

THE EVIDENCE FOR MINDFULNESS IN SCHOOLS FOR CHILDREN AND YOUNG PEOPLE

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EXECUTIVE SUMMARY

Mindfulness in schools is increasingly popular, and programmes, interventions, and accompanying research on mindfulness in schools are increasing exponentially.

This paper reviews the evidence for mindfulness-based interventions (MBIs) in school contexts with children and young people. The MBIs reviewed here are short, on average 10 sessions, usually the length of an average class session, with an invitation to home practice. They are typically based on the adult Mindfulness-based Stress Reduction/ Cognitive Therapy (MBSR/MBCT) course content, including breath awareness and present moment awareness (watching thoughts, feelings, sounds and bodily sensations come and go), and sometimes include mindful movement, mindful eating, relaxation, and body scan/body awareness. They are being taught through both universal and targeted approaches about evenly to both genders and age ranges, and are taught alone or integrated - most typically with yoga and social and emotional learning (SEL). The papers that report such short, focused, classroom-based interventions have been reviewed in 3 recent systematic reviews, and 5 meta-analyses, with 43 individual studies identified in school contexts which were published in peer-reviewed journals and scientific books, and we review the results here as well as looking at the evidence for particular outcomes. We include 11 case studies of particular programmes and their impacts where there are several studies of one programme.

OVERALL FINDINGS

Taken together, the evidence suggests that such short, focused, classroom based MBIs in school settings:

- Are **popular** (“acceptable”) with students and teachers and show **very little evidence of any adverse effects**.
- Can reliably impact on a wide range of indicators of **positive psychological, social and physical wellbeing and flourishing** in children and young people.

- Have most often been measured in relation to **psycho-social health and wellbeing/ mental health**, and aspects of **cognition**, where they reliably show small to medium impacts in both domains.
- Show promising emerging evidence for impacts on academic grades, on problem behaviour, and on physical health and wellbeing, but the numbers of group studies are too small to claim a reliable impact as yet.

Psycho-social outcomes/ mental health

- MBIs in school settings most often measure psycho-social aspects of wellbeing and this is where the evidence is strongest. They typically show between a **small and medium impact** (including on social and emotional skills, psychosocial wellbeing, and **mental health**).
- They typically show **small to medium impact on the signs and symptoms of child and adolescent depression** in a school context, across the age ranges, including on underlying ruminative and suicidal thoughts (10 studies, 7 of them Randomised Control Trials (RCTs), 1 controlled trial). There is some evidence of greater impact on those with a higher level of difficulty, and supportive evidence from work in clinical contexts.
- They typically show **small positive effects on anxiety**, across all age ranges (6 studies, 3 of them RCTs, 1 controlled trial).
- They typically show small to medium impacts on stress, in terms of both perceptions and dysfunctional reactions, across age ranges (5 studies, 1 of them an RCT, 3 controlled trials).
- The majority of evaluations of MBIs in schools have included some kind of measure of **social and emotional skills**, and have generally found **reliably positive, small, impacts**.
- They generally show small to medium impacts on **emotional self-regulation** (13 studies, 7 of them RCTs, 2 controlled trials), small to medium impacts on the development of **caring and compassion** (10 studies) self-perception and self-care (5), relationship skills and empathy (5).

Cognition

- An increasing number of MBIs measure aspects of cognition, and the evidence is becoming fairly convincing that they typically have a small to medium impact.
- Fourteen MBIs (7 of them RCTs, 4 controlled trials) showed impacts on aspects of **cognition, learning, executive function and cognitive processes, particularly on the ability to focus and sustain the attention**.
- Six studies (4 of them RCTs) included evidence for a small to medium impacts on **academic grades**.
- Two (1 an RCT, 1 controlled trial) found evidence for impacts on **meta-cognition** (reflecting on thought processes).

Behaviour

- Five group-based MBIs in school settings (2 controlled trials) found small impacts on behaviour.
- There is more evidence from single case studies and in clinical and community contexts, including parenting, where 5 studies show early, promising **evidence for impacts on problem behaviour, with small to medium impacts** on aggression, hostility and Attention Deficit Hyperactivity Disorder (ADHD).

Physical health

- There is promising early **evidence for impacts on signs of physiological health**. There are not as yet enough studies to calculate overall significance.
- Six MBIs(4 of them RCTs) have shown impacts on **physiological indicators of health and wellbeing** in children and young people including heart rate, blood pressure, cortisol production and sleep quality.
- Two MBIs (both RCTs) showed a positive impact on **eating problems**, one on obesity prevention, one on the signs of eating disorder, both with adolescents.

Need for more and better research

Research on mindfulness in schools is still in its infancy, particularly in relation to impacts on behaviour, academic performance and physical health. It can best be described as 'promising' and 'worth trying'. We need more and larger RCTs, more replication and longer follow ups, more measures designed specifically for young people, and greater standardization between measures, a wider range of measures, such as performance, physiological measures and multi-informant measures, greater separation between developers and researchers to reduce bias, greater effort to ensure that null findings and adverse effects are properly and fully reported, and more studies on implementation- exploring the impact of how MBIs are delivered, for whom they are and are not indicated and so on. There is a need to avoid 'overselling' mindfulness, a tendency that is sometimes encouraged by commercial interests, and the media, rather than academic research.

Acknowledgment/ possible conflict of interest

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INTRODUCTION

The growth of interest in mindfulness

We are experiencing a major growth of interest and activity around mindfulness, with programmes, courses, research, publications, conferences and media interest proliferating. Mindfulness is increasingly moving into the mainstream in public life and can be found in many interconnected arenas, including the health services, business, politics and education (New Economics Foundation, 2014). It has impacted on popular consciousness, and been the subject of a degree of both 'hype' and backlash (Van Dam, et al, 2016).

Research with adults, including many RCTs and meta-analyses have concluded there is, overall, a clear and numerically significant, impact of short, focused mindfulness-based interventions for adults over a very wide range of aspects of wellbeing, on mental health. The strongest evidence is for impacts on depression, anxiety and stress, on physical health including pain, and a wide range of illness and conditions, and physical indicators such as cortisol and blood pressure, with more mixed evidence for performance, including attention and focus (Chiesa et al, 2012; Khoury et al. 2013; Goyal et al, 2014). Evidence is starting to emerge for the beneficial impacts on the wellbeing and performance of school staff (Weare, 2014; Emerson et al, 2017).

Neuroimaging studies suggest that the practice of mindfulness meditation reliably changes the structure and function of the brain to increase blood flow and density to areas associated with decision-making and rational thinking, emotion regulation, learning and memory, kindness, and compassion, and decreased density in areas involved in anxiety, worry and impulsiveness (Davidson and Lutz, 2008; Holzel et al., 2011a, 2011b).

In the wake of the generally positive impacts of mindfulness with adults, programmes, curricula and interventions for children and young people have been developing apace, accompanied by growing research into their effectiveness. This activity has been accompanied by an ever-increasing number of papers, books, conferences, online mailing lists and discussion boards. Mindfulness is being presented as 'promising' and apparently cost effective, able to help young people improve their mental health, their social and emotional skills and capacities, their behaviour, their cognitive development, their learning and their physical health (New Economics Foundation, 2014). Schools are a particular focus for such aspirations, and mindfulness programmes in schools are proliferating.

As with any kind of therapeutic intervention, mindfulness meditation can lead to 'difficult' psychological experiences, and as with physical exercise, brings risks as well as benefits. For most participants difficult experiences are seen as part of the journey of self-knowledge and insight, and even empowering (Allen et al, 2009), while risks can be mitigated by working with an experienced teacher (Baer and Kuyken, 2016).

However there is a need for caution as people unused to these traditions take up meditation with unmitigated enthusiasm, and while there is no control over who offers to teach mindfulness. There are first person accounts emerging of the troubling experiences of a relatively small number of people, so far all of them adults who engage in longer practice and silent retreats (Rocha, 2014). There are concerns that not enough attention is being paid to

some serious adverse psychological effects from longer periods of meditation and silence, which anecdotal evidence suggests may, in rare cases, persist over significant amounts of time (Rocha, 2014). Efforts are now starting, from within the mindfulness community itself to address this, to uncover the incidence and prevalence of difficulties and adverse effects, and clarify what steps need to be taken to safeguard the wellbeing of participants, particularly medium and long term meditators (Baer and Kuyken, 2016; Lindhal et al, 2017). **It should be emphasised that none of these concerns, as far as we currently know, apply to the kind of relatively short, focused MBIs being reviewed here, which to date show almost no adverse effects.**

Aims, definitions and scope of this paper

In the face of all this activity, energy, and enthusiasm, as well as a degree of hype and some concerns, it is right to ask critical questions about the nature and strength of the evidence base. This paper will attempt to outline **what we currently know of the evidence for MBIs in schools, as of February 2018**, presented in what is intended to be an easy to read, non-technical style and language for the general reader.

Drawing on accepted current definitions (e.g. Kabat-Zinn 2005, p4) **we define mindfulness as the ability to pay attention and to be present with all kinds of experience, with open minded curiosity and kindness, developed through practice, including mindfulness based meditations.**

In order to maintain the most rigorous possible focus, **we will concentrate here mainly on the type of rigorous quantitative research studies that either have been, or appear eligible to be, subject to systematic reviews and meta-analyses¹** This involves studies sometimes known as ‘experimental and quasi-experimental studies’, taking the form of a ‘control trial’, dividing participants into a group who receive the intervention and a control group who do not and who can act as a comparison group. To increase rigour it may take the form of a ‘randomised control trial’ (RCT) where participants are allocated randomly between the two groups, either as individuals or as preexisting group such as a class or school. We include also ‘pre-post test’ designs, where measures are taken with one group only, but at different time points, usually before and straight after the intervention, and sometimes also later. These quantitative studies are often labelled ‘Mindfulness Based Interventions’ (MBIs), the term ‘intervention’ indicating that they are clearly defined in scope and length, and wholly or partly manualised, i.e. with clear and written instructions on how they are to be conducted. **We look here mainly at MBIs**, but when we include other types of research such as smaller case studies, we make that clear.

In practice specific MBIs may well be part of wider and more diffuse approaches, programmes and frameworks, including qualitative work, process evaluations and whole school implementation: such work is invaluable and indeed essential to help the specific MBIs develop and work well, but it is harder to evaluate numerically.

¹Systematic reviews answer a pre-defined research question by collecting and summarizing all empirical evidence that fits pre-defined eligibility criteria, using a transparent and structured methodology to decide what literature to include and exclude. Meta-analyses are systematic reviews which take the process a step further through using statistical methods to summarise the results of the studies: they bring together the quantitative findings of a range of studies and make a pooled statistical estimate of the overall impact on various outcomes.

This paper focuses primarily on **MBIs that teach mindfulness to pupils in school and preschool settings**. Where we include findings from other settings, such as clinics, homes, and youth centres, that illuminate a particular issue or outcome, we make that context clear.

REVIEWS OF THE FIELD

Building on the progress made with MBIs for adults, the last 15 years have seen a rapid increase in MBIs for children and young people. There have been to date around 13 reviews of the overall evidence on mindfulness in schools published in peer-reviewed journals and scientific books. Some are '**narrative reviews**' that bring together the research base in an emerging field to give an overview, with analysis and commentary (e.g Greenberg and Harris, 2012, Micklejohn et al, 2012, Weare, 2013). There have been **3 'systematic reviews'**¹ of mindfulness for children and young people (Burke, 2010; Felver, 2015; Black, 2016). Recently the number of interventions and the number of participants in them have become large enough, and the designs methodologically strong enough, to enable the publication of **5 meta-analyses** of mindfulness with children and young people¹ (Zenner et al, 2014; Zoogman et al, 2014; Kallapiran et al, 2015; Klingbeil et al, 2017a; Klingbeil et al, 2017b; Maynard et al, 2017, popularly called 'the Campbell Collaboration review'). Most of these reviews include interventions that take place both in schools and out of school settings (such as homes and clinics).

Between them, the reviews and meta-analyses have found that MBIs, in school settings, have the following characteristics:

- The bulk of studies come from the US or Canada but there is activity across the world, with some evaluated MBIs in Australia, Europe (including the UK), and Asia.
- MBIs in schools are more likely to be delivered to everyone in a naturally occurring group or school class - the so called 'universal' approach - but a significant percentage (estimated as 39% Felver et al, 2015, 16% Maynard et al, 2017) target groups with problems.
- Problems targeted in school settings have included a wide range of medical, developmental, behavioural, educational, and psychological difficulties and disabilities. There is a good deal of further targeted work in non-school settings, such as clinics and detention centres, covering a wider range of problems and conditions.
- MBIs have been spread across the school age ranges (average age 12.8 years, Felver et al, 2015), but with a slight tendency towards older age groups/teens (Zenner et al., 2014).
- Teaching has been generally been balanced between the genders.
- MBIs in schools are generally delivered in a face-to-face group format, and most of them fully or partly manualized.
- MBIs have been implemented in many parts of the school day: in the traditional core curriculum; in physical education classes; and in electives, such as lunchtime groups, school clubs and summer schools.

- MBIs in schools vary greatly in terms of the time they take up, ranging from 4 to 28 weeks, with an average of 10.5 weeks; they have been spread between 6 to 125 sessions, with an average of 26 sessions, and with an average of 13 hours of instruction. They have varied in intensity, from once every other week to 5 times a week.
- There is a 'common core curriculum' emerging, based largely on work with adults in MBSR/MBCT courses. Sessions generally incorporate meditation, breathing techniques/breath awareness, present moment awareness (watching thoughts, feelings, sounds and bodily sensations come and go), and often include mindful movement, mindful eating, relaxation, and body scan/body awareness.
- Home practice has been assigned or encouraged in about half of the studies.
- Several interventions have included, or been integrated with, other components in addition to mindfulness, most often yoga and/or social and emotional learning (SEL), but also cognitive and/or behavioural strategies, talk/discussion, reading, art, and touch therapy.

Overall impacts and outcomes

We are looking in this part of the paper at reviews and meta-analyses, which bring results together and take the findings of many studies into account. We not looking at individual pieces of work which will inevitably come to a range of contrasting conclusions. We will explore the nuanced differences between individual studies later in the paper when we look at particular outcomes and particular programmes.

All the systematic reviews and meta-analyses found MBIs to be popular with staff and children/young people (so-called 'acceptable').

They found little evidence of harmful (so-called 'adverse') effects from these short, focused interventions.

All came to cautiously positive conclusions, identifying positive effects in the small to medium range across a wide range of outcomes. To look in more detail:

- All of the 7 that reviewed this area agreed there was **at least a small, some said medium, impact on 'psychosocial outcomes'** (such as social and emotional skills, aspects of psychosocial wellbeing, and mental health including depression, anxiety and stress – some included problematic behaviour in that category).
- All of the 6 that reviewed this area found between **a small to medium impact on aspects of cognition**, particularly the ability to pay attention.
- All of the 6 that reviewed this area, bar one (Maynard et al, 2017, the 'Campbell Collaboration') concluded there is evidence for **at least a small overall impact on academic learning, with 2 finding evidence for improvements in grades.**
- All found **evidence in individual studies for impacts on physiological health**, such as heart rate and blood pressure, but they varied on whether the quality and amount of the evidence allowed for an estimation of the size of impact.

Small differences and disagreements between the reviews are inevitable as they are not directly comparable. They are of variable quality and rigor, use slightly different foci (e.g. school only or including other contexts), slightly different criteria for inclusion/ exclusion of different studies (e.g. published only or including unpublished such as theses; control studies only or including other types e.g. pre and post) and consulted overlapping but slightly different databases.

The reviews in more detail

To summarise in more detail **the key conclusions of the 7 most recent reviews and meta-analyses.**

- **Felver (2015)** systematically reviewed studies in school settings and concluded from 28 studies, including 10 RCTs, that ***‘MBIs appear to be effective at reducing psychosocial problems and supporting positive attributes’*** (in which they included mental health indicators, social and emotional learning, cognitive function and physiological measures) and are *“acceptable and possibly effective interventions for various target behaviours”* (p538).
- **Black (2016)** systematically reviewed 41 MBI studies, including 13 RCTs, conducted in school and clinical settings. They concluded that **MBIs in schools reliably impact on a wide range of indicators of wellbeing** including: aspects of cognition and executive function, particularly the ability to pay attention; psycho-social variables such as emotional regulation, interpersonal relationships, stress, depression and anxiety; and measures of psycho-biological outcomes such as blood pressure and heart rate.
- A meta-analysis by **Zenner et al. (2014)** of 24 school-based MBIs across a wide range of psycho-social and cognitive domains found *“a significant medium effect size across all controlled studies. The effects are strongest in the domain of cognitive performance with a large and significant (effect size) for controlled studies”* (p.16).
- **Zoogman et al (2014)** in a meta-analysis of mindfulness interventions with youth aged 6–21 years (including non-school settings) found **MBIs showed effect sizes in the small to moderate range for all outcomes**, including emotional and behavioural regulation, depressive and anxiety symptoms, stress, attention, and cognitive functioning.
- **Kallapiran et al. (2015)** in a meta-analysis analysed 11 RCTs targeting mental health outcomes in both clinical and non-clinical samples, with young people ranging from 6 to 18 years old. They concluded that **MBIs with non-clinical samples (including schools) had small effects on stress and depression, and large effects on anxiety.**
- **Maynard et al (2017)** the ‘Campbell Collaboration’ reviewing MBIs for school-aged children in a range of settings, identified 61 studies for systematic review,

and 35 randomised or quasi-experimental studies for further meta-analysis. They found **small positive effects on cognitive and socioemotional outcomes**. **They found positive but non-significant effects on academic and behavioural outcomes** (it may be significant that their search overlooked two of the studies that provide the strongest evidence in this area). They did not find enough studies to estimate the size of impacts on physiological measures of health.

- **Klingbeil et al (2017a)** in their meta-analysis of 76 studies concluded that MBIs yielded a **small positive average treatment effect across all outcomes**, with the largest effect being seen in academic achievement and school functioning, and slightly lower but still positive effects on meta-cognition, attention, cognitive flexibility, emotional/behavioural regulation, mental health issues/ internalizing problems (e.g. distress, depression and anxiety), positive emotions and self-appraisal. They found larger effect sizes at follow up than immediately after interventions.
- **Klingbeil et al. (2017b)**, focused on 10 single case studies that explored the impact of mindfulness on behaviour. They found that **MBIs had at least a moderate average effect on disruptive behaviour during treatment phases with larger effects observed during maintenance phases** and concluded MBIs were '*useful*' as targeted interventions for decreasing youths' disruptive behaviour in home and school settings.

Characteristics of the papers and studies used in this review

In the light of all these recent reviews and meta-analyses we have not undertaken a new systematic review but are guided by these recent reviews. The papers which we use as our evidence have the following characteristics.

- The core evidence is **44 MBIs in school settings**: where we have included work in other settings to illuminate a particular issue (5 papers) we make that clear.
- Most of the papers were **included in the 8 reviews and meta-analyses** summarised above.
- The 44 papers we review here include a small number of **further papers that appear to fit the criteria of those various reviews and meta-analyses**, but were published after the authors of the reviews did their searches, or appear to have been overlooked. In particular, we have included papers from a new review currently being undertaken by the Myriad project which is focusing on RCTs for young people, and taught in multiple sessions by trained teachers.

- They largely use **quantitative methods** of data collection, being RCTs, or quasi-experimental with controls, wait list or pre- and post-. Where we include work from single case studies we make that clear.

We include here only those papers which have been **subject to external review**, published in peer reviewed journals or scientific books. We exclude unpublished works, theses and dissertations, and papers published online only (often by those involved in the programme being evaluated - a clear source of bias). This is in contrast to some of the reviews, which use such 'grey literature', and is intended to ensure this paper is based only on the highest quality evidence.

PSYCHO-SOCIAL IMPACTS

MBIs with adults have regularly focused and measured impacts on psychological and social aspects of health and wellbeing. Work with young people has followed this lead and this is the area on which the majority of school-based MBIs have concentrated. Maynard et al (2017) found 28 good quality studies which attempted to measure some form of psycho-social impacts to include in their meta-analysis, from the overall sample of 35.

A conclusion on which there was clear consensus across all the reviews and meta-analyses is that MBIs can **impact positively on psychological, mental and social health and wellbeing** (variously titled by the reviews e.g. '*resilience to stress*', '*coping*', '*socio-psychological processes*' '*psychosocial problems*' and '*psychological symptoms*'). The 4 meta-analyses that looked at this issue (Maynard et al, 2017; Zoogman et al, 2014; Zenner et al, 2014, Klingbeil, 2017a) concluded that there is between a small to a medium impact overall. Indeed, Zoogman et al found that MBIs tended to have larger effects on what they termed '*psychological symptoms*' than on any of the other outcomes they looked at.

Wellbeing

There is new emphasis on the positive in studies of human development, using terms such as 'wellbeing', 'flourishing' and 'thriving', moving on from the traditional focus only on human problems and pathologies (Keyes, 2002; Huppert, 2014). **All the reviews concluded that MBIs can promote various aspects of positive wellbeing and flourishing in young people**, psychologically, socially, behaviourally, academically and physically.

'Wellbeing' can be a vague term, and several scales have been produced which attempt to bring clarity and precision to the concept, using items which refer to states such as: cheerfulness, optimism, relaxation; clarity of thinking; and satisfying interpersonal relationships, interest in and connection with others and a sense of social usefulness and purpose (e.g. *The Warwick-Edinburgh Mental Wellbeing Scale (WEMWEBs)*, University of Warwick, 2017; *The Stirling Children's Wellbeing Scale (SCWBS)*, Liddle and Carter 2015).

Case study 1:

Mindfulness promotes wellbeing in children from an indigenous community

*Bernay (2016), undertook a before and after evaluation with 124 elementary students of an **eight-lesson mindfulness module developed by the Mental Health Foundation of New Zealand**. As well as the usual mindfulness practices, the programme also included practices tailored to fit the particular context, and the attitudes to health and well-being held by the indigenous Māori population, including promoting kindness and gratitude, emotion-regulation and interconnectedness between oneself and the wider environment. The evaluation found significant improvements in subjective well-being, cheerfulness and satisfying interpersonal relationships, measured on the SCWBS.*

Five school based studies of MBIs (Huppert and Johnson, 2010; Lau and Hue, 2011; Kuyken et al, 2013; Weijer-Bergsma et al, 2014; Bernay et al, 2016) have used such composite scales in an attempt to measure the impact of MBIs on wellbeing: they all found small but positive effects across the age ranges.

Mental health problems

Acknowledging the value of an overall focus on positive wellbeing, we also recognise the serious and growing level of mental health problems in children and young people. Currently in the UK about 25% of young people are estimated to have an identifiable disorder with 10% needing specialist treatment, and 20% of adolescents may experience a mental health problem in any given year. Mental health problems in youth do not generally go away, indeed most serious mental health problems begin in childhood or adolescence. In the UK it has been estimated that 50% of mental health problems are established by age 14 and 75% by age 24.2. Yet 70% of UK children and adolescents who experience mental health problems have not had appropriate interventions at a sufficiently early age (Mental Health Foundation, 2014), so most mental health problems remain untreated. Problems such as anxiety, depression, self-harm, suicidality, eating disorders, low self-esteem, self-harm, bullying and stress are widespread and growing and occurring at earlier ages than hitherto.

Mental health outcomes of various kinds have been among those most frequently evaluated on MBIs with the young. **The systematic reviews and meta-analyses we reviewed above estimate that there is typically between a small and medium impact of MBIs in school settings on mental health for the young.**

There is a body of emerging evidence for MBIs targeted at youth identified as having mental health problems in out of school settings. In an influential and robust clinically based study, Biegel et al (2009) conducted an RCT of 102 adolescents. The intervention group reported significantly reduced anxiety, depressive symptoms, obsessive symptoms, somatization symptoms, stress and interpersonal problems, with improved self-esteem and sleep quality,

relative to those who did not receive the intervention. Impacts have also been reliably shown on Attention Deficit Disorder (ADHD) (Bogels et al, 2008; Zylowska et al, 2008) and autism (Hwang et al, 2015) in homes and clinics.

Sibinga et al (2016), in a fairly large and robust RCT, compared a 12 week MBI with a health education class, using a sample of 300 students aged between nine and twelve in schools in a deprived area. They measured both outcomes and some underlying indicators of mental health conditions. MBI students showed significantly lower levels of mental health problems, including somatisation, depression, and post-traumatic symptoms, and exhibited lower rates of negative coping, rumination, and self-hostility, compared with controls.

Case study 2:

The Mindfulness in Schools Project can impact on mental health, wellbeing, stress and meta-cognition - when taught by classroom teachers

The Mindfulness in Schools Project in the UK is a 10-week universal MBI, involving generally one session a week taking place in normal lesson time. The content is based loosely on the MBSR course, and includes the basic practices of mindfulness of breath, of body, the passing nature of thoughts, mindful eating, mindful walking and dealing with stress. It is supported by a home practice, a guidance manual, an indicative script for teachers and a student booklet. The course designers, who are classroom teachers, have focused particularly on making the programme attractive to children and teens, with interactive, experiential and lively teaching methods and high quality resources, including film clips, and challenging and sometimes 'edgy' activities.

*A controlled study of an early pilot 4 week version of the **Secondary School .b (pronounced 'dot be') programme** (Huppert and Johnson, 2010) with 14 to 15 year-old male students in two English independent boys' schools, taught by the developers of the programme to their regular classes produced significant effects on mindfulness, ego-resilience or well-being among students who regularly did 10 minutes of home practice a day, and smaller non-significant changes among those who did not, compared with controls.*

Three years later, a 9-week version of the programme was evaluated in a non-randomized controlled study of a sample of 522 young people aged twelve to sixteen in 12 secondary schools (Kuyken et al, 2013). It was taught by regular classroom teachers who had also been fully trained to deliver the programme. Young people in the intervention group reported significantly fewer depressive symptoms post-treatment and at three month follow-up, and lower stress and greater well-being at follow-up, compared with controls. Although with this longer intervention young people benefitted whether or not they practiced, greater home practice was again significantly associated with better outcomes such as greater well-being and less stress at follow-up.

*A controlled feasibility pilot the curriculum adapted for **Primary Schools, Paws b***

(Vickery and Dorjee, 2016) underwent a controlled study of 71 seven to nine year-olds from three primary schools in the UK. It was taught by regular classroom teachers who had been trained to deliver the programme. It showed significant decreases in negative affect at follow-up, with a large effect size and small but positive improvements in meta-cognition (the ability to 'think about thinking' compared with the control group.

An RCT by Johnson et al (2017) of the .b teen curriculum with 13/14 year boys and girls, was not so positive. The programme was delivered by an outside facilitator, to one group of 191 students with strong parental involvement, 186 without parental involvement, and to 178 students in a control group taught their usual curriculum. The measures detected no significant differences in measures of anxiety, depression, weight/shape concerns, wellbeing and mindfulness between intervention and control groups at post-intervention, six or twelve month follow-up. In exploring the reasons for these out of line findings, it may be significant that the intervention deviated considerably in its implementation from the advice in the guidance manual and from the conduct of the other three trials. In this trial all the groups were taught by the same mindfulness instructor, the other trials used a range to even out individual differences. The instructor was an outside researcher/facilitator, not a classroom teacher, while the advice guidance, followed in the other trials, is to use classroom teachers teaching their regular classes to ensure good classroom management skills and a pre-existing relationship with the pupils. Parents were actively involved in encouraging their children to practice at home, an approach which has not been trialed in this or any other programme and may well have been off-putting for teens – the original programme takes pains to be pupil centred, fun, and somewhat 'subversive'. The materials used were not the latest version and were 'customised', which the programme expressly discourages to ensure quality and consistency. This points to the need to deliver programmes with fidelity (i.e. as intended as trialed) and to look to implementation quality as well as outcomes when in examining programme effectiveness and in exploring unusual results.

Depression

Ten school-based MBIs, 7 of them RCTs, plus a controlled trial, have reported a reliable impact of MBIs on the signs and symptoms of child and adolescent depression in a school context, across the age ranges.

Depression and suicidality appear to be increasing in the young, with signs and symptoms occurring at increasingly young ages. Building on the solid evidence for the role of mindfulness in the prevention of depression relapse in adults (Ma and Teasdale, 2004; NICE, 2009) mindfulness has shown promise in treating depression in young people in and out of school contexts, such as clinics and community based environments (Liehr and Diaz, 2010; Biegel et al, 2009).

MBIs have attempted to tackle and measure depression in school settings. Case studies in this paper have summarized impacts on depression from three programmes (case study 2, *The Mindfulness in Schools Project .b programme* with adolescents (Kuyken et al, 2013) case study 6, *Learning to Breathe*, for adolescents (Bluth et al, 2015) and case study 7, *The MindUP programme* for middle school children (Schonert Reichel et al, 2015)).

Mendelson et al (2010), in an RCT with 97 children aged eight to nine, and Joyce (2010) in a before and after study with 141 aged ten to eleven, also showed significant impacts on the signs of depression in middle school children.

Adolescence is the peak incidence for depression, and associated problems such as self-harm and suicidality. Raes et al (2013) undertook sizeable RCT of a universal MBI with 12 pairs of parallel classes, with 408 secondary school students, aged thirteen to twenty, from five schools: they found a medium sized effect on depressive symptoms. Lau and Hue (2011) undertook a controlled study of a 6 week MBI in two schools in Hong Kong, with 48 fourteen to sixteen year-olds, with low academic performance: they showed a small but significant decrease in depressive symptoms compared with controls. Edwards et al (2010) evaluated the impact of the 8 lesson Mindfulness-Based Stress Reduction for Teens in a study measuring depressive symptoms at three time points in 20 Latino students aged from 12 to 17: they found the signs of depression to be significantly decreased.

As with adults, **the fairly reliably reported impact of mindfulness practice on depression is currently thought to be its ability to reduce mental ‘rumination’**, allowing people to gain a sense of space and objectivity around their thoughts, becoming aware of and ‘unhooking’ from the ‘automatic pilot’ of circular negative thought patterns. Both Mendelson (2010) and Sibinga (2016) found a diminution in rumination and intrusive, repetitive thoughts, while Britton (2014), in an RCT with 101 ten to eleven year-olds, found less suicidal and self-harm thoughts in an intervention group compared with controls.

Anxiety

There have been 6 school-based studies, 3 of them RCTs, plus 1 further controlled trial, which show small but positive effects from MBIs on anxiety, across age ranges, ability and income ranges.

Anxiety is the most reported mental health problem among the young, and often accompanies depression. The bombardment of modern life, including the public scrutiny and constant comparison that can accompany the over-use of social media, and increasing pressures from school and parents appears to be making anxiety a chronic problem for many young people, who are already at a stage of their life when they are liable to feel particularly unsure and vulnerable. Chronic anxiety often persists into adulthood, and causes impairment in many areas of life.

Semple (2010) also found significant reductions in anxiety in a wait list RCT of 25 nine to thirteen year-olds from low income, inner-city households. Sibinga (2016) showed significant impacts on anxiety with an RCT involving 41 boys aged eleven to twelve, as did Haydicky (2012) in a control trial with 60 twelve year-old boys with learning difficulties. Beauchemin

(2008), in a pre-post study showed an impact on 34 adolescents, average age 16, with learning difficulties, as did Franco (2011b) in an RCT of sixteen to eighteen year-olds.

Case study 3:

The Attention Academy Programme shows impacts on anxiety and the ability to pay attention in young children

The Attention Academy Program (AAP) consisted of twelve 45-minute sessions of mindfulness and relaxation over the unusually long period of 24 weeks. It employed familiar mindfulness practices, including breath, body scan, mindful movement, and sensorimotor awareness activities, taught to children aged 5-to 8 identified as having high anxiety. Napoli, et al (2005) evaluated the programme, using an RCT design, and a fairly large sample of 228 participants. There was a significant improvement in self-rated test anxiety, teacher-rated attention, social skills, and selective (visual) attention post treatment, compared with control groups, with effect sizes ranging from small to medium.

Stress

'Stress' is a term used colloquially to cover a wide range of negative feelings, particularly a sense of pressure and overwhelm. Measures have been developed that attempt bring more precision to the concept. They include measures of **perceived psychological stress** that explore perceptions of a wide range of distressing feelings and mood states, connected with a sense of life feeling unpredictable and uncontrollable, and feelings of overload, tension, preoccupation, confusion and agitation. Some MBIs measure stress more behaviourally, looking at **dysfunctional reactions to stress**, such as negative coping strategies, rumination, intrusive thoughts and impulsive behaviour.

Five school based MBIs, 1 of them an RCT, 3 controlled trials, have shown impacts on stress.

Two of the case studies of programmes in this paper measured and showed impacts on perceived stress in adolescents (case study 2, *.b Mindfulness in Schools Project*, Kuyken et al, 2013; case study 6, *Learning to Breathe*, Metz et al, 2013).

Edwards et (2014), in a study we reported on above, exploring the impact of the 8 lesson *Mindfulness-Based Stress Reduction for Teens* on 20 Latino middle school students found that perceived stress was significantly decreased. Sibinga (2016) in a control trial looked at the impact of MBSR, adapted for children, in 300 students of average age twelve, in two schools. They found that MBSR students had significantly lower levels of negative coping compared with controls.

(We explore the psychobiological 'stress response' later when we look at physical health.)

Case study 4:

Mindfulness and yoga can impact on reactions to stress in middle school children

Mendelson et al. (2010) in a pilot study using an RCT, assessed a school-based mindfulness and yoga-based physical activity, involving breathing techniques and guided mindfulness practice. The class consisted of yoga-inspired postures and movement series, including bending, stretching, and fluid movement. Students also practiced paying attention to their breath and using their breath to center and calm themselves. Each session included information and discussion on topics such as identifying stressors, using mindfulness techniques to respond to stress, cultivating positive relationships with others, and keeping one's mind and body healthy. Students were encouraged to practice these skills outside class.

Four urban public schools were randomised to an intervention or wait-list control condition involving 97 fourth and fifth graders. Findings suggest the intervention was attractive to students, teachers, and school administrators and that it had a significantly positive impact on problematic responses to stress including students' levels of rumination, intrusive thoughts, and emotional arousal.

Eating problems

Case study 5:

The mindfulness based *Body Project* can impact on body awareness

A school-based cluster RCT (Atkinson and Wade, 2015) assessed a mindfulness based body awareness project which attempted to address body eating disorders directly. Nineteen classes of 347 adolescent girls were allocated to a 3-session mindfulness-based body awareness programme or to a control group. The programme was adapted from MBCT to be relevant to eating disorder, including: present-moment awareness through mindfully eating a raisin while using breath as an anchor; viewing thoughts and feelings about the body as mental events; and practising non-judgement and acceptance around body-related thoughts and feelings. Students receiving the MBI demonstrated significant reductions in weight and shape concern, dietary restraint, thin-ideal internalisation, eating disorder symptoms and psychosocial impairment, relative to control, at 6-month follow-up. However these results were only the case where the programme was facilitated by the best trained leader: the programme showed no difference when tutors were trained only briefly.

Eating problems are on the rise. Across England for 40.4 per cent of people are overweight and a further 24.4 per cent are obese (Public Health England, 2017). Up to 6.4% of adults display signs of an eating disorder such as anorexia and bulimia; the number is rising steadily, especially in the young, with an increasing number of hospital admissions at ever earlier ages (Beat, 2014).

Mindful eating practice is a regular part of most MBIs, with participants invited to eat slowly, savouring the food, and with awareness of the thoughts and feelings that accompany eating. Mindful eating is showing promise in adults as a treatment for all kinds of dietary and eating-related problems and disorders such as obesity, diabetes, anorexia and bulimia (The Centre for Mindful Eating, 2017; Godrey et al, 2014).

Two school-based MBIs showed a positive impact on eating problems.

A 12-week mindfulness-based eating awareness programme (MB-EAT) (Barnes and Kristeller, 2016) was subject to an RCT, with 40 ninth grade adolescents who were randomly assigned to the intervention or a health education class. Results showed that, relative to controls, the MB-EAT-A group increased their levels of moderate exercise and their intake of low calorie, low fat foods.

Social, emotional and behavioural skills

Case study 6:

“Learning to Breathe” can enhance social and emotional skills and mental health, in teenagers

The “Learning to BREATHE” curriculum attempts to tailor mindfulness-based approaches to the developmental needs of adolescents by helping students be mindful of their present situation through lessons on body, thought, and emotion awareness, reducing self-judgment, and being mindful in everyday life. It takes the form of a six, twelve, or sixteen week curriculum conducted in a group setting. Each 45-minute lesson includes a short overview of the mindfulness principle being studied, The core includes practices familiar from most MBIs such as body scan, mindfulness of thoughts, mindfulness of emotions, and mindful movement, plus a more unusual loving kindness practice (where students are invited to bring someone to mind, including themselves, and wish them well). Student workbooks and individual practice CDs for home mindfulness practice are provided.

The programme, integrated into a health class, was evaluated by Broderick and Metz (2009), using a control trial with 120 senior students, average age 17 in an American independent girls’ school. They found a range of significant impacts, including less negative emotion, and increased calmness, relaxation, clarity, self-acceptance, emotional regulation, and some impacts on physical health, such as less tiredness and aches and pains. Four years later, Metz et al (2013), in a larger controlled study of 216 high school students in a choir class, found similar results. Students who participated in

the programme reported statistically lower levels of perceived stress and psychosomatic complaints, higher emotional regulation, including emotional awareness, and greater access to emotional regulation strategies, and emotional clarity, compared with controls.

In a further study of the programme by Bluth et al (2015), 27 nine to twelfth grade students were randomly assigned to a mindfulness or substance abuse control class, for 50 minutes, once a week, over one school semester. Reductions in depression were seen for students in the mindfulness class compared to controls. Over the semester, the perceived credibility with students of the mindfulness class increased, while that of the substance abuse class decreased.

The cultivation of social and emotional skills (often called social and emotional learning - SEL) is a highly active field in education. SEL has been summarised as *“the process through which children and adults acquire and effectively apply the knowledge, attitudes, and skills necessary to understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions”* (CASEL, 2017).

The evidence for the impact of SEL skills is fairly robust: SEL programmes have been shown by some robust meta-analyses to be directly and indirectly linked to psychological wellbeing, mental health, and academic performance, in both the short term (Durlak et al, 2011) and the longer term (Taylor et al, 2017).

The majority of evaluations of MBIs in schools have included some kind of measure of social and emotional skills, and have generally found reliably positive, small, impacts.

Self-regulation and emotional regulation

Self-regulation refers to the ability to monitor and control our thoughts, behaviours/actions and emotions and is a core generic skill. Self-regulation has been found to be related to, and predictive of, a number of outcomes important to student success in school, such as externalizing and internalizing problems, classroom behaviours and disciplinary incidents, and to school grades and performance (Quinn and Fromme, 2010; Wyman et al., 2010).

Self-regulation can be divided into emotional self-regulation (exploring affect, behaviour and mental health) and cognitive self-regulation (exploring executive function, attention, and planning, for example). We will explore cognitive self-regulation in more detail later in the paper when we look at impacts of MBIs on cognition.

Emotional self-regulation refers to the ability to control emotional impulses, delay gratification, monitor attention, and thus make wiser choices. Emotional self-regulation has been suggested as a key foundation for emotional well-being. Children and young people with higher degrees of emotional regulation are more likely to demonstrate a greater ability to concentrate and pay attention in school, and exhibit better impulse control and fewer externalising behaviours (such

as hostility and aggression) leading to success and improved functioning (Eisenberg et al., 2010; McClelland et al., 2007).

Thirteen school based MBIs (7 of them RCTs, 2 of them control trials) have shown impacts on measures of emotional self-regulation.

Case study 6 of the *Learning to Breathe* programme also summarises impacts on self-regulation, while the *Kindness Curriculum*, summarised in case study 8, showed small to medium effects in delaying gratification.

Case study 7:

MindUP can impact on self-regulation, SEL, executive function and academic performance

MindUP is a published curriculum that combines mindfulness and gratitude practice with SEL and neuroscience. There are three versions for different ages - grade 2, grades 3-5 and grades 6-8. It has carried out process evaluations on implementation, and acceptability with teachers and students to shape its development (the programme and all the research is described in Maloney, 2016). We focus here on the outcome evaluations.

Using a control group design, Schonert-Reichl and Lawlor (2010) assessed the impact of MindUP on 246 fourth- to seventh-grade children, drawn from 12 classrooms in elementary schools in Vancouver, Canada. Students showed significant improvements on a wide range of (teacher-rated) aspects of social and emotional learning, such as aggression, behavioural dysregulation, and social competence, as well as greater self-reported optimism and mindful attention, compared with controls.

In an RCT (Schonert-Reichl et al, 2015) also in Canada, 99 fourth- and fifth-grade classrooms were randomly assigned to receive a 12-week version of the MindUP program or attend an active control - a social responsibility program. Using self-report, the MindUP group showed significant increases in optimism, emotional control, empathy, perspective taking, prosocial goals, and mindful attention, and decreased depressive symptoms, compared with the control group, who demonstrated significant deterioration in these measures. They also had a significant increase in self-reported school self-concept (i.e., perceived academic abilities and interest and enjoyment) and demonstrated a 15 % gain in teacher-reported maths achievement. Using peer ratings, the children who studied MindUP scored higher on sociality with significant improvements in sharing, trustworthiness, helpfulness, and taking others' perspectives, and significant decreases in aggressive behaviour. Tests of students' performance on various tasks suggested they had improved aspects of executive function, with significantly shorter response times but sustained accuracy, compared to those in the control group, on tasks that required inhibition, working memory, and selective attention.

Further research with pre-schoolers demonstrated improvements in self-regulation in an RCT with 29 children (Poehlmann-Tynan et al, 2016). A pre-post study of a 5-week MBI with 409 kindergarten to 6th grade students (Black and Fernando, 2013), evaluated by teacher report, showed improved classroom behaviour including self-control, and the ability to pay attention, participate in activities, and show care and respect for others: the effects were apparent up to 7 weeks after the intervention.

Emotional self-regulation has been successfully cultivated in older pupils. An RCT involving 114 elementary students by Parker et al (2014) of the 4-week *Master Mind* programme showed small increases in self-control in boys (although not girls). An RCT study (Flook et al, 2010) of 64 children ages 7–9 years of an 8 weeks, 16 session MBI, was assessed by teacher and parent report: it showed significant differences in behavioural regulation (as well as metacognition, and overall global executive control) especially among those with the lowest ratings to begin with. Further impacts have been shown on impulse/inhibitory control in an RCT of 97 eight to nine year-olds (Mendleson et al, 2010) and in a pre-post study of 99 nine to ten year-olds (Oberle, 2012). Improvements in ‘emotional stability’ were shown in a controlled study of seven to nine year-olds (Vickery and Dorjee, 2016). An RCT with 155 adolescent boys showed an impact on self-regulation - but only if the boys practised at home (Huppert and Johnson, 2010).

Mindfulness has been shown to impact social and emotional skills that relate to self-regulation, such as calmness (Broderick and Metz, 2009), acceptance (Viafora et al, 2015), the ability to relax (Broderick and Metz, 2009), optimism (Schonert Reichel et al, 2015; Schonert-Reichl and Lawlor, 2010), and a sense of autonomy, mastery, and growth (Lau and Hue (2011).

Neuroscience is giving us some sense of the neural mechanisms at work: mindfulness has been associated with changes in brain regions underlying self-regulation and emotional regulation (Holzel et al., 2011a). Through building patience during meditative practice to stay with experience, and to watch thoughts and feelings come and go, developing the capacity to ‘be with’, rather than react, increasing the time lapse in brain pathways between the impulse to respond to a stimulus or thought and the response, allowing more time for considered choices to be made (Hölzel et al, 2011b).

Empathy, compassion and relationship skills

The ability to feel and show compassion and kindness for ourselves and others, and to relate effectively to others with empathy and concern, are core social and emotional capacities. Such capacities have been shown to be strongly related to levels of wellbeing, acting as a protective factor for mental health, enabling us to feel safe, confident, and effective, and thus ready to learn. Where members of a school community cultivate and practise these capacities, schools and classrooms are more “prosocial”, places in which all can feel safe, connected and thrive (Greenberg and Jennings, 2009).

Case study 8:

The Kindness Curriculum can improve social and emotional skills, executive function and grades in young children

The Kindness Curriculum is a 12-week mindfulness-based prosocial skills training, designed for preschool-age children. It uses standard mindfulness practice, plus kindness practices such as empathy, gratitude, and sharing, while incorporating children's literature, and music. It is taught in 2 x 20-30 minute lessons for 12 weeks.

An RCT with 68 children (Flook et al, 2015) found that those who received the intervention showed greater improvements in social competence and cognitive functioning, and earned higher report card grades for health and social-emotional development, compared with the control group. Meanwhile, the control group exhibited more selfish behaviour over time. Children who had initially lower grades in social competence exhibited larger shifts in this dimension.

The core skills fostered by mindfulness, particularly the fundamental attitudes of open-hearted curiosity and kindness, have the potential to develop a sense of compassion and empathy to the self and others.

Ten MBIs have shown a specific impact on the development of caring and compassion, 5 on aspects of self-perception and self-care, 5 on relationship skills and empathy.

Five studies showed impacts on children's self-image, improving through self-acceptance, (Broderick and Metz, 2009) and the sense of a positive, proactive self-concept (Franco 2011a, 2011b; Schonert- Reichel et al, 2015; Sibiinga 2016).

We have noted in case study 7 that the *MindUP* curriculum would appear to improve perspective-taking and empathy. Other studies have shown impacts including on social skills (Beauchemin et al, 2008), on levels of caring and respect for others (Black and Fernando, 2013) and in reducing hostility (Wright, 2010).

Problem behaviour

It is reasonable to hypothesise that the impact of MBIs on self-regulation and emotional regulation might lead to visible and demonstrable improvements in behaviour classed as 'difficult', and some MBIs have attempted to measure this.

The reviews and meta-analyses differed in how confident they were that MBIs impact on problem behaviour. The meta-analysis which focused on behaviour only, looking at single case studies in a range of contexts including children's homes (Klingbeil et al, 2017b) reported a generally medium effect on problem behaviour directly after MBIs, and an even greater one at follow up. In contrast, Maynard et al (2017) in their more broadly focused meta-analysis of MBIs with young people of school age, could not find enough studies to be able to report such clear statistical impact on behaviour: they looked only at high powered studies that used

controlled methods in group work settings in schools, and there were not many on which to base statistical analysis.

However, promising evidence is starting to emerge. There are several robust studies of the impact of MBIs on problem behaviour out of school settings, such as homes, clinics, and detention centres, which have found clear positive outcomes, on ADHD (Bogels et al, 2008; Zylowska et al, 2008) and on externalising behaviour, including aggression (Singh et al, 2007) and oppositional defiant problems and conduct problems (Haydicky et al, 2012).

Five studies in school settings, 2 of them controlled trials, have used direct observation and teacher rating of behaviour and found positive results.

Carboni et al (2013), studied 4 boys aged eight with ADHD who received an MBI in a school setting. They observed more 'on task behaviour', while parent and teacher ratings indicated a decrease in hyperactive behaviours. Singh et al (2007) found that an MBI helped 3 adolescents reduce the aggressive behaviour that was putting them at risk of school expulsion: students kept their behaviour within socially acceptable levels in school through to graduation.

Studies have also used teacher ratings to assess problem behaviour. We have already noted the evidence of impact on behaviour in case study 6 of the *Learning to Breathe* curriculum, and in case study 7 of the *MindUp* curriculum. Beauchemin et al (2008), in a before and after study, also found significant improvements in problem behaviours, using teacher ratings of 34 adolescents with learning difficulties, who experienced a 5-week MBI.

COGNITION, EXECUTIVE FUNCTION, LEARNING, AND ATTAINMENT

Overview

The potential of mindfulness to impact on aspects of cognition is attractive to schools, drawn by the promise mindfulness holds of helping pupils manage their thinking processes, and engaging their increasingly distracted attention.

The 6 systematic reviews and meta-analyses which looked at this area found small but positive evidence for impacts of MBIs on a range of aspects of cognition and executive function, especially abilities connected with the attention, and 5 of them deduced reasonable evidence for impacts on learning and attainment. Zenner et al (2014) in their meta-analysis of mindfulness-based interventions in schools, concluded that this was the strongest area of impact, while Zoogman et al (2014) in their more broadly focused meta-analysis of mindfulness for youth noted clear overall impacts on attention. Maynard et al (2017) in their meta-analysis on mindfulness for school-aged children found evidence of a small impact on cognitive performance, although they concluded there was not yet enough evidence to show a statistical impact on academic outcomes, such as grades.

In all, 14 MBIs in school settings, 7 of them RCTs, 4 more controlled trials, found impacts on aspects of cognition, learning, executive function and cognitive processes, particularly focus and attention. Six studies, 4 of them RCTs, included evidence for

small to medium impacts on academic grades. Two (1 an RCT, 1 controlled trial) found evidence for impacts on **meta-cognition** (reflecting on thought processes).

Executive function and attention

'Executive function' is an umbrella term for a set of cognitive processes that help control behaviour related to attainment of chosen goals. Aspects of executive function include attentional control, cognitive inhibition, working memory, cognitive flexibility, planning, reasoning, and problem solving.

Oberle et al (2011) studying 99 eight to nine year-olds found a correlation between their trait (i.e. naturally occurring) levels of mindfulness and their levels of executive function. On the assumption that this link can be cultivated, 3 MBIs, all of them controlled studies and 2 of them RCTs, have applied measures of executive function, especially those that relate to the attention.

A core executive function skill is the ability to focus and sustain the attention, an ability which is both a central part of mindfulness practice, and increasingly lacking in today's digitally distracted, multi-tasking youngsters. Directing and sustaining the attention is central to all kinds of learning and performance (Moran, 2012; Goleman, 2013) and underlies many kinds of emotional and social capacities, including our happiness (Killingsworth and Gilbert, 2010). To a great extent what we focus on determines our life experience.

Case study 9:

'The Mindful Child' curriculum can impact on executive function

Flook et al (2010) conducted an RCT of 64 children aged 7–9 years to evaluate a school-based program of mindful awareness practices, delivered for 30 minutes, twice a week, for 8 weeks. The programme was based on the 'Mindful child' curriculum approach of Kaiser Greenland (2009). It included exercises and games to promote awareness of self through sensory awareness, attentional regulation, awareness of thoughts and feelings, awareness of others and awareness of the interconnectedness of the environment. The intervention showed that, compared with controls, children who received the MBI demonstrated a significant growth in executive function, particularly the ability to shift, initiate, and monitor the attention. The effect was strongest in children who had the lowest levels of executive function to begin with.

Five MBIs have demonstrated their ability to help young people improve aspects of their attention, they include *the Attention Academy* (case study 3) and *MindUP* (case study 7). Semple et al (2010) evaluated *Mindfulness-based Cognitive Therapy for children*, a manualised group psychotherapy developed to increase social-emotional resiliency through the enhancement of mindful attention. They conducted an RCT with 25 boys and girls aged nine to thirteen, mostly from low-income, inner-city households: they found that those who completed the program showed fewer attention problems than wait-listed controls, improvements which were maintained three months later. Parker et al (2014), in a controlled

study of 111 elementary schools students, taught a four-week MBI, also found significant improvements in executive functioning skills, in the form of the ability to ignore distractions while completing a task, compared with controls. Black and Fernando (2015) evaluated the effect of a 5-week mindfulness-based curriculum on teacher-ratings of 409 children (83 % enrolled in a California free lunch program and 95.7 % from an ethnic minority group). The children were kindergarten through sixth grade, and were measured at pre-intervention, immediate post-intervention, and 7 weeks post-intervention. Teachers reported improved classroom behaviour of their students, in terms of paying attention, self-control, participation in activities, and caring/respect for others, improvements which lasted up to 7 weeks post-intervention.

Ricarte (2015) compared two groups of 45 children, ages 6 to 13 from a rural school in Spain who participated in a 6-week, daily MBI. Compared with the control group the MBI group improved their concentration, and immediate auditory-verbal memory, although not their focused attention and working memory. Felver (2017) found improvements in ‘academically engaged behaviour’ in 4 students aged 8-9, who were taught a 2- minute ‘soles of the feet’ meditation over the course of five 20–30-min sessions.

Meta-cognition

Meta-cognition is the ability to stand back from the thought process and ‘think about thinking’. It is an essential component of strategic thinking and problem-solving, as well as emotional- and self-regulation. There is a growing evidence base for the ability of MBIs to develop meta-cognition in adults, but it has to date only been measured in relation to two MBIs.

Vickery and Dorjee (2016) evaluated an 8-week mindfulness program (Paws b) for 71 children aged 7–9 with a control group. They found that teacher reports (but not parental ratings) of meta-cognition showed significant improvements at follow-up, with a large effect size. Flook et al. (2010), in an RCT with children aged seven to nine years, reported above as case study 9, also found improvements in meta-cognition and overall global executive control straight after the MBI, particularly for children with lower levels of baseline functioning.

Academic grades/ performance

Studies with adults suggest that mindfulness can improve measured performance of various kinds, including academic results, and there is a small but growing body of literature on the impact of mindfulness on the test scores of university students (e.g. Mrazek et al, 2013).

Six studies of MBIs in school settings have concluded that mindfulness can impact on measurable academic performance, including test and grades scores.

Two studies have looked at teacher perceptions of academic performance. Beauchemin (2007), in a pre-post study of a 5-week mindfulness meditation intervention with 34 adolescents diagnosed with learning difficulties, found improved academic performance using teacher ratings. The *Kindness Curriculum* (Flook et al, 2015) summarised in case study 8 found that preschool children in the intervention had higher report card grades from teachers compared with controls.

Case study 10:

'Meditacion Fluir' has been shown to improve cognition and learning - including academic results

A Spanish programme called Meditación Fluir is based on a selection of MBSR practices such as open-mindedly letting thoughts come and go, observing the breath, and body scan.

In an RCT, 60 boys and girls (Franco, 2009) with a mean age 17.3 years were divided equally and at random into two groups. Those who received the 10 week programme showed significant improvements in tests of verbal creativity compared with controls.

An RCT (Franco et al 2011) was conducted to evaluate the programme, as taught to first year high school students, with a mean age 16.3, in 3 schools randomly chosen in a province in southern Spain. Sixty-one students were allocated at random to experimental and control groups: the control group were offered the same programme later. Students were taught a 1½-hour session once a week for 10 weeks, and were expected to practise daily for 30 minutes. Significant improvements were found in academic performance of the participants in Spanish language and literature, foreign language and philosophy (the three subjects examined). Students also improved their self-concept and reported reduced test-related anxiety.

Four studies looked at test scores and results.

Case study 7 of the *MindUp* programme suggested that it showed a 15% improvement in maths scores of 4th and 5th graders (Schonert Reichel, 2015).

Bakosh (2015), in a control trial of a 10 minutes-a-day audio guided mindful awareness training program for 191 elementary school students found that being in the intervention group predicted improved grades for reading and science grades (although not for maths, writing, spelling, or social studies).

PHYSICAL HEALTH

Modern secular mindfulness began in a clinical context as a treatment for pain (Kabat Zinn, 1996), since when there has been considerable investigation of its impacts on physical aspects of health, with meta-analyses concluding that mindfulness can have a significant impact on pain, medical disorders such as psoriasis and fibromyalgia, and indicators such as blood pressure and heart rate (Khoury et al, 2013; Baer, 2003). Impacts on physical indicators have been hypothesised as being connected with the apparent ability of mindfulness to interrupt the psycho-biological response to chronic stress through its impact on the hormonal, cardiovascular and immune systems, while triggering the relaxation response (summarised in Black, 2015).

The impact of MBIs on the physical health and wellbeing of children and young people is relatively unexplored territory. **Six MBIs, 4 of them RCTs, have shown impacts on physiological indicators of health and wellbeing in children and young people** (5 studies in schools, one in a clinical context).

Cortisol

Sibinga et al (2013), conducted an RCT of a school-based MBSR program for 42 children eleven and twelve year-olds, in a small school for low-income urban boys, 95% of whom were African American. Cortisol levels (the 'stress hormone') increased during the school term for the control group participants but remained constant for MBSR participants, suggesting a possible attenuation of cortisol response to stress. The intervention group also showed less anxiety and improved coping skills, assessed by self-report.

Heart rate and blood pressure

Case study 11:

Mindful breathing practice impacts on blood pressure and heart rate

Three RCT studies in school settings were conducted by the same author team. They explored the impact of breathing meditation on blood pressure and heart rate with samples of African American adolescents at risk of heart disease and high blood pressure: all showed similar and positive findings.

*Barnes et al (2004) conducted an RCT with 73 middle school students who received either **10-minute mindful breathing sessions** at school, and at home after school, daily for 3 months, or a health education class. Significant differences in average change were found between the intervention and control groups for systolic and diastolic blood pressure, and ambulatory heart rate. The findings were broadly replicated in an RCT with 166 adolescents who were at risk of cardiovascular disease (Gregoski et al, 2011) and in an RCT with 66 ninth graders at risk of hypertension (Barnes et al, 2008), where the study also found a reduction in overnight urinary sodium excretion rate in the intervention group (behavioural stress induces increased sodium retention).*

Sleep

Bei et al (2013), using a pre-post design, studied 10 students at a girls' school aged 13-15 with self-reported poor sleep, who were enrolled into a six-session program which combined mindfulness concepts and practice with sleep-related advice, skills and education. They showed significant improvement in patterns surrounding sleep, sleep quality and total sleep time after the intervention, using self-report measures. These findings are supported by a similar project, with similar results, in a clinical context of a six-session group treatment to treat

sleep disturbances which included MBSR. Participants completed sleep diaries, wore electronic monitoring devices and completed self-report measures. Those who completed four or more sessions showed improved sleep patterns (Bootzin and Stevens, 2005) compared with baseline findings.

CONCLUSIONS AND NEXT STEPS FOR RESEARCH

Research on mindfulness in schools is still in its infancy. We will indicate here a few of the areas in which there is some consensus among researchers and reviewers that it could most usefully develop:

- **More and larger RCTs and primary studies**, with more participants, more replication and longer follow-ups.
- **More studies in areas where research is particularly thin**, such as impacts on problem behaviour, cognition, learning and academic performance.
- **More measures designed specifically for young people**, and **greater standardisation** between measures.
- **A greater use of a wider range of measures**, such as performance and physiological measures (e.g. brain scans, heart rates, hormone levels), and multi-informant measures (e.g. from teacher, parent and peer report), as well as the more usual self-report.
- There is a **need to reduce bias**, through greater separation between those who develop the programmes and those who evaluate them.
- Greater care to **ensure that results are reported with responsibility**, modesty and caution.
- **More research and focus on the limitations and possible adverse effects** of mindfulness to balance the familiar focus on positive gains.

We generally need more studies on how best to implement mindfulness effectively and safely (Lawlor, 2014): we know very little about the following kind of important questions, for example:

- For what populations and vulnerabilities is mindfulness indicated or not?
- How intense can the practice safely be?
- What about the quality of the mindfulness instructor and instruction?
- What 'dosage' and degree of staff training is needed to have a particular level of impact?
- What is the effect of using an external facilitator compared with a classroom teacher?
- What value is added to related work such as SEL, school mental health promotion, counselling?
- What are the cost-benefits over time?

In conclusion, mindfulness in schools appears to be well worth pursuing. It has already demonstrated a great deal of promise, especially in the areas of promoting psycho-social wellbeing and learning and reducing mental health problems, with strong indications that, when well taught, it can fairly reliably improve cognition, executive functioning, behaviour and physical health. There is growing evidence that it can be of benefit for adults who work and care for young people, including teachers and parents.

Educational, professional and mainstream interest is increasing steadily and the potential for the creative and original applications of mindfulness-based approaches in schools may only just be starting to be tapped.

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