.88$; $p < 0.001$). When controlling for the effects of time and type of intervention, meditation practice explained 24% of disruptive behaviour decrease ($R^2 = 0.24$; $\beta = -0.79$; $p < 0.001$). When accounting for the effects of time and MBPBS, MB made a significant contribution of an additional 5% ($R^2 = 0.05$; $\beta = 0.26$; $p = 0.002$). When controlling for time and type of intervention, meditation made a significant contribution ($R^2 = 0.27$; $\beta = 0.85$; $p < 0.001$).	91	II

Citation and location	Child outcomes (measures)	Follow-up	Results	STROBE rating (%)	NHMRC level of evidence
Weitlauf et al. (2022) USA	Autism signs: ADOS-2[27]. Cognitive assessment: MSEL[28]. Adaptative functioning: VABS-II.	6 months	Scores on the ADOS-2 decreased from T1 to T2 (− 0.82 points; $p < 0.01$), but did not change from T2 to T3 (0.05 points; $p > 0.10$). Early learning composite scores of MSEL did not change from T1 to T2 (0.51 points, $p > 0.10$), but increased from T2 to T3 (3.94 points, $p < 0.01$). Raw scores increased for visual reception (T1–T2, 3.12 points, $p < 0.001$; T2–T3, 1.6 points, $p < 0.001$), receptive language (T1–T2, 6.00 points, $p < 0.001$; T2 to T3, 2.39 points, $p < 0.01$), expressive language (T1 to T2, 4.41 points, $p < 0.001$; T2 to T3, 3.5 points, $p < 0.001$), and fine motor (T1–T2, 2.09 points, $p < 0.001$; T2–T3, 2.49 points, $p < 0.001$). No significant change occurred in adaptive behaviour composite (T1–T2, 2.02 points, $p = 0.052$; T2–T3, − 0.40 points, $p > 0.10$).	93	II

[27] Autism Diagnostic Observation Schedule, Second Edition.
[28] Mullen Scales of Early Learning.

Table 3. Significant improvement in children's behaviour

Children's behaviour	n*
Reduced frequency and/or severity of challenging behaviours	10
Reduced withdrawal, attention problems and somatic complaints	2
Hyperactivity signs	1
Emotional problems and inappropriate speech	1

***** Number of studies.

Table 4. Risk of bias assessment for the RCT studies. The risk of bias was assessed as low (+), high (-) or uncertain (?)

Citation	Generation of sequence (selection bias)	Concealment of allocation sequence (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessors (detection bias)	Incomplete outcome data (attrition bias)	Selective outcome reporting (reporting bias)	Treatment implementation
Schwartzman et al. (2022)	+	+	?	-	+	?	-
Singh et al. (2021)	+	?	?	-	?	?	-
Weitlauf et al. (2022)	+	+	?	?	+	?	+

Author Note

This submission is an original systematic review paper. We certify that this manuscript will not be submitted elsewhere during the *Review Journal of Autism and Developmental Disorders* review process. We confirm that all named authors provided substantial contributions to this study and have reviewed and approved the final version of this manuscript. We also all agreed to the listing-order for authors.

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Conflicts of interest: The authors declare that they have no conflicts of interest.

Dear Editor,

We would like to thank the reviewers for their latest comments on our manuscript entitled "Mindfulness meditation-based interventions in parents of autistic children: A systematic review of effects on children". Their comments helped us improving our manuscript. We hope the proposed changes meet your/their expectations.
In this document, we have replied to each comment separately (our answers appear in blue). We have also made changes to the original manuscript, which are also highlighted in blue.

REVIEWER 1

1. Given that the review period was extended from 17 December 2022 to April 2024, this should stated on page 4 as: "An electronic search was conducted for the period 2006 to April 2024."
We added this information (see page 4).

This statement on page 5 should be omitted to avoid confusion: "We updated the database searches since the initial search date was more than 12 months from the intended publication date. The results of the updated searches, limited to the period between January 2023 and April 2024, were screened for potentially eligible studies." This statement will only make sense to the reviewers because new readers will not know that the extended date was requested by the reviewers.
We removed this sentence from the manuscript (see page 5).

2. In the Reference section, some of the article include the DOI but the majority of them do not. Be consistent.
We added the DOI.

REVIEWER 3

1. PP. 2, line 14 - In my opinion the phase "The particularities of autism" is not appropriate and should be revised.
We revised this phrase: "**Autism** can also impact the well-being of the family" (see page 2).

2. Pp. 3, lines 32-39 - The added definition of challenging behaviours is not clear. Please define externalising behaviours. See website of The Challenging Behaviours Foundation for definition that is accepted by family carers and people with challenging behaviours. https://www.challengingbehaviour.org.uk/
We revised the definition of challenging behaviours: "Challenging behaviours are defined as a range of behaviours that people with severe learning disabilities may display to get their needs met, such as hurting others, destructive behaviours or self-injurious behaviours" (see page 3).

3. Pp. 28, line 34-51 - Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines outline how systematic reviews should be reported, not conducted. Therefore, explanation provided by authors to justify only one person screening titles and abstracts is incorrect. For example, see Cochrane Handbook for Systematic Reviews of Interventions for guidelines on how systematic reviews should be conducted - https://community.cochrane.org/mecir-manual/standards-conduct-new-cochrane-intervention-reviews-c1-c75/performing-review-c24-c75/selecting-studies-include-review-c39-c42 Since authors have done full text review in duplicate, the paper is still publishable. However, they need to describe their rationale for only one person doing initial screening

which is against good practice guidelines for systematic review (irrespective of systematic review reporting guidelines). The rationale provided on page 28 is not correct.
We concur that the screening by a single author represents a deviation from the guidelines; it is only justifiable by our misreading of the guidelines. Therefore, we added the following paragraph to the limitation sections:
"Thirdly, only one author screened the titles and abstracts during the initial phase. This shortcoming may have partially influenced the identification of articles. However, this issue is mitigated by the small number of available articles, which limits the risk of false negatives. Additionally, all the selected articles were fully read by two of the authors." (see page 18).

4. Pp. 28, line 34-51 - Protocol registration prior to review starting is done for transparency of research methods used.
This was rephrased as follows: "Secondly, although the protocol registration prior to review starting is done for transparency of research methods used, the protocol was not registered, as one of the authors had already initiated literature searches" (see page 18).