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ORIGINAL PAPER

Family Mindfulness Training for Childhood ADHD: Short- and Long-Term Effects on Children, Fathers and Mothers

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Abstract

Objectives We evaluated the effects of the family mindfulness-based intervention (MBI) "MYmind" for children with ADHD and their parents, and examined child and parent predictors of child outcome.

Methods Using a pragmatic quasi-experimental waitlist design, children aged 7–19 years ($n = 167$), clinically referred with a DSM-IV ADHD diagnosis, and both their parents completed waitlist (average waiting time was 8 weeks), pre-test, post-test, 8-week, and 1-year follow-up measurements. MYmind consisted of eight weekly 1.5-h mindfulness-based group sessions for children and parallel for parents, and a follow-up session. We assessed children's and both parents' ADHD symptoms and other psychopathology, child executive function, parental stress, parental overreactivity, and mindful parenting.

Results Multilevel analyses revealed medium-to-large effect-sized reduced child ADHD symptoms between pre- and post-test, becoming stronger at follow-ups, while no waitlist effects occurred. Parents above the ADHD threshold improved on adult ADHD symptoms with similar sized effects. Children's and parents' other psychopathology, child executive function, parental overreactivity, and mindful parenting improved, whereas parental stress only improved at 1-year follow-up. Child age, child gender, ADHD medication, parental ADHD, and parent participation did not predict child outcome. Parent gender however interacted with parental ADHD to predict child outcome; children of fathers (but not mothers) above the ADHD threshold improved *more* than children of fathers below the ADHD threshold at post-test and at 8-week follow-up. Reduced paternal ADHD from pre- to post-test mediated this effect.

Conclusions Family MBI (MYmind) may reduce childhood ADHD and improve parental functioning. Fathers with ADHD symptoms appear important in helping offspring with ADHD.

Keywords ADHD · Mindfulness · MYmind · Mindful parenting · Fathers · Family MBI

Attention deficit and hyperactivity disorder (ADHD) is a prevalent disorder, affecting around 5% of the child and adult population worldwide (Getahun et al., 2013; Polanczyk et al., 2007; Wittchen et al., 2011). ADHD is the most common child mental disorder presenting for treatment (Wilens et al., 2002). Costs of illness in ADHD are high, with 6–7 times higher school costs alone for students with ADHD in the USA (Pelham et al., 2007; Robb et al., 2011). ADHD has severe consequences in childhood, negatively affecting school performance and dropout, social relationships, self-esteem, and quality of life (Danckaerts et al., 2010; Harpin, 2005). Childhood ADHD affects not only the child, but also the family, causing marital and family dysfunction, sibling relationship problems, parental stress, and negative parenting (Harpin, 2005).

ADHD runs in families, with an estimated 60% of children of which at least one parent has ADHD developing ADHD themselves (Minde et al., 2003) and parents of children with ADHD showing elevated (symptoms of) ADHD (Epstein et al., 2000). Moreover, 35% of children who have sibling(s) with ADHD were found to have ADHD

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themselves (Yang et al., 2011). In addition to a significant genetic contribution (Faraone et al., 2001), ADHD appears to result from a gene by environment interaction (Thapar et al., 2007). In fact, every child referred to mental health care because of ADHD was found to have an eightfold increased chance that one or both parents suffer from (symptoms of) ADHD (Thapar et al., 2007).

In a clinical paper, Weiss et al. (2000) described both the strengths and weaknesses of parents with ADHD. "Children may enjoy the enthusiasm, boundless energy, and playfulness of an ADHD parent. However, a parent with ADHD may find some of the tasks of parenting 'boring', such as feeding a baby or guiding an older child in doing homework" (p. 1059). They find it difficult to maintain their attention at supervising their child and keep track of them, overreact to tantrums, are stubborn, get into conflict more, interrupt their child's activities, and are (negatively) hypersensitive to the ADHD symptoms of their child(ren). Family environments constructed by parents may in important ways influence the etiology, maintenance, and coping with childhood ADHD. Raising a child with ADHD can be challenging and stressful, whereas parents need to provide structure and be consistent, clear, and calm, more so than parents of typically developing children (Sonuga-Barke et al., 2001). Families characterized by chaos, parental overreactivity, and lack of parental attention may increase the risk of ADHD (Sonuga-Barke, 2010), and this is exactly the behavior that parents with ADHD will more often display (Harvey et al., 2003; Johnston et al., 2012; Park et al., 2017). An observational study by Wymbs et al. (2015) indeed showed that child and adult ADHD behavior interacted synergistically to predict negative parenting and co-parenting, such that parents reporting greater ADHD symptoms were rated as (co) parenting more negatively when managing child ADHD-like behavior than parents with fewer ADHD symptoms or managing typical child behavior.

Fathers have been understudied in childhood ADHD as, mostly, only mothers participate in research and in parent training (Fabiano, 2007). This is unfortunate, as fathers are three times more likely to have the disorder than mothers (de Graaf et al., 2012). Research suggests that fathers may play an important role in the ADHD of their children, for better and worse. Paternal but not maternal rejective parenting was found to be more typical in families of children with ADHD than with anxiety disorders or control families (Maric & Bögels, 2019), and paternal but not maternal rejective parenting longitudinally increased child's ADHD (Lifford et al., 2008). Fathers, but not mothers, who interrupt or take over their child's activity and limit its influence on content and pace of play longitudinally compromised the development of self-regulation in children showing early signs of ADHD (Rogers et al., 2009).

Children with ADHD need and initiate more exciting, physical, rough-and-tumble play (Panksepp, 1998), and such challenging play is more fathers' than mothers' domain (Bögels & Phares, 2008). Differently from mother–child interactions that rely on mutual regulation of positive arousal during social exchanges of affect, fathers' interactions with their child rely on physical play, and are less social, less regulated, and more unpredictable (Feldman, 2003). Feldman suggests that fathers' rough-and-tumble play provides the child unique opportunities in regulating attention, emotion, and behavior in the face of outbursts of positive arousal that quickly build up and decline. As novelty or sensation seeking is characteristic for adult ADHD (Nilsson et al., 2019), fathers with ADHD may actually be better in initiating such *exciting* play and peak arousal than fathers without ADHD. The idea that children with ADHD need exciting play is in line with a study showing that hyperactivity in children with ADHD improves cognitive performance but worsens cognitive performance in typically developing children (Sarver et al., 2015). In turn, due to their attention problems, fathers with ADHD may be worse in the *sensitive* aspect of play, the extent to which the parent is "tuned in" to and responds appropriately to child's cues, interests, and mood.

Having discussed the prevalence of childhood ADHD, its severe impact including on the family, its family-based causes, and the role of parents and specifically fathers, we now discuss childhood ADHD treatment. Medication (methylphenidates) is advised as the treatment of choice in international guidelines (Pliszka, 2007; Taylor et al., 2004), as it is effective in the short term in reducing symptoms of inattention, hyperactivity, and impulsivity in over 70% of children with ADHD (Shaw et al., 2012; Storebø et al., 2015). It is the most widely prescribed drug (Swanson, 2003), with 10% of children in the USA and 5% in Europe using it, and 70% of diagnosed children (Getahun et al., 2013).

However, the use of medication for ADHD comes with disadvantages. Firstly, nearly two-thirds of child users reported severe short-term side effects, such as insomnia, loss of appetite, headache, anxiety, abdominal pain, and nervousness (Graham et al., 2011; Storebø et al., 2015). Secondly, reduced growth and weight in children who take long-term stimulant medication have been documented, and although rare, long-term effects on blood pressure, heart rate, and suicidal, psychotic, and manic symptoms (De Loo-Neus et al., 2011). Thirdly, methylphenidates are palliative rather than curative as symptoms return once medication is discontinued (Taylor et al., 2004). Fourthly, treatment compliance is low: non-adherence can be as high as 64% (Adler & Nierenberg, 2010). Fifthly, effectiveness reduced over time (De Loo-Neus et al., 2011; Shaw et al., 2012). Finally, methylphenidates reduced children's play initiatives (Panksepp, 1998).

Effects of non-pharmacological interventions for ADHD however have been found inferior to medication for most interventions (Van der Oord et al., 2008) and at best only moderately effective (Sonuga-Barke et al., 2013). Such moderately effective psychological treatments mostly concern parent management training. However, parent management training was found to be ineffective for parents who suffer themselves from ADHD (Sonuga-Barke et al., 2002; 2010). Thus, psychological treatments do not appear to work for those who need it most: families with multiple members with ADHD. Moreover, the meta-analyses of van der Oord et al. 2008 and Sonuga-Barke et al. (2013) observed the largest effects in preschool children, highlighting the need for more effective psychological treatment for school-aged youth. In addition, these meta-analyses found that psychological interventions had no added value to medication. Also, psychological treatments did not target the core symptoms of ADHD—attention, hyperactivity, and impulsivity—but negative consequences like difficulties with planning, organization, and compliance.

Mindfulness-based interventions (MBIs) are a novel treatment approach for ADHD, targeting the core of the disorder: inattention, hyperactivity, and impulsivity. That is, in mindfulness practices, meditators learn to be still in order to cultivate awareness of where their attention goes from moment to moment and bring it back to a chosen anchor, such as the breath or body, rather than following the impulses that arise. Meta-analysis of the effects of MBIs on symptoms of ADHD in both children and adults showed a significant effect of MBIs compared to control conditions, with a larger effect (0.66) on attention than on hyperactivity/impulsivity (0.53) (Cairncross & Miller, 2020) and larger effects for adults than for children (Zhang et al., 2018), highlighting the possible benefits of MBIs for ADHD.

Some of the child studies reviewed in these meta-analyses combined mindfulness training for children with parallel mindful parenting training for their parents (Bögels et al., 2008; be van der Oord et al. (2011); Van de Weijer-Bergsma et al., 2012). There are various reasons for parents to participate in a parallel mindful parenting program. First, as meditation can be a challenge for children with ADHD, and their generalization may be poor, parents learn how to guide and reinforce their child's meditations and help them generalize meditation skills to daily life. Second, as parents of children with ADHD need calm and focus given the challenges a child with ADHD puts on the family, they learn how to not get distracted by their child for their own focus and take care of themselves. Third, as children learn sustained, undivided attention from the relationship with their attentive parent, parents practice sustained and undivided attention for their child with ADHD. Fourth, they cultivate non-reactive parenting in times of (parenting) stress. Finally, parents with ADHD (symptoms) themselves may benefit from the mindfulness practice for their own ADHD. The combination of mindfulness for children and their parents is also thought to improve parent–child and family relationships, which is supported by findings of Haydicky et al. (2015).

The present study is a pragmatic trial to examine the effects of mindfulness training for children and adolescents with ADHD plus parallel mindful parenting for their parents (MYmind), using a family perspective. We assessed the effects of a quasi-experimental waitlist period and the immediate and longer term effects of the family MBI. The primary outcomes were children's ADHD symptoms and their executive functions. The secondary outcomes were children's other psychopathology, both parents' ADHD symptoms, parents' other psychopathology, parenting stress, parental overreactivity, and parental mindfulness. We hypothesized that a waitlist would have no or a smaller effect than intervention. Although which parent participated in the mindful parenting training was not randomly assigned, given the constraints of a pragmatic trial, we were interested whether the participating parent rated the effects of MYmind differently from the non-participating parent, and whether it made a difference for child outcomes which parent participated. We examined the effects of parental ADHD on outcome. We further investigated whether MYmind had different effects for children versus adolescents, for boys versus girls, and for children who used medication versus those who did not, although medication use was not a random factor.

Method

Participants

Clinically referred children ($n = 167$, 104 (62%) boys and 63 (38%) girls) with a primary diagnosis of ADHD, plus both their parents, participated in the study. Children's mean age was 11.4 years ($SD = 2.27$, range 7–19), 127 (76%) were elementary school students, and 40 (24%) secondary school students. Seventy-two children (43%) used medication for ADHD, the majority the short-acting methylphenidate (Ritalin). The most common education levels among parents were secondary education ($n = 54$, 16%), higher education ($n = 91$, 27%), and university ($n = 94$, 28%). A vast majority of children were Caucasian. The majority ($n = 96$, 57%) lived together with both parents, 43 (26%) had divorced or separated parents, the other children had other family backgrounds, or background details were missing.

Procedures

Design

Children with a primary diagnosis of ADHD ($n = 195$) and their parents referred to one of three outpatient community mental health care clinics: UvA minds ($n = 160$; 82.1%),

Max Ernst ($n = 27$; 13.8%), Karakter Arnhem ($n = 8$; 4.1%), were screened for eligibility, $n = 167$ (86%) eventually participated in the study (see Fig. 1, flow diagram). Families were included if the child had a primary clinical diagnosis of ADHD, was between 8 and 19 years (grade 4 of elementary school up to grade 6 of secondary school, 7-year-olds were included if in grade 4), had an estimated IQ of 80 or above and mastered the Dutch language, and at least one parent was willing to participate in the parallel mindful parenting intervention and mastered the Dutch language. Severe child behavior problems that would interfere with group participation was an exclusion criterion. The classification of ADHD was based on clinical assessment and confirmed in a multidisciplinary staff meeting. The ADHD section of the Anxiety Disorders Interview Schedule (ADIS-C and P; Silverman & Albano, 1996) was conducted, separately with the child and with both parents together to validate the ADHD diagnosis. Eighty-seven (52%) of children had ADHD, combined type; 57 (34%) ADHD, attention type; 9 (5%) ADHD-NOS; 5 (3%) other (a behavior or infancy disorder, but the clinical ADHD diagnosis remained); and 9 (5%) were missing (but had a clinical ADHD diagnosis).

A quasi-experimental design was used, in which families who had to wait before start of the experimental intervention (MYmind) participated in a waitlist assessment ($n = 106$, 63%) in order to correct for the effect of time and assessment. During waitlist, treatment as usual could take place. Average waiting time was 57.8 days (*SD* 32.3, range 7–188). All participating families filled out a pre-test ($n = 167$, 100%), followed by an 8-week intervention period, in the week thereafter a post-test ($n = 137$, 82%), and a follow-up session and follow-up assessment ($n = 147$, 88%) after an 8-week follow-up period, in which no further treatment was provided, aside from the continuation of medication if they used medication. A selection of questionnaires was administered at 1-year follow-up, in which 86 (51%) families participated. Assessments consisted of online questionnaires completed independently by child, father, and mother. Families decided themselves whether father ($n = 28$, 17%) or mother ($n = 109$, 65%), or both parents ($n = 30$, 18%), participated in

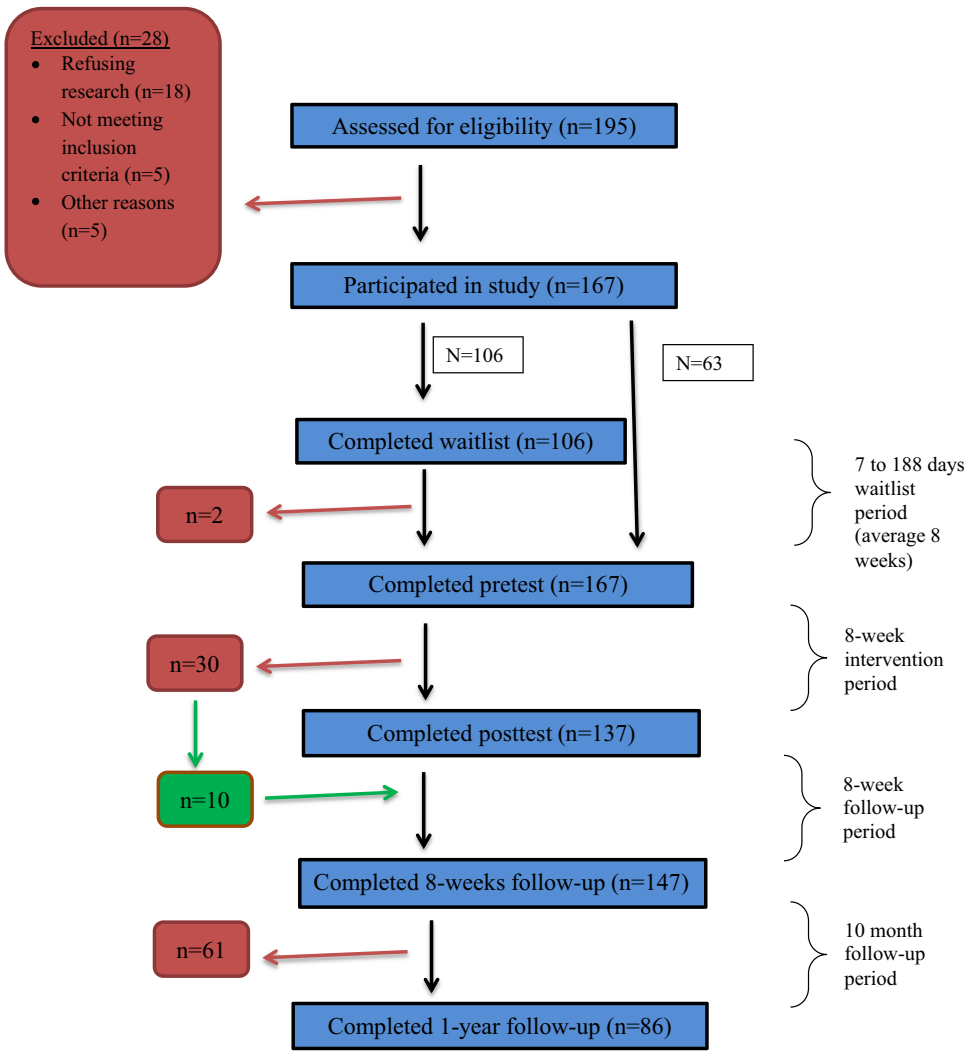

Fig. 1 Flow diagram

the intervention, but both parents were asked to complete the questionnaires. Children who used medication for ADHD were instructed to keep medication stable during the intervention and 8-week follow-up period, unless they wanted to stop medication before enrolling in the trial.

Intervention

MYmind consists of 8 weekly sessions in parallel child and parent groups lasting 1.5 h, and a follow-up session 8 weeks later. In addition, participants are instructed to practice (meditate) 6 days a week for approximately 10–15 min (children/adolescents) and 20–30 min (parents). Children received illustrated session handouts describing the week's theme, instructions for practice, guided meditation audios, and homework completion forms. Parents received copies of the child handouts, as well as handouts describing the mindful parenting week's theme, instructions for practice, guided meditation audios, and homework completion forms. Some of the session time is with youth and parents together: session 1 and session 5 the first 30 min, and session 8 and the follow-up session most of the time. There were in total 34 groups, 27 for children aged 7–13, and seven for adolescents aged 12–19. Children participated in a child or adolescent group on the basis of attending primary or secondary education, rather than age.

The child groups were facilitated by two trainers; an expert trainer who was an experienced mindfulness teacher and child mental health professional with a cognitive-behavioral background and experience in guiding children with ADHD, and a junior trainer for assistance, for example when a child needed individual attention. The parent groups were guided by one trainer, an experienced mindfulness teacher and mental health professional with experience in guiding parents of children with ADHD. The expert trainers of both child and parent groups were certified MYmind facilitators. Child and parent trainers met weekly to discuss the group's and individual participants' progress. They were monthly supervised by SB and could initiate extra supervision sessions in case of questions. Group sessions were video-taped for intervision and supervision.

Measures

Child Outcomes

Parents completed the parent version of the Disruptive Behavior Disorders Rating Scale (DBDRS; Pelham et al., 1992). The DBDRS consists of 42 items and four subscales: Inattention, Hyperactivity/Impulsivity, Oppositional Defiant Disorder, and Conduct Disorder and is rated on a 4-point Likert scale, from 1 (not true) to 4 (very true or often true). The Dutch translation has good reliability and validity (Oosterlaan et al., 2008). The Inattention (item example: "is often easily distracted by extraneous stimuli") and Hyperactivity/Impulsivity ("often interrupts or intrudes on others") subscales were used. The internal consistency of Inattention in this study (at pre-test, averaged between father and mother ratings) was $\alpha = 0.82$, and of Hyperactivity/Impulsivity 0.87. The test–retest reliabilities (wait list to pre-test correlation, averaged between father and mother) were $r = 0.65$ for Inattention and 0.77 for Hyperactivity/Impulsivity.

Parents rated children's executive functioning on the Behavior Rating Inventory of Executive Function (BRIEF; Goia et al., 2000). This 86-item questionnaire was rated on a 3-point Likert scale, from 1 (never) to 3 (often), and consists of a total score and two broad indices, Behavioral Regulation (item example "is too wild or unruly") and Meta-cognition ("has difficulties with planning activities in order to obtain a goal"). The Dutch BRIEF has good psychometric properties (Huizinga & Smidts, 2010). In this study, excellent internal consistencies and good test–retest reliabilities were found for total BRIEF ($\alpha = 0.94$, $r = 0.73$).

Parents' perceptions of their child's emotional and behavioral problems were measured using the Child Behavior Checklist (CBCL for ages 6–18; Achenbach & Rescorla, 2001). All 113 items are rated on a 3-point Likert scale, from 0 (not true) to 2 (very true or often true). Good reliability and validity have been reported for the Dutch CBCL (Verhulst et al., 1996). We used the broadband syndrome scales Internalising (item example "there is very little he/she enjoys"), Externalising ("cruelty, bullying, or meanness to others"), and Attention problems ("inattentive or easily distracted"). Here, good internal consistency and test–retest reliability were found for Internalising ($\alpha = 0.88$, $r = 0.77$), Externalising ($\alpha = 0.91$, $r = 0.84$), and good internal consistency and acceptable test–retest reliability for Attention problems ($\alpha = 0.78$, $r = 0.68$).

Adolescents (aged 11 and above) completed the Youth Self Report (YSR; Ebesutani et al., 2011), rating 112 items on a 3-point Likert scale, from 0 (not true) to 2 (very true or often true). We used the broadband scales Internalising, Externalising, and Attention problems, and found sufficient internal consistencies (resp. $\alpha = 0.93$, 0.81, and 0.72).

Parent Outcomes

Parents completed the ADHD rating scale (Kooij & Buitelaar, 1997) about their own current and childhood ADHD symptoms, rating 46 items on a 4-point scale, from 0 (never or almost never) to 3 (very often). For this study, only current ADHD symptoms (23 items) was used as outcome, which contains the subscales Inattention and Hyperactivity/impulsivity. The ADHD current and past subscales at pre-test were used to calculate above threshold parental ADHD (instructions in Kooij & Buitelaar,

1997). The ADHD rating scale has adequate reliability and validity (Kooij et al., 2008). In this study, internal consistencies and test–retest reliabilities were good for Inattention ($\alpha = 0.87$, $r = 0.88$), Hyperactivity/impulsivity ($\alpha = 0.78$, $r = 0.79$), and the total score ($\alpha = 0.91$, $r = 0.88$).

Parents' own behavioral and emotional symptoms were assessed with the Adult Self Report (ASR, Achenbach & Rescorla, 2003), an upward extension of the YSR. A total of 123 items are rated on a 3-point scale, from 0 (not true) to 2 (often or very true). Good reliability and validity have been reported for the ASR (Achenbach & Rescorla, 2003). Three scales were used: Internalising (item example "I don't get along with other people"), Externalizing ("I argue a lot"), and Attention problems ("I have trouble planning for the future"). We found good internal consistency and test–retest reliability for Internalising ($\alpha = 0.93$, $r = 0.80$), and good internal consistency and acceptable test–retest reliability for Externalising ($\alpha = 0.87$, $r = 0.65$) and Attention problems ($\alpha = 0.88$, $r = 0.64$).

Parental stress was assessed with the Dutch Parenting Stress Index (PSI, Brock et al., 1992). We used the Sense of Competence scale, measuring the extent to which the parent feels incompetent in parenting the child, giving an indication of parental stress, which possesses good reliability and validity (Dekovic et al., 1996). An item example is: "Raising my child is more difficult than I expected." Parents rated 15 items on a 6-point scale from 1 (totally disagree) to 6 (totally agree). Here, Cronbach's alpha and test–retest reliability were good ($\alpha = 0.92$, $r = 0.79$).

Overreactive parenting was assessed with the Dutch version of the Parenting Scale (PS, Arnold et al., 1993). The PS covers three dysfunctional parenting styles, Laxness, Over-reactivity, and Verbosity, and has adequate test–retest reliability and construct validity (Arnold et al., 1993). We used only the Over-reactivity scale. Parents rated 6 items on a 7-point scale presented between two counterparts, for example "When my child misbehaves, …I raise my voice and yell" versus "…I speak to my child calmly". We found good internal consistency and test–retest reliability ($\alpha = 0.91$, $r = 0.81$).

Mindful parenting was assessed with the Dutch version of the Interpersonal Mindfulness in Parenting scale (IM-P) (Duncan, 2007). Parental present-centered attention, emotional awareness, and openness and non-judgmental receptivity are measured with 29 items, rated on a 5-point scale from 1 (never true) to 5 (always true). An example item is: "When I'm upset with my child, I notice how I am feeling before I take action." The Dutch IM-P possesses good validity and reliability (de Bruin et al., 2014). We used the IM-P total score and found good internal consistency and acceptable test–retest reliability ($\alpha = 0.88$, $r = 0.57$).

Data Analyses

Multilevel regression analysis (aka mixed modelling) was used with repeated measurements nested within respondents. The therapeutic effects are represented by coefficients for deviations from pre-test (at wait list, post-test, 8-week, and 1-year follow-up), and effects of the predictors in the model are represented by regression coefficients. We did an intent-to-treat analysis, including all families that intended to participate in MYmind, completed the pre-test, and participated in at least one intervention session. The advantage of the multilevel approach to longitudinal data is that all available data can be used, which improves statistical power and precision of parameter estimates. All continuous variables were standardized (zero means, unit variances), and all dichotomous variables were binary coded, so that parameter estimates can be interpreted as effect sizes (0.2, 0.5, and 0.8 are considered small, medium, and large). The following binary predictors were added to the model: father/mother participating in mindful parenting, participating/non-participating parent rating, parental above/below threshold ADHD, yes/no child medication, child/adolescent, and boy/girl. In order to assess whether missing data were at random, we tested whether at each of the assessments there were any significant differences on any of the dependent variables between measurement dropouts and completers. This was not the case on all variables except for parental Over-reactivity: dropouts had somewhat lower scores on parental Over-reactivity. Also, measurement dropout occurred more often in families of older children.

Results

Child Outcomes

Tables 1 and 2 show results for children. With respect to children's ADHD symptoms, as measured using both parents' report on the DBDRS total Attention and Hyperactivity/Impulsivity score, multilevel analysis showed no effect of waitlist, and a significant, medium-sized reduction of ADHD symptoms after intervention, which became stronger over time, reaching a large effect size at 1-year follow-up. Also, a significant main effect (over all time points) of father (versus mother) and adolescent (versus child) occurred, showing that fathers reported overall lower child ADHD symptom levels compared to mothers and adolescents had overall lower ADHD levels than children. Parents' report of children's Attention problems (CBCL) revealed a similar picture as the DBDRS with respect to time: no effect of waitlist, a significant medium-sized reduction of Attention problems after intervention, becoming stronger over time, approaching a large-sized effect at 1-year follow-up. Similar to the

Table 1 Parameter estimates (standard error between brackets) of the parents-rated outcome measures for children at waitlist, post-test, 8-week follow-up, and 1-year follow-up, as deviations from pre-test. The MYmind intervention took place between pre- and post-test

	ADHD	Internalising	Externalising	Attention	Executive
Waitlist (vs pre-test)	.05 (.06)	.01 (.07)	.02 (.06)	− .07 (.07)	.15 (.07)*
Post-test (vs pre-test)	− .48 (.06)***	− .33 (.07)***	− .17 (.06)**	− .47 (.08)***	− .44 (.06)***
8-week follow-up (vs pre-test)	− .55 (.06)***	− .54 (.06)***	− .32 (.05)***	− .63 (.06)***	− .46 (.06)***
1-year follow-up (vs pre-test)	− .81 (.09)***	− .54 (.06)***	− .38 (.07)***	− .77 (.09)***	− .77 (.21)***
Girls (vs boys)	− .15 (.12)	.12 (.12)	− .26 (.14)	.18 (.11)	− .07 (.14)
Adolescent (vs child)	− .30 (.14)*	.07 (.14)	.03 (.16)	− .27 (.13)*	− .17 (.15)
Medication (vs no medication)	.17 (.12)	.10 (.12)	.13 (.13)	.17 (.11)	.08 (.14)
Father reporting (vs mother)	− .29 (08)***	− .21 (.07)**	− .13 (.06)*	− .22 (.08)**	− .14 (.08)
Participating parent (vs nonp. parent)	.02 (.09)	− .02 (.08)	− .03 (.07)	.13 (.08)	.08 (.09)
Father ADHD (vs no ADHD)	.06 (11)	− .09 (.13)	− .15 (.14)	.05 (.12)	− .09 (.14)
Mother ADHD (vs no ADHD)	.02 (.12)	.32 (.11)**	.26 (.13)*	.19 (.10)	.10 (.13)

Negative estimates at the different time points indicate fewer problems compared to pre-test, whereas positive estimates indicate more problems compared to pre-test. Also, the final models for the factors child gender, child age, child medication, father/mother reporting, participating/non-participating parent reporting, fathers' and mothers above/below threshold ADHD, predicting overall levels of child problems are presented (predictor estimates represent deviations from the overall levels across time points, so that negative estimates indicate less problems, and positive estimates represent more problems). Parameter estimates can be interpreted as Cohen's *d* effect sizes. Measures are Z-transformed

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

ADHD ADHD symptoms (DBDRS), *Internalising* Internalising problems (CBCL), *Externalising* Externalising problems (CBCL), *Attention* Attention problems (CBCL), *Executive* Executive function problems (BRIEF)

DBDRS, fathers rated the Attention problems of their child lower than mothers across time points, and parents rated the Attention problems of adolescents as lower than that of children across time points. On adolescents' self-rated Attention problems (YSR), similar results emerged: a significant medium-sized reduction of Attention problems after intervention, which increased over time, reaching a large effect size at 1-year follow-up. No waitlist was available for the YSR. On parent-rated child executive functioning (BRIEF), a significant small-sized improvement of waitlist was observed, and a significant medium-sized improvement at post-test and 8-week follow-up, approaching a large effect size at 1-year follow-up.

Regarding parent-rated child Internalising problems (CBCL), no waitlist effect occurred, and a significant small-sized reduction after intervention, increasing to medium size at both follow-ups. Fathers reported lower child Internalizing problems across time points than mothers, and children of mothers with above threshold ADHD had higher Internalising problems across time points. Parent-rated child Externalising problems showed no waitlist effect, and a significant small-sized reduction after intervention, which became stronger over time. Fathers reported lower child Externalizing problems across time points than mothers. Adolescents' self-rated Internalising problems (YSR) showed no effect immediate after intervention, and a significant small-sized reduction at 8-week follow-up, reaching a large-sized effect at 1-year follow-up. Girls rated themselves as having higher Internalising problems across time points than boys. Adolescents reported no significant reduction in Externalizing problems after intervention, and a significant small-sized reduction at 8-week follow-up, reaching a medium-sized effect at 1-year follow-up.

Parent Outcomes

Tables 3 and 4 show parents' own results. Parental self-rated ADHD symptoms revealed the following picture: no effect of waitlist, a significant reduction of own ADHD symptoms immediate after intervention and at follow-ups,

Table 2 Parameter estimates (standard error between brackets) of the outcome measures for adolescents' self-reported psychopathology symptoms at post-test, 8-weeks follow-up, and 1-year follow-up, as deviations from pre-test. The MYmind intervention took place between pre- and post-test

	Internalising	Externalising	Attention
Post-test (vs pre-test)	− .09 (.10)	.10 (.11)	− .40 (.12)**
8-weeks follow-up (vs pre-test)	− .37 (.13)**	− .26 (.13)*	− .64 (.17)***
1-year follow-up (vs pre-test)	− .80 (.20)***	− .46 (.21)*	− .85 (.24)***
Girls (vs boys)	.74 (.25)**	− .39 (.27)	− .06 (.28)
Medication (vs no medication)	− .38 (.25)	− .52 (.28)	.18 (.29)
Father ADHD (vs no ADHD)	.04 (.32)	− .07 (.35)	− .11 (.37)
Mother ADHD (vs no ADHD)	− .40 (.28)	− .24 (.30)	.58 (.31)

Negative estimates at the different time points indicate less problems compared to pre-test, whereas positive estimates indicate more problems compared to pre-test. Also, the final models for the factors child gender, child medication, and parents' above/below threshold ADHD, predicting overall levels of adolescent problems are presented (predictor estimates represent deviations from the overall levels across timepoints, so that negative estimates indicate less problems, and positive estimates represent more problems). Parameter estimates can be interpreted as Cohen's *d* effect sizes. Measures are *Z*-transformed. Waitlist assessments not available

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

Internalising Internalising problems (YSR), *Externalising* Externalising problems (YSR), *Attention* Attention problems (YSR)

of small-sized effect. Parents who participated in the intervention self-reported higher ADHD symptoms than non-participating parents across timepoints. Parents with above threshold ADHD had higher ADHD symptoms across timepoints. On parental Attention problems (ASR), a significant small-sized deterioration during waitlist occurred, and a subsequent significant small-sized improvement after intervention, which was maintained at follow-ups. Mothers with above threshold ADHD had higher Attention problems across timepoints.

A significant deterioration during waitlist for parental Internalising and Externalising problems occurred (small effect), and a subsequent significant improvement after intervention (small effect), which was maintained at follow-ups. Mothers with above threshold ADHD had higher Internalising and Externalising symptoms across timepoints.

Over-reactive parenting improved significantly during waitlist (small effect), and further improved after intervention (small effect), which was maintained at both follow-ups. Parental stress showed no waitlist effect and no effect after intervention and at 8-week follow-up, but significantly improved at 1-year follow-up (small effect). Mindful parenting did not change during waitlist and significantly improved after intervention (small effect), which was maintained at 8-week follow-up. No 1-year follow-up was available. Mothers with above threshold ADHD reported lower overall Mindful parenting levels.

Predictors Interacting with Treatment Outcome for Children

We examined which predictor (boy/girl, child/adolescent, father/mother rating, participation/non-participation of parent in intervention, and parental above/below threshold ADHD) interacted with time to affect children's outcome after intervention, measured by both parents' ratings of child ADHD (DBDRS). Results revealed firstly that child gender, child age, whether father or mother rated child ADHD, and whether the parent participated in the intervention or not, all did not interact with time to predict child outcome, aside from a deterioration of adolescents (not children) during waitlist. No interaction of maternal ADHD with time, but an interaction of paternal ADHD with time was revealed ($F = 3.06$, $p = 0.019$; see Fig. 2). Testing the different time comparisons (pre-test versus waitlist, pre-test versus post-test, pre-test versus 8-week follow-up, and pre-test versus 1-year follow-up) revealed that immediately after intervention, children of fathers with threshold ADHD improved *more* than children of fathers without ADHD (beta = −0.40, $p = 0.001$). The larger improvement of children of fathers with threshold ADHD was still significant at 8-week follow-up (beta = −0.29, $p = 0.023$), but no longer significant at 1-year follow-up (beta = −0.23, $p = 0.301$). We tested three explanations for the finding that children of fathers with above threshold ADHD improved more:

Fathers with Threshold ADHD Overestimate Child Improvement (Rater Bias)

We retested the model comparing maternal ratings of child ADHD to paternal ratings of child ADHD. For mothers' child ratings, the interaction between paternal threshold ADHD and child outcome was only significant at post-test compared to pre-test (beta = −0.49, $p = 0.006$), whereas for fathers' child ratings, the interaction between paternal threshold ADHD and child outcome was significant at post-test (beta = −0.32, $p = 0.045$) and at 8-week follow-up (beta = −0.37, $p = 0.036$). Therefore, the first explanation was refuted for the post-test findings.

Table 3 Parameter estimates (standard error between brackets) of the outcome measures for parents at waitlist, post-test, 8-week follow-up, and 1-year follow-up, as deviations from pre-test. The MYmind intervention took place between pre- and post-test

	ADHD	Internalising	Externalising	Attention
Waitlist (vs pre-test)	− .00 (.05)	− .21 (.06)***	− .22 (.07)**	− .23 (.07)**
Post-test (vs pre-test)	− .20 (.05)***	− .15 (.07)*	− .19 (.08)*	− .16 (.07)*
8-weeks follow-up (vs pre-test)	− .21 (.06)***	− .25 (.07)***	− .28 (.08)***	− .25 (.07)***
1-year follow-up (vs pre-test)	− .37 (.08)***	− .24 (.07)**	− .32 (.07)***	− .26 (.08)***
Father reporting (vs mother)	.04 (.11)	− .14 (.10)	.07 (.10)	.03 (.11)
Participating parent (vs. nonpart. parent)	.25 (.11)*	.16 (.10)	.19 (.11)	.13 (.11)
Father ADHD (vs no ADHD)	.44 (.10)***	.09 (.12)	.20 (.11)	.22 (.04)
Mother ADHD (vs no ADHD)	.84 (.09)***	.41 (.11)***	.39 (.10)***	.59 (.10)***

Negative estimates at the different time points indicate fewer problems compared to pre-test, whereas positive estimates indicate deterioration. Also, the final models for the factors father/mother reporting, participating/non-participating parent reporting, and fathers and mothers above/below threshold ADHD, predicting overall levels of parent problems are presented (predictor estimates represent deviations from the overall levels across measurement moments, so that negative estimates indicate less severe problems, and positive estimates represent more severe problems). Parameter estimates can be interpreted as Cohen's *d* effect sizes. Measures are *Z*-transformed

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

ADHD ADHD symptoms (adult ADHD questionnaire), *Internalising* Internalising problems (ASR), *Externalising* Externalising problems (ASR), *Attention* Attention problems (ASR)

Table 4 Parameter estimates (standard error between brackets) of the outcome measures on parenting at waitlist, post-test, 8-week follow-up, and 1-year follow-up, as deviations from pre-test. The MYmind intervention took place between pre- and post-test

	Overreactive parenting	Parental stress	Mindful parenting
Waitlist (vs pre-test)	.18 (.06)**	-.05 (.06)	-.04 (.09)
Post-test (vs pre-test)	-.20 (.04)***	-.01 (.07)	.19 (.07)*
8-weeks follow-up (vs pre-test)	-.28 (.05)***	-.08 (.07)	.32 (.07)***
1-year follow-up (vs pre-test)	-.20 (.07)**	-.33 (.09)***	n.a
Father reporting (vs mother)	.09 (.08)	-.13 (.09)	-.22 (.13)
Participating parent (vs. nonpart. parent)	.15 (.08)	-.02 (.11)	-.18 (.14)
Father ADHD (vs no ADHD)	-.03 (.15)	-.15 (.14)	.08 (.15)
Mother ADHD (vs no ADHD)	.02 (.13)	.21 (.13)	-.32 (.14)*

Negative estimates indicate lower overreactive parenting, parenting stress or mindful parenting compared to pre-test, whereas positive estimates indicate higher overreactive parenting, parenting stress or mindful parenting compared to pre-test. Also, the final models for the factors father/mother reporting, participating/non-participating parent reporting, parents' above/below threshold ADHD, predicting overall levels of parent problems are presented (predictor estimates represent deviations from the overall levels across time, so that negative estimates indicate lower overreactive parenting, parenting stress or mindful parenting, and positive estimates represent higher overreactive parenting, parenting stress or mindful parenting). Parameter estimates can be interpreted as Cohen's *d* effect sizes. Measures are *Z*-transformed

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

n.a. not assessed at 1-year follow-up

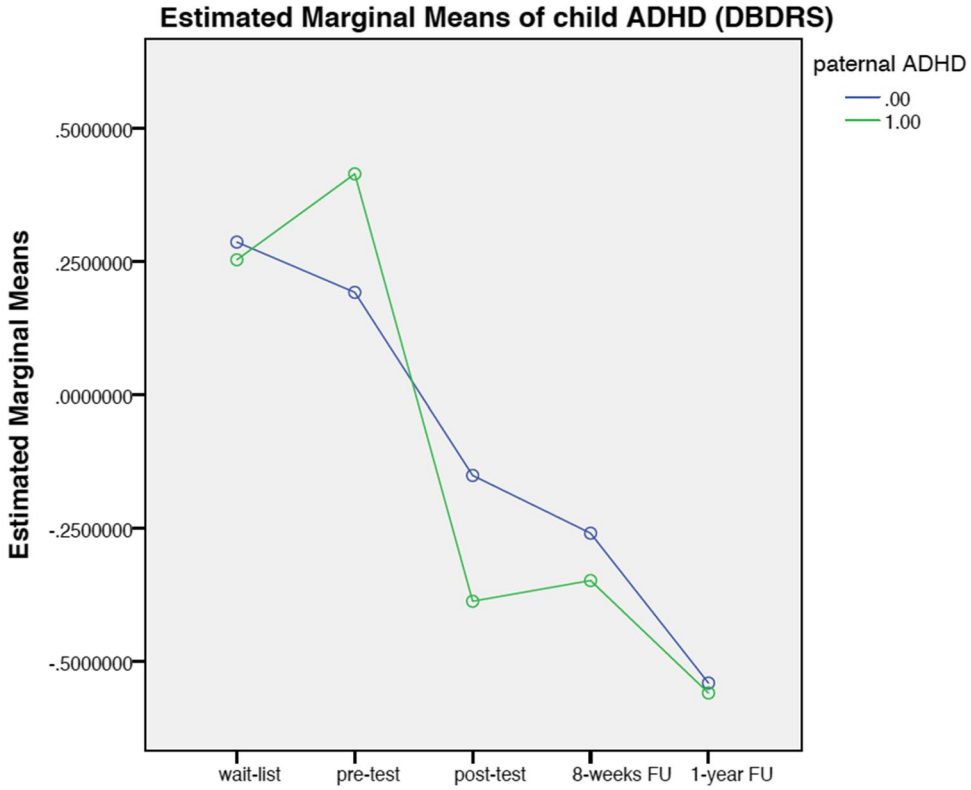

Fig. 2 Paternal above or below threshold ADHD symptoms predicting child ADHD (DBDRS) outcome

Fathers with Threshold ADHD Participate More Often in the Intervention and Thereby Their Children Display Most Changes

Analyses revealed indeed that fathers with threshold ADHD participate more often in the intervention than fathers without ADHD: resp. 61% (28/46) versus 34% (22/64), $X^2 = 7.5$, $p = 0.005$, whereas for mothers such a relation was not found: 87% (65/74) of mothers with threshold ADHD participate in the intervention versus 83% (62/75) of mothers without ADHD. Father participation in the intervention did not predict better treatment outcome for children, except at 1-year follow-up (beta − 1.34, $p < 0.001$), compared to fathers who do not participate. However, as the better child outcome was found at post-test and 8-week follow-up, this explanation was refuted.

Fathers with Threshold ADHD Improve More on Their Own ADHD Symptoms Than Fathers Without ADHD, and This Improvement Explains the Larger Improvement of Their Children

This explanation is supported by the analyses: Paternal threshold ADHD interacted with treatment outcome for fathers' (but not mothers') own ADHD in the direction that fathers with (versus without) threshold ADHD improve more at post-test (beta = −0.60, $p = 0.000$), 8-week (beta = −0.75, $p = 0.000$), and 1-year (beta = −0.78, $p = 0.000$) follow-up (see Figure III in supplementary materials). In the same way, maternal threshold ADHD interacted with treatment outcome for mothers' (but not for fathers') ADHD symptoms, in the direction that mothers with (versus without) threshold ADHD improve more at post-test (beta = −0.60, $p = 0.000$), 8-week (beta = −0.51, $p = 0.001$), and 1-year follow-up (beta = −0.65, $p = 0.005$) (see Figure IV in supplementary materials). However, the key mediation occurred: reduction of paternal (and not maternal) ADHD mediated their child's reduced ADHD depending on paternal threshold ADHD, that is, the observed interaction at post-test as well as 8-week follow-up compared to that at pre-test between paternal threshold ADHD and child outcome disappeared when entering fathers' reduction in ADHD symptoms.

Discussion

This pragmatic trial examined mindfulness training for children with ADHD and their parents (MYmind), in a representative clinical context, including measures of child ADHD and parental ADHD, looking at separate mother and father effects, including children and adolescents, and including a long-term (1-year) follow-up. Main results were as follows: (I) overall, no changes during a wait-list period occurred; (II) MYmind was found to reduce

attention and hyperactivity/impulsivity and executive function problems in childhood ADHD, with medium- to large-sized effects; (III) adolescents improved no differently from children, youth with ADHD medication no differently from youth without, and boys no differently from girls; (IV) effects were maintained up to 1-year follow-up; (V) parents' own inattention and hyperactivity/impulsivity problems were reduced after MYmind, specifically in parents above the ADHD threshold; (VI) offspring of fathers above the ADHD threshold improved more compared to fathers without ADHD, which was mediated by steeper reductions of fathers' own ADHD symptoms.

A brief group MBI for clinically referred youth with ADHD and their parents resulted in substantial reduction in children's core ADHD symptoms. Observed effect sizes of change were comparable to those reported in meta-analyses on MBI for childhood ADHD (Cairncross & Miller, 2020; Zhang et al., 2018).

The child moderators' age, gender, and medication use were investigated. That adolescents were found to have on average lower ADHD symptoms, and particularly lower hyperactivity/impulsivity symptoms, compared to children, is consistent with the literature (e.g., Biederman et al., 2000). As effective psychological treatment specifically for adolescents with ADHD is needed, the finding that adolescents benefited no less from MYmind than children is important. Girls were found to benefit no differently from MYmind than boys, so mindfulness appears a helpful approach for them, which is important given the gender-biased treatment referral (Biederman et al., 2002). The finding that youth taking medication improved as much as youth not taking medication implies that participating in MBI while on medication, especially for the more severe cases, can be beneficial. One might argue that youth on medication may not experience the full effects of meditation, as their symptoms are partially controlled by medication. This might be true, but meditation may for some or sometimes be too hard without medical support.

The finding that effects were maintained up to a year after MYmind had ended is promising. Mindfulness is often regarded as a lifestyle rather than a treatment. After completion of MYmind, families were encouraged to continue to meditate, live attentively, take yoga lessons, etc. It should be kept in mind that parents followed parallel mindful parenting, and for such long-term benefits parental participation may be crucial. That is, in the long term, the parents that remind their child of mindfulness, in direct ways (by suggesting them to take a breathing space for example) or indirect ways (by modelling mindfulness, e.g., taking a breathing space themselves when stressed), may see more lasting changes. The working mechanism of the mindful parenting intervention might also be parents' own change, having become more attentive and accepting towards the child for example, as a study of Medvedev & Singh, 2018 revealed that at 2-year follow-up, children with autism whose parents had received a day-long mindfulness workshop, showed lasting improvements in their behaviour problems, more so than after a positive parenting intervention.

Consistent with findings that clinically referred youth with ADHD have an eightfold chance of at least one of their parents meeting criteria of ADHD as well (Epstein et al., 2000), in our sample, 46% of parents self-rated above the threshold of adult ADHD. Therefore, our finding that MYmind improved not only ADHD symptoms of children, but also those of parents, and particularly of parents who were likely to meet criteria for ADHD, is important in its own right. Children with a susceptibility to develop ADHD (because of a genetic load from their parents with ADHD), who grow up in a more chaotic, low attentive, high impulsive family environment which is more characteristic of families in which at least one of the parents has (symptoms of) ADHD (Johnston et al., 2012; Park et al., 2017), may be most at risk for ADHD (Thapar et al., 2007) and comorbid psychopathology (Deault, 2010). MYmind can be seen as a family MBI. Parents and children who follow mindfulness in parallel groups, but come and leave together, are aware of the fact that their parent/child participates in a similar program next door, meet at crucial moments in the course, practice at home together, and develop a common language, such as "being on the highway." By for example reminding each other to take a breathing space when on the highway, MYmind may function as a family emotion regulation approach (Haydicky et al., 2015). That parents who are estimated to meet criteria for ADHD self-selected for the mindful parenting training and benefitted most in terms of their own ADHD symptoms may in part explain the effect of MYmind for their children. Treating youth with ADHD not in isolation, but within their family constellation, and assessing ADHD on a family level rather than as an individual characteristic, may further our understanding of what causes and maintains this disorder and improve treatment.

An intriguing finding was that children of fathers who are likely to meet ADHD criteria benefit *most* from MYmind, and this could be explained by the larger improvement of these fathers with respect to their own ADHD symptoms. Given that children with ADHD may benefit from a playful and challenging parent, who can help them focus attention by increasing their level of excitement, and fathers were found to have a comparative advantage in initiating such exciting play (see introduction), a father with ADHD can actually be beneficial, provided he is able to contain his ADHD, that is, challenge the child in a sensitive way, attuned to the child's needs. The mindful parenting training for which fathers above the ADHD threshold self-selected twice as often than fathers below threshold may have helped

them do just that. That for mothers with ADHD this beneficial effect was not revealed can have several explanations. First, mothers with ADHD may be less dysfunctional in their parenting or may have a better relationship with their child with ADHD to begin with, and therefore have less room for improvement than fathers. Related, as mothers are usually most involved in childcare and treatment, most gain may come from involving fathers, which may be novel for the family. As parents with ADHD (de Zwaan et al., 2012), and parents of children with ADHD (Wymbs et al., 2008), are more likely to divorce, and active paternal involvement generally strongly decreases after divorce (Kelly, 2000), children with ADHD may particularly suffer from lack of father contact.

Limitations and Future Research

Pragmatic clinical trials have clear disadvantages as there is less control. First, as we used a quasi-random waitlist design, in which those families that had to wait for MYmind (63%) first participated in a waitlist assessment, we cannot rule out that the effects observed in the MYmind intervention period may be (also) caused by factors other than the treatment. Second, the factors under study, such as which parent participated in the parallel mindful parenting training, and whether or not the child used medication, were not randomly assigned, and therefore the direction of effects remains inconclusive. Third, we only obtained data from half of our sample 1 year after the training had ended, and although our statistical tests suggest that missing data were at random, higher follow-up participation is needed to draw more final conclusions. Fourth, we only used questionnaires as measure, rated by people who are close to the intervention (child, parents).

There are many directions for future research to shed more light on the effects of family MBI for childhood ADHD. First, to compare the effects of MYmind to medication and other treatment as usual using randomized designs. Such comparison trials are currently being undertaken (Chan et al., 2018, trial registration ChiCTR1800014741; Meppelink et al., 2016, trial registration NTR4206; Siebelink et al., 2018, trial registration 2015 1938). Second, to disentangle whether the effect of MYmind is primarily due to the child mindfulness training or the parent mindfulness training, or the combination. Third, to investigate the effect of father or mother participating in the parallel mindful parenting training, using a random assignment. Fourth, randomizing parents with and without ADHD to participate or not in the parallel mindful parenting intervention, to shed more light on parental ADHD as a mediator of the effect of mindful parenting on child ADHD. Fifth, to investigate whether medication increases or decreases the effect of MBI on ADHD using a between-persons design (randomizing youth for MBI only versus MBI plus medication) or time series single case design (the direct effect of specific meditations with or without medication). Sixth, to examine the effects of MYmind on more objective measures of ADHD, such as attention tasks, behavior observation, teacher reports of ADHD symptoms, and educational performance. Seventh, to explore which practices or insights participants still use long term, and how their long-term practice can best be supported, like through meditation communities or online tools. Finally, the cost-effectiveness of MYmind, particularly on a family level, needs study.

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Author Contribution SB: designed the study, developed the manual, trained and supervised the trainers, and wrote the paper. FO: prepared the dataset and analyzed the data. EP: organized intervision and supervised data collection. RvR: organized intervision and collaborated with data collection. MW: supported the training development. EdB: collaborated with the design and writing. All the authors approved the final version of the manuscript.

Declarations

Ethical The study was approved by the Ethics Committee of the University of Amsterdam, and written informed consent was obtained from both parents and from children ages 12 and above. SB is shareholder of a clinic where data collection took place, published the manual of MYmind, and offers teacher training in MYmind, for which she receives an honorarium. FO conducted the statistical analyses and has no conflict of interest, ensuring objectivity in data presentation.

Research data are not shared yet as they may be included in ongoing research of our research group, but can be obtained from the first author.

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