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Mindfulness-Based Approaches with Children and Adolescents: A Preliminary Review of Current Research in an Emergent Field

Christine A. Burke

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Abstract Interest in applications of mindfulness-based approaches with adults has grown rapidly in recent times, and there is an expanding research base that suggests these are efficacious approaches to promoting psychological health and well-being. Interest has spread to applications of mindfulness-based approaches with children and adolescents, yet the research is still in its infancy. I aim to provide a preliminary review of the current research base of mindfulness-based approaches with children and adolescents, focusing on MBSR/MBCT models, which place the regular practice of mindfulness meditation at the core of the intervention. Overall, the current research base provides support for the feasibility of mindfulness-based interventions with children and adolescents, however there is no generalized empirical evidence of the efficacy of these interventions. For the field to advance, I suggest that research needs to shift away from feasibility studies towards large, well-designed studies with robust methodologies, and adopt standardized formats for interventions, allowing for replication and comparison studies, to develop a firm research evidence base.

Keywords Mindfulness meditation · Children · Adolescents · Families · Schools

C. A. Burke (✉)
Centre for Mindfulness Research and Practice (CMRP), Department of Psychology, University of Wales, Bangor, Gwynedd LL57 2UW, UK
e-mail: psp66a@bangor.ac.uk; burkec@optusnet.com.au

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Introduction

The recent decade has seen an upsurge in the use of mindfulness-based interventions that teach mindfulness skills to promote psychological health and well-being. *Mindfulness* is a particular way of paying attention, described by Kabat-Zinn (2003, p. 145), as "the awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experience". Largely, interventions and research have been undertaken in adult populations, although there is now increasing interest in applications with children and adolescents, with a small body of research literature emerging. In this paper I review the currently available research in the emergent field of mindfulness-based interventions, which include core mindfulness meditation practices, with children and adolescents.

The predominant mindfulness-based approaches include MBSR (mindfulness-based stress reduction), MBCT (mindfulness-based cognitive therapy), DBT (dialectic behavior therapy), and ACT (acceptance and commitment therapy). Fundamental to these approaches is a focus on developing mindfulness, however the methods for teaching mindfulness skills vary. MBSR and MBCT use regular mindfulness meditation practices to develop mindfulness skills, whereas DBT teaches mindfulness techniques described as "psychological and behavioral versions of meditation skills" (Linehan 1993, p. 114), with ACT taking a similar approach in teaching nonmeditative component skills of mindfulness (Baer and Krietemeyer 2006; Hayes and Shenk 2004). Exploration of DBT and ACT is outside the scope of this paper, as my review is of interventions that include core regular mindfulness meditation practices, and the applicability of these to children and adolescents. Considerable published literature on DBT and ACT can be

found elsewhere (e.g., Baer 2006; Greco and Hayes 2008; Hayes 2004; Hayes et al. 2003; Linehan 1993; Murrell and Scherbarth 2006).

Before reviewing the research literature on interventions with children and adolescents, I will briefly review distinctive features of MBSR/MBCT, including the core curriculum, requirements for teachers of MBSR/MBCT, proposed elements and processes of mindfulness in this context, and the current research applications with adults.

MBSR was originally developed in the late 1970s as an 8-week group intervention, for people experiencing a range of medical problems including chronic pain, within a university-based medical center (Kabat-Zinn 1990). The MBSR core curriculum was later incorporated into MBCT, as an adaptation for preventing relapse in adults with previous depression (Segal et al. 2002). MBSR and MBCT include a series of mindfulness meditation practices drawn from Buddhist origins applied in a secular context, offering universal applications not tied to religious or philosophical traditions (Baer 2003; Dryden and Still 2006; Kabat-Zinn 1990).

MBSR and MBCT are experiential learning programs that include weekly group sessions, regular home practice, and the core curriculum of formal mindfulness practices (body scan, sitting, movement and walking meditations), and informal mindfulness practices (where participants intentionally bring mindful awareness to activities of daily living, e.g., showering, eating, gardening, shopping). Group sessions include guided meditation practices, teacher-led enquiry, discussion of experiences, and psycho-education (includes information about universality of the wandering mind, the role of perception, the mind/body association, stress reactivity, developing inner resources for coping and enhancing health). MBCT includes additional psycho-education and exercises specific to depression, while content in both MBSR/MBCT is adaptable to the specific characteristics of group participants (e.g., for anxiety, eating disorders, etc.).

Through group and home practices, participants develop mindfulness skills and attitudes, including focusing, sustaining and switching attention, and accepting their present moment experience, including felt sensations in the body, without judgment or elaboration. Participants are encouraged to use the physical sensations of the breath and the body as "anchors" for attention, when attention wanders or becomes scattered.

A distinguishing feature of MBSR and MBCT, as interventions in both clinical and non-clinical settings, is that the program authors are adamant that mindfulness teachers must have extensive personal experience of mindfulness practice, and an embodiment of the attitudinal foundations of mindfulness (described below), before beginning to teach the practices to clients (Kabat-Zinn 1990, 2003; Segal et al. 2002). Requirements for MBSR teachers (and good practice guidelines for MBCT teachers) include an established and ongoing personal mindfulness meditation practice, professional training, regular supervision, attendance at teacher-led silent meditation retreats, and ongoing professional development (Center for Mindfulness 2009; Centre for Mindfulness Research and Practice 2009). Just as swimming teachers need to be able to swim, so do mindfulness teachers need the experiential knowing that comes from riding the waves, the ebb and flow, of their internal experiences (Segal et al. 2002).

Although mindfulness-based interventions have been in use for over 20 years, it has only been more recently that mindfulness has been examined as a psychological construct, with efforts to establish consensus on the operational definition, elements and processes (Bishop et al. 2004; Shapiro et al. 2006). In addition, there have been concurrent advances in the development of instruments to measure aspects of mindfulness, which is an obvious need to further empirical research (for an overview of available measures, see Baer et al. 2006; Feldman et al. 2007).

Three primary elements have been proposed as components in the process of mindfulness: *attitude*, *attention* and *intention* (Shapiro et al. 2006). Mindfulness practice is grounded in particular *attitudinal foundations*, which include non-judgment, acceptance, trust, patience, non-striving, curiosity and kindliness (Bishop et al. 2004; Kabat-Zinn 1990; Shapiro et al. 2006). *Attention* includes focused, broad and sustained attention, and skills in switching attention from one stimulus to another. The third element of conscious *intention* extends from an intention to practice, to the intentionality one brings to directing, sustaining or switching attention. *Intentional attention* can be considered as the self-regulation of attention (Bishop et al. 2004).

Shapiro et al. (2006) propose that the elements, *attitudes, attention* and *intention*, are simultaneous, interconnected aspects of the process that "*is*" mindfulness (p. 375). This process allows one to develop a de-centered perspective on one's experiences, from a non-judgmental, objective and non-elaborative stance; witnessing thoughts, sensations and emotions as transient phenomena. This potentially leads to a shift in one's relationship with these phenomena, from where one can clearly observe, recognize and disengage from habitual patterns or mind states, and begin to respond more reflectively, rather than reactively (Baer 2003; Segal et al. 2002; Shapiro et al. 2006).

There is significant and continued growth in the empirical research base investigating the efficacy of MBSR and MBCT interventions with clinical and non-clinical adult populations. Clinical studies of MBSR with adults include management of chronic pain, stress, anxiety, psoriasis, eating disorders, fybromyalga, substance abuse and with cancer patients (Baer 2003; Bishop 2002; Grossman

et al. 2004; Ivanovski and Malhi 2007; Shigaki et al. 2006). MBCT was initially developed as an approach to prevent relapse in depression (Segal et al. 2002; Teasdale et al. 2000), though now has been adapted for use with generalized anxiety disorder (Evans et al. 2007), mixed mood disorders (Ree and Craigie 2007), current depressed treatment-resistant individuals (Kenny and Williams 2007), and with cancer patients and their carers (Foley et al. 2007). MBCT is currently being evaluated in prevention of recurrence of suicidal behavior (Williams et al. 2006) and for feasibility with individuals with bipolar disorder (Williams et al. 2008).

Meta-analyses of the empirical research report overall medium effect sizes ($d = .50$–$.59$) on outcomes measures of physical and psychological health (Baer 2003; Grossman et al. 2004), with authors suggesting that MBSR (and MBCT: Baer 2003) may be helpful in improving psychological health and well-being. The meta-analyses also highlight various methodological weaknesses in many studies, and conclude that more rigorous research, with large scale randomized control trials (RCTs) are required to empirically validate mindfulness-based interventions, across a range of populations and problems.

Mindfulness-Based Approaches with Children and Adolescents—A Review of Current Research

There is evidence of growing interest in the application of mindfulness-based approaches with children and adolescents, in both the professional and public arenas. Examples include mindfulness interventions in pain management with adolescents (Thompson and Gauntlett-Gilbert 2008), MBCT for depressive relapse prevention with adolescents (Allen 2006), pilot projects at the Oxford Mindfulness Centre (http://www.oxfordmindfulness.org), Mindful Awareness Research Center, University of California Los Angeles (MARC, UCLA; http://marc.ucla.edu.), InnerKids Foundation (http://www.innerkids.org), and the recent publication of a practitioner's guide focusing on treatment of children and adolescents (Greco and Hayes 2008). Additionally, there are reports (e.g., Garrison Institute Report 2005) and media coverage that highlight the growing interest (e.g., Brown 2007; Mahr 2007; Suttie 2007).

Baer's (2003) empirical review of adult interventions was used to broadly guide this review, however meta-analysis or overall effect size calculation was not possible, due to wide variability in methodologies and data reporting across studies. Included are single case and small sample feasibility studies with no objective outcome measures, some with only partial data reported, and there are multiple variants in implementation of the MBSR/MBCT core curriculum. Inclusion of this range of studies reflects the very small pool of publications to date. The aim is to provide a preliminary overview of all the available research in this newly emerging field.

Method

The published articles reviewed were collected by the author through searches of the following electronic data bases: PsychINFO, PSYarticles, BioMed Central, CSA Illumina, Medline, Blackwell Synergy, JSTOR, Web of Knowledge Version 4, Science Direct, SpringerLink, Wiley Interscience, and the Cochrane Library, or acquired directly from the author, including unpublished or submitted studies. Search terms included "mindfulness", "meditation" "MBCT", "MBSR", "children", "adolescents", "young people", "families" and "schools". Dissertation studies and conference papers were not accessed. Only articles written in English were reviewed, and only studies that used secular contemplative mindfulness meditation techniques (MBSR/MBCT based), not concentration methods (such as transcendental meditation —TM), were included. Single case and small sample studies with informal posttreatment results were included. Fifteen studies meeting this criteria were located and are reviewed.

Overview of the Research Literature

Studies are grouped by the school age of children involved. Table 1 summarizes the one study of pre-school age; Table 2, elementary school age (6 studies); Table 3, high school age (8 studies). Within each table, studies are grouped by participant populations, first by clinical samples, then non-clinical samples, and ordered by publication date within each group. Only data on child or adolescent outcome measures is reported, although several studies included parents in the intervention and analysis.

Sample sizes range from 1 to 228. In studies reporting age, range was from 4 to 19 years; in those reporting gender, ratio ranged from 24.1 to 71% male. Reportage of demographic information was limited. Nine studies intervened with clinical samples, and six studies with non-clinical samples. All studies trained participants in "mindfulness meditation practices", adaptations of MBSR or MBCT, however there were many variations from the standard MBSR/MBCT core curriculum, some interventions using "elements" of MBSR.

Six studies used pre-post between groups design, four report wait-list or intent-to-treat controls, with two reporting other non-treatment activities; of the six, four report randomization to these control groups, two do not specify randomization. The remaining studies used pre-post

within-participant or multiple base-line across participant designs, or report observational and informal participant reports. Several studies report follow-up data, at intervals varying from 8 weeks to 3 years, post intervention. Dependent variables include self-reports and/or teacher/parent reports of attention, behavior, anxiety, depression, social skills, body weight, physical symptoms, sleep quality, substance use; clinical measures of mental health, and some objective measures of attention. Five studies report some or all effect sizes, others report p values, percentage data, trends, and clinical or informal observations.

General Findings

Given that research in this area is so novel, all studies investigated feasibility and acceptability of mindfulness-based interventions with the populations investigated, and overall conclusions indicate that interventions were acceptable and well-tolerated by the participants, and no studies report any adverse effects. Analyses of changes in posttreatment outcome measures range from non-significant to significant, with reported effect sizes (Cohen's d) ranging from small to large ($d = -0.2$–1.4). Effect sizes of $d = 0.2$ are considered small, $d = 0.5$ medium, and $d = 0.8$ considered large (Cohen 1977). Several studies include posttreatment qualitative information, e.g., participant satisfaction ratings, though none present formal qualitative analysis.

Overall, studies generally present with methodological issues (small samples, few with controls or randomization, few objective measures, potential biases from recruited volunteers, reliance on self or non-blind parent/teacher reports, etc.) that prevent conclusions being drawn or generalized to a wider population of children and adolescents. The individual studies are briefly described and critiqued, below.

Mindfulness-Based Approaches with Pre-School Age Children

Non-Clinical Sample

Smalley et al. (unpublished) conducted a RCT of a non-clinical sample of 44 children (4–5 years) in a university based early childhood centre. The intervention was an 8-week (twice weekly) mindful awareness practices (MAPs) intervention, modified for age. MAPs are secular, structured group programs informed by MBSR/MBCT models, and include sitting, movement and body scan meditations, taught by experienced instructors (Zylowska et al. 2007).

Table 1 Mindfulness-based interventions with pre-school children

Study	*N*	Participant type	Age/ grade	Intervention location	Research design	Treatment group	Control group	Random assignment	Dependent variables	Effect size/data reported
Smalley et al. (unpublished)	44	Non-clinical pre-school students	4–5 years	Pre-school	Between group pre-post	MAPs, 2 x wkly, 8 wks	Yes, Typical play period	Yes	EF, social skills, temperament	Cohen's $f^2 = .37$–$.40$[a]

MAPs Mindful awareness practices, *EF* Executive function

wkly Weekly; *wks*, Weeks

[a] Effect sizes reported only for measures that showed significant differences, i.e., 4 domains/indices of EF ($p < .05$)

Table 2 Mindfulness-based interventions with elementary school children

Study	N	Participant type	Age/grade	Intervention location	Research design	Treatment group	Control group	Random assignment	Dependent variables	Effect size/ data reported
Ott (2002)	1	Clinical, outpatient, gastroesophageal reflux	9 years	Outpatient clinic	Single case study	Mindfulness meditation intervention	No	No	Reflux symptoms, medication, sleep quality	No data reported
Semple et al. (2005)	5	Clinical, anxiety symptoms	7–8 years	School	Within participant pre-post	MBCT-C, 6 wks, wkly	No	No	Anxiety, internalizing and externalizing behavior	Trends in results, clinical observation
Singh, et al. (2009)	2	Clinical, ADHD	10–12 years	Not stated	Multiple baseline across participants	Mindfulness training, 12 wks parent, 12 wks chd	No	No	Children's compliance	Percentage data reported
Napoli, et al. (2005)	228	Non-clinical school students	Grades 1–3	School	RCT between groups pre-post	AAP fortnightly 24 wks	Yes quiet activities/ reading	Yes	Attention; social skills; behavior	Cohen's $d = .39–.60$
Saltzman and Goldin (2008)	74 (39 chn, 35 parents	Non-clinical self referred	Grades 4–6	Community setting	Between groups pre-post, wait list control	Modified MBSR, 8 wks, wkly	Yes, waitlist	Not stated	Attention, self compassion, depression, anxiety, mindfulness	Data analysis incomplete
Lee et al. (2008)	25	Non-clinical reading class	9–12 years	Community based reading clinic	Pre-post intent to treat, 2 phase open trial	MBTC-C, 8 wks, wkly	No	No	Internalizing, externalizing behavior, anxiety, depression	Cohen's $d = .11–.40$

MBSR Mindfulness-based stress reduction, *MBCT-C* Mindfulness-based cognitive therapy-children, *AAP* Attention academy program, *ADHD* Attention deficit hyperactivity disorder, *chd* Child, *chn* Children, *wkly* Weekly, *wks* Weeks, *develop. disabilities* Developmental disabilities

Table 3 Mindfulness-based interventions with high school adolescents

Study	*N*	Participant type	Age/grade	Intervention location	Research design	Treatment group	Control group	Random assignment	Dependent variables	Effect size/data reported
Bootzin and Stevens (2005)	55	Clinical, adolescents substance use, sleep disorders	13–19 years	Clinic	Pre-post within participant	MBSR, 5/6 wks, 6 wk cog th, light th, educ., stimulus control inst.	No	No	Sleep data, substance use, mental health, worry	$p < .05$ for some sleep indices, $p > .05$ all other measures
Zylowska et al. (2007)	32; 8 adol, 24 adults	Clinical, ADHD or probable ADHD	Adol mean 15.6 years; adult mean 48.5 years	Not stated	Pre-post within participant	MAPs, 8 wks, wkly	No	No	Attention, anxiety, depression	Pooled results, $p < .01$ some attn meas., all others non-signif
Singh, et al. (2007)	3	Clinical, conduct disorder	13–14 years	Not stated	Multiple base line across participants	Mindfulness meditation, 4 wks, 3 × wkly, 25 wk mindfulness practice	No	No	Aggressive and non-compliant incidents	Percentage data reported
Singh et al. (2008)	1	Clinical, Prader-Willi syndrome	17 years	Home-based	Within participant multiple baseline-changing criterion design	Multiple components: mindfulness meditation × 24 months, exercise, food awareness program	No	No	Body weight	Weight change in lbs, BMI reported
Bogels et al. (2008)	14 adol and parents	Clinical, externalizing disorders, mixed	11–18 years	Community mental health clinic	Within participant pre-post, intent to treat, f/up	MBCT, 8 wks, wkly	Non-random waitlist	Not stated	Goals, behavior, happiness, mindfulness	Cohen's $d = -0.1$–1.4; f/up: $d = -.02$–1.5, (at 8 wks)
Biegel et al. (2009)	102	Clinical, psychiatric disorders, mixed	14–18 years	Outpatient psychiatric clinic	RCT, pre-post, f/up within group	MBSR, 8 wks, wkly and TAU	Yes, TAU, waitlist	Yes	Mental health, GAF, stress, psych symp, self-esteem	Cohen's $d = .14$–1.11 (d = pre-test–f/up)
Wall (2005)	Not reported	Non-clinical school students	11–13 years	School	Nil	Elements of MBSR and Tai Chi	No	No	Nil	Informal observation, comments
Beauchemin et al. (2008)	34	Non-clinical volunteers	13–18 years	School	Pre-post within participant	Mindfulness meditation	No	No	Anxiety, social skills, academic performance	All *ps* $< .05$

MBSR Mindfulness-based stress reduction, *MBCT* Mindfulness-based cognitive therapy, *f/up* Follow up, *MAPs* Mindful awareness practices, *ADHD* Attention deficit hyperactivity disorder, *BMI* Body mass index, *TAU* Treatment as usual, *GAF* Global assessment of functioning, *wkly* Weekly, *wks* Weeks, *adol* Adolescents, *attn meas* Attention measures, *cog th* Cognitive therapy, *light th* Light therapy, *non signif* Non significant, *psych symp* Psychological symptoms

Parent and teacher reports of executive functioning (EF), social skills and temperament posttreatment indicated significant improvements in some domains of EF ($ps < .05$; effect size: Cohen's $f^2 = .37–.40$) on teacher ratings, but not parent ratings, and no significant differences on other outcome measures. Effect size was not reported for measures that showed no significant difference. The small sample size and reliance on measures by non-blind raters with potential bias limit the findings beyond the intervention, however the study provides a preliminary indication that young children can participate in mindfulness meditation practices in a group setting.

Mindfulness-Based Approaches with Elementary School Aged Children

Clinical Samples

Ott (2002) reports a case study of 9-year-old girl with gastroesophageal reflux, taught mindfulness meditation practices (body scan, mindful eating and walking) in a hospital outpatient setting. Changes in physical symptoms, medication and sleep quality are reported, however details of the intervention structure, or methods of measuring outcomes are absent. It is not possible to draw or generalize conclusions from this study, due to lack of reported data and methods, and the presence of potentially confounding variables (e.g., effects of medication, passage of time, individual attention, absence of control group, etc.), however, the study suggests the intervention was well-tolerated by the patient, who reportedly generalized mindfulness skills to other settings (preparing for exams).

In an open clinical trial of feasibility and acceptability of modified MBCT, MBCT-C, five children (7–8 years) with anxiety symptoms participated in a 6 week intervention (45 min weekly) taught by experienced, trained mindfulness teachers in a school-based setting (Semple et al. 2005). Individual posttreatment changes in teacher-rated internalizing and externalizing behaviors were reported, though not analyzed due to small sample size; and with no control group, the findings cannot be generalized outside the study participants. Semple et al. report clinical observations, suggesting the intervention was acceptable to the children, and that the program may hold promise in overall treatment for children presenting with anxiety symptoms. As an early feasibility study, Semple et al. exemplify the cautious, "small steps" approach needed in the early stages of research into a novel intervention.

Singh et al. (2009) report a multiple baseline across participant design intervention, in which 2 children (10 and 12 years) with attention deficit hyperactivity disorders (ADHD) participated in a 12-week mindfulness meditation intervention that followed their parents' 12-week mindfulness intervention. Parents' event recording of children's compliance indicated increased child compliance during parent mindfulness training, which further increased during child mindfulness training, with some maintenance at follow-up. Percentage increases in compliance ranged from 262.7% during interventions, to 10.2% in the 24-week follow-up period. Although the small size, design and methodology preclude generalization of results, the intervention's use of mindfulness training for parents followed by mindfulness training for children appears feasible, and offers a systemic approach, addressing parent-child interactions through the medium of mindfulness training.

Non-Clinical Samples

Napoli et al. (2005) report a RCT, with 228 non-clinical first to third grade students, participating in the Attention Academy Program (AAP) intervention, with twelve 45-min sessions over 24 weeks. The AAP included sitting, movement and body scan mindfulness meditations, relaxation exercises, facilitated by trained, experienced mindfulness instructors. Home practice was not reported as part of the intervention. Significant improvements were reported in posttreatment measures of self-rated test anxiety ($p = .007$), teacher rated attention ($p = .001$) and social skills ($p = .001$), objective measures of selective (visual) attention ($p < .001$) but not sustained attention ($p = .350$). Reported effect sizes ranged from small to medium ($d = .39–.60$).

Napoli et al.'s use of an RCT design, reasonable size sample, and use of objective measures of attention strengthen the methodology. Limitations included the potential for bias in teacher ratings (teachers aware of treatment/control participants), and no examination of potential moderating effects of group participation. The study suggests the AAP intervention was feasible in a school setting, with results lending support for a possible treatment effect on selective (visual) attention in this intervention. Although AAP included core practices of MBSR/MBCT, it differed in a number of aspects, including structure, absence of home practice, and the inclusion of relaxation exercises, limiting direct comparisons with MBSR/MBCT interventions.

Saltzman and Goldin (2008) report an 8-week modified MBSR intervention with a non-clinical sample of 31 children, grades 4–6, who participated with their parents. The teachers were experienced mindfulness instructors, and the design included a waitlist control group (randomization was not reported). Final analysis was incomplete at publication, however preliminary analysis indicated feasibility, and improvements for children and parents in attention, emotional reactivity and some areas of meta-cognition, based on self and parent report measures, and objective

measures of attention. The study used self-report measures of mindfulness for children and parents, though the results, type of measure, or details on its validity in the age group, are not reported in the publication.

The final analysis is likely to provide more detailed methodology and results for review. Data on duration and frequency of home practice was collected, offering potential investigation of the moderating effect of these variables. Limitations include small sample size, randomization not reported, potential for parent reports to be influenced by expectations of positive outcome, (as they were self-referred co-participants), and the use of few objective measures and no third party (e.g., teachers) blind reports of outcome measures.

Lee et al. (2008) report an open trial of a 12-week MBCT-C program, using an intent-to treat two phase trial with no control group, with 25 non-clinical children (9–12 years), taught by experienced mindfulness instructors. Significant reductions were reported in parent-rated externalizing behaviors for completers ($p = .04$) but not on internalizing behaviors ($p = .16$), or self-report measures. Small to medium effect sizes were reported for the completers, ranging from $d = .19$–$.40$. As the non-clinical sample did not meet diagnostic criteria at baseline, authors note that it was difficult to detect changes post intervention.

The study is limited by no randomization or control group, small sample, and the reliance on parent or self-ratings, rather than objective or blind third party reports. The results do not provide much quantitative evidence of treatment efficacy, and the selection of clinical measures for non-clinical participants is questionable. Qualitative reports indicated positive evaluations by children and parents, and the intervention was considered feasible and acceptable for children in this age range.

Mindfulness-Based Approaches with High School Age Adolescents

Clinical Samples

Bootzin and Stevens (2005) report the use of MBSR in a multi-component 6-week intervention with 55 adolescents (13–19 years) who had received treatment for substance abuse, and presented with sleep problems. The MBSR component (five of six sessions) included instructions for home meditation practice, and one of two facilitators had MBSR training. Other components included cognitive therapy, sleep hygiene education, bright light exposure, and stimulus control instructions. The study used a within-participant pre-post design, with no control group. Authors reported significant reductions in self-reported sleepiness, worry and mental health distress ($p < 0.05$) and significant improvements in aspects of sleep quality for completers (e.g., sleep efficiency: $p < 0.001$; total sleep time: $p < 0.05$). Substance use *increased* during the intervention for all participants, though reported trends in 12-month follow up evaluations suggested decreasing substance use in completers, and continued increased substance use in non-completers.

Limitations of this study include the small sample, absence of randomization and control group, and reliance on self-reported data. The contributing effect of the MBSR component cannot be isolated from the multiple components in this study, nor were the features of the MBSR clearly outlined, making comparisons of this study's results with other MBSR/MBCT interventions untenable.

Zylowska et al. (2007) report a feasibility study of an 8-week MAPs intervention with a mixed group ($N = 32$) of adolescents ($N = 8$; mean age 15.6 years) and adults ($N = 24$; mean age 48.5 years) with ADHD, or "probable ADHD" (p. 5). Instructors were trained and experienced in MAPs interventions. The within-participant pre-post no control group intervention included weekly 2.5 h-sessions, homework practice (5–15 min sitting meditation) and specific psycho-education about attention deficit disorders. Pooled results for adults and adolescents indicated significant improvements in self-reported ADHD symptoms overall ($p < .01$), and some significant changes in neurocognitive measures ($p < .01$). Separate analysis of some adolescent and adult data was reported, e.g., time spent in home practice, where adults spent almost twice as much time as adolescents (adults averaged 90.3 min per week; adolescents averaged 42.6 min per week; $p = .03$), however this data was not analyzed for potential moderating effect of the variable (time spent in home practice) on outcome measures.

Zylowska et al.'s study is limited by the small sample size, no control group or randomization, and use of self-reported outcome measures, though strengthened somewhat by the inclusion of objective neurocognitive measures (though authors warn of potential practice effects in neurocognitive tests), however results cannot be used to attribute causality, or be generalized outside the intervention context. The study's design, which combined adults (mean age 48.5) and adolescents (mean age 15.6), may have effects on the intervention e.g., suitability of content, instructions, group cohesion, etc., that were not controlled for in the analysis. Additionally, authors noted that potential effects of group support and psycho-education were not controlled for, not allowing examination of the mindfulness effects, per se, and suggest this is a limitation.

Singh et al (2007) report a study of three adolescents with conduct disorders (13–14 years), at risk of school exclusion, who participated in a mindfulness meditation intervention administered individually in 12 sessions over

4 weeks, followed by a 25-week practice phase with monthly instructor-led sessions. The dependent variable was the self-reported number of aggressive and non-compliant acts, which showed minimal decrease in the training period, though more substantial decrease (up to 52%) in the follow up period, and all three students completed middle school without further threats of expulsion.

The study drew on mindfulness techniques, individually administered, and is not comparable to group MBSR/MBCT interventions; and the nonrandom small sample, no control group, self-reported data, limit the capacity for finding causality or generalization the results. The study's use of school-based data and incident recording suggests a method for data collection that may reflect functional changes in behavior that are objective and meaningful, particularly in a school context.

Singh et al. (2008) report a single case study of a multiple phase, changing criterion design intervention, which included mindfulness meditation, exercise and a food awareness program, with a male (17 years) with Prader–Willi Syndrome, who presented with morbid obesity. The intervention was conducted within the home, with the adolescent's mother providing mindfulness training, under the guidance of the study's senior author. The adolescent's body weight data was recorded at intervals across the intervention and 3-year follow-up periods. The adolescent's body weight decreased by 13.5 lbs (256.3–242.8 lbs), from baseline to pre-mindfulness meditation phase, and by 42.8 lbs (242.8–200 lbs) during the 24-week mindfulness intervention. During the 3-year follow up period, weight was maintained at range of 197–190.7 lbs.

The mindfulness meditation intervention included elements of MBSR, individually administered and combined with food awareness and exercise, so effects of mindfulness per se cannot be extracted from these results, nor can the results be generalized outside the single case context. However, anecdotal reports suggested that the mindfulness techniques were generalized and maintained to other maladaptive behaviors, once they had been taught in relation to eating behaviors, and the study offers some potential support for a parent—delivered mindfulness meditation intervention.

Bogels et al. (2008) report a pilot study using modified MBCT, with a quasi-experimental within-participant wait-list control nonrandomized design, in a community mental heath setting, with fourteen adolescents (age 11–18 years) with externalizing disorders (ADHD, oppositional and conduct disorders, and autistic spectrum disorders) and their parents in concurrent MBCT groups. Instructors were experienced and trained in MBCT. Results indicated significant improvements post intervention on objective attention measures ($p < .05$; $d = .6$), and at 8 week follow-up ($p < .001$; $d = 1.1$), and self reported measures of behaviors, goals, subjective happiness and mindful awareness, effect sizes at posttreatment ranging from $d = 0.4$ to 1.4, and at follow-up, $d = 0.5$–1.5. Parent reports of child variables were also analyzed, and ranged from $d = -0.1$ (social behavior; posttreatment) to $d = 1.6$ (child's goals; follow-up).

Bogels et al.'s study provides some promising results, intervening with a clinical group acknowledged by the authors as "hard work" (p. 205), with some high effect sizes maintained at 8-week follow-up. However, the small sample size, nonrandomized wait-list, and the use of behavioral reports taken from informants who participated in the intervention (rather than blind third party measures) limit the capacity for generalization beyond the study. The concurrent parent and child MBCT programs appears feasible and promising, although the analysis did not explore the possible interaction effects of concurrent participation.

Biegel et al. (2009) report a RCT of an MBSR intervention with 102 adolescents (14–18 years), who were under current or recent psychiatric outpatient care. The randomized wait-list control group received treatment as usual (TAU), the intervention group participated in TAU and an 8-week modified MBSR program, which adhered closely to the standard MBSR curriculum and structure, and was facilitated by trained, experienced mindfulness teachers. Modifications included reduced home practice time, and content focused on issues relevant to the age and characteristics of the group. Self-reported measures of perceived stress, anxiety, and several psychopathological symptoms all differed significantly post-test ($ps < .05$; effect sizes ranging from $d = .15$–.79), with similar results at 3-month follow-up (effect size range of $d = .28$–.92). Clinical measures of mental health, made by clinicians blind to treatment conditions, showed significant improvement in treatment group ($p < .0001$), and at follow-up ($p < .0001$) for completers.

Biegel et al. also report exploratory analysis of potential moderating effects on outcome measures of time spent in mindfulness practice, finding that more time spent in sitting meditation practice predicted improved clinician rated functioning, and declines in self reported depressive and anxiety symptoms, baseline to 3 month follow-up ($ps < .05$). Overall, this study presents reasonably sound methodology and analysis, with the inclusion of blind clinician ratings adding objectivity, and 3-month follow-up allowing initial examination of maintenance of changes. The study could be strengthened with a larger sample, longer follow-up assessments, and inclusion of more specific analysis of the effects of the mindfulness component, outside of group and psycho-education effects. The findings are promising, in paving the way to further the empirical evidence base for mindfulness-based intervention as an effective adjunct to TAU in clinical populations of adolescents.

Non-Clinical Samples

Wall (2005) reports on the feasibility of a 5-week modified MBSR intervention combined with Tai Chi with students (aged 11–13), with no outcome measures or home practice, where students' subjective reports suggested they felt calmer after sessions. The intervention included elements of MBSR (sitting meditations, mindful eating) however diverged from MBSR core curriculum and format, limiting any direct comparisons with MBSR/MBCT interventions. The absence of formal outcome measures prohibits conclusions being drawn as to efficacy, although, as noted, feasibility and acceptability of such novel interventions are essential in early research development.

In a study of mindfulness meditation techniques (not identified as MBSR), Beauchemin et al. (2008) conducted a pre–post no control design intervention of classroom of mindfulness meditation (MM) with 34 volunteer students with learning difficulties (aged 13–18 years) in a specialized school setting. Classroom teachers led 5–10 min MM at the commencement of each period, daily for 5 weeks, while non-participants engaged in in-class nondisruptive activities. Teachers had no mindfulness meditation experience prior to two and three quarter hours training, pre-intervention. Self rated anxiety and social skills, and teacher rated social skills and academic achievement all showed significant differences post-test (all p values $< .05$).

While these results appear initially positive following a brief intervention, the study's methodology limits inferences of causality. Limitations include potential subjectivity and bias in reporting, due to participant and teacher expectations (student volunteers, teacher led-intervention), the absence of a control group, small sample size, recruitment methods and potential effect of non-participants' presence in the intervention setting. The relative inexperience and brief training of teachers may be an issue, though may not be remarkable in this context, as this was not an MBSR-based intervention.

Discussion

The fifteen studies reviewed represent pioneering work and generally reflect a judicious approach, providing a reasonable base of support for the feasibility and acceptability of mindfulness-based approaches, that include core mindfulness meditation practices, with children and adolescents. However, the current research base is limited by lack of empirical evidence of the efficacy of interventions with these younger populations. The limitations may partly be attributable to the early stage of the research, where, like Phase I or II clinical research trials, safety, feasibility and effectiveness take priority over rigorous experimental design (Bowling 2007). In general, studies' methodologies and design were weak, (small samples, most lacking randomization and control groups), limiting subsequent data analysis, and precluding attribution of causality or generalization of results outside the intervention contexts.

Other limitations included reliance on self-report or non-blind third party measures, use of clinical measurement instruments with non-clinical samples, and all studies failed to include any methods for examining the relative contribution of mindfulness compared with the potential contributions of psycho-education and group support. Two studies reported the pre-post use of measures of mindfulness (Saltzman and Goldin 2008; Bogels et al. 2008), however, without published data on reliability and validity on these, the value of results remains uncertain. The multiple variations in intervention formats and varied methods of analysis limit comparisons between studies, and thus limiting the overall utility of the general findings from the current research base.

While the studies reviewed are limited somewhat by their status as innovative ventures in a novel field, their investigation of feasibility and acceptability of mindfulness-based interventions is a necessary prelude to furthering empirical research with younger populations. To empirically validate mindfulness-based interventions with children and adolescents, the same recommendations as the adult research apply: methodologically sound, large scale RCTs, across a range of problems and populations (Baer 2003; Grossman et al. 2004). Furthermore, to be designated as "probably efficacious" treatments, the field requires at least two studies that demonstrate the treatment is more effective than an alternate treatment or wait-list control (Baer 2003)—the reviewed study of Biegel et al. (2009) may open the pathway to gathering the requisite evidence in this newly emerging field.

In addition to broad methodological issues, specific practical issues relating to intervening with children and adolescent populations need to be addressed in future research studies. Adapting MBSR/MBCT programs for younger participants requires attention to age-related developmental needs (attention span, cognitive capacities, language, physicality, relevant content), and issues arising from the fact that children are somewhat embedded within their family (and school) systems, and varyingly reliant on adults (Saltzman and Goldin 2008; Semple and Lee 2008). Several of the reviewed studies include valuable and detailed examples of adaptations made to meet the age-related needs of younger participants (e.g., Napoli et al. 2005; Saltzman and Goldin 2008; Semple and Lee 2008).

The embedded nature of children in family and school systems suggests the inclusion of caregivers and/or teachers, so they are informed, and able to support home (or school) practice, at the very least, whereas concurrent or co-participation (e.g., Bogels et al. 2008; Saltzman and Goldin 2008) may elicit interaction effects, with the potential to strengthen treatment efficacy.

Other practical issues include the time involved in the interventions and home practice, competing with time demands of busy classrooms and family lives, with the additional requirements for developing a substantive research base (large sample RCTs, wait-lists, comparative non-mindfulness group interventions, etc.) adding further time demands, as well as ethical issues, including ensuring informed consent from both children and caregivers. Training and experience for mindfulness teachers presents as another practicality, for without the requisite experience, treatment fidelity of mindfulness-based interventions cannot be assured. Napoli et al. (2005) and Saltzman and Goldin (2008) highlight the need for external mindfulness teachers to have connected and supportive relationships with school staff, if school-based interventions are to function effectively, and Napoli et al., suggest that school staff could well benefit from participation in mindfulness-based interventions themselves.

Clearly, expansion of the research base requires careful attention to research aims and hypotheses, and to design, methodology, selection of appropriate and objective outcome measures, with thorough analysis, including the analysis of potential moderating variables. While measures of mindfulness have been developed for adults (Baer et al. 2006; Feldman et al. 2007), no measures have as yet been validated for use with children and adolescents, leaving a gap in the field that needs attention. Finally, I suggest that there are distinct advantages in researchers adhering to standardized intervention formats, as is the case with adult MBSR and MBCT, as this can allow for replication studies across multiple sites and conditions, from which meaningful comparisons may be made, expanding the evidence base. Collaboration and consensus on standardized adaptations and formats could be a valuable step forward in this field.

Advancing the empirical research is vital, as it is clear that the popularity of mindfulness-based approaches is on the rise in all age groups, including children and adolescents, despite the absence of empirical evidence of the efficacy of these interventions with younger populations. Now, with a reasonable base of support for the feasibility and acceptability of mindfulness-based interventions with children and adolescents, it is time that the field embarks upon a more rigorous course of gathering empirically sound evidence of the efficacy of these interventions.

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