

Implementing yoga within the school curriculum: a scientific rationale for improving social-emotional learning and positive student outcomes

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Publication info: Journal of Children's Services ; Bingley Vol. 11, Iss. 1, (2016): 3-24.

[ProQuest document link](#)

Abstract:

Purpose

- The purpose of this paper is to review and synthesise research evidence and propose a theoretical model suggesting that school-based yoga programs may be an effective way to promote social-emotional learning (SEL) and positive student outcomes.

Design/methodology/approach

- This paper is a literature review focusing on: the current state of research on school-based yoga interventions; a preliminary theoretical model outlining the potential mechanisms and effects of school-based yoga; similarities, differences and possibilities for integrating school-based SEL, yoga and meditation; practical implications for researching and implementing yoga in schools.

Findings

- Research suggests that providing yoga within the school curriculum may be an effective way to help students develop self-regulation, mind-body awareness and physical fitness, which may, in turn, foster additional SEL competencies and positive student outcomes such as improved behaviours, mental state, health and performance.

Research limitations/implications

- Given that research on school-based yoga is in its infancy, most existing studies are preliminary and are of low to moderate methodological quality. It will be important for future research to employ more rigorous study designs.

Practical implications

- It is possible, pending additional high-quality research, that yoga could become a well-accepted component of school curricula. It will be particularly important for future research to examine possibilities around integrating school-based yoga and meditation with SEL programs at the individual, group and school-wide levels.

Originality/value

- This paper is the first to describe a theoretical model specifically focused on school-based yoga interventions, as well as a discussion of the similarities and differences between school-based yoga, SEL and meditation.

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Introduction

Children and adolescents living in the USA in the twenty-first century struggle with numerous stressors, such as interpersonal conflicts with family and peers as

well as pressure to perform academically (Ryan-Wenger *et al.* , 2005). Several studies suggest that these stressors can lead to mood and other psychological disturbances (Carter *et al.* , 2006; Grant *et al.* , 2009; Roberts *et al.* , 2009). Indeed, research suggests that the cumulative prevalence of psychiatric problems by the age of 21 exceeds 80 per cent in the USA (Copeland *et al.* , 2011) with the majority of psychiatric conditions having child-adolescent onsets (Kessler and Wang, 2008).

These findings suggest that young people are in need of techniques to facilitate the development of social-emotional competencies, such as stress management and self-regulation. The purpose of the present paper is to review and synthesise research evidence suggesting that school-based yoga programmes may be an effective way to promote social-emotional learning (SEL) and counteract many of the stressors faced by modern youth. In particular, we propose a theoretical model suggesting that yoga practices enhance mind-body awareness (e.g. mindfulness and attention), self-regulation (e.g. stress and emotion regulation) and physical fitness (e.g. flexibility and strength), thereby improving behaviours, mental state, health and performance.

We begin by describing the historical development of school-based SEL initiatives and contemplative interventions such as yoga and meditation. We go on to review the research on school-based yoga and present a theoretical model elucidating how yoga may enhance student outcomes. We conclude with a comparison of the similarities and differences between school-based yoga, meditation and SEL initiatives, as well as a discussion of the practical implications around implementing and researching yoga in schools. This paper contributes to the literature by being the first to describe a theoretical model specifically focusing on the unique mechanisms and effects of school-based yoga, as well as the ways in which school-based yoga may be applicable within the context of SEL initiatives in school settings.

Yoga and SEL: definitions and conceptualisations

Yoga is a holistic system of mind-body practices for mental and physical health that typically incorporates four primary components: physical postures/exercises to promote strength and flexibility, breathing exercises to enhance respiratory functioning, deep relaxation techniques to cultivate the ability to physically and mentally release tension and stress and meditation/mindfulness practices to enhance mind-body awareness and improve attention and emotion regulation skills (Butzer *et al.* , 2015b). Research on the potential benefits of yoga for adults and children has been growing in recent years (Cramer *et al.* , 2014a; McCall, 2014), with systematic research reviews suggesting that it may be effective at reducing stress and enhancing mood and well-being in adults (Chong *et al.* , 2011; Kirkwood *et al.* , 2005; Li and Goldsmith, 2012; Pilkington *et al.*, 2005; Sharma, 2014).

Yoga is also suitable for both children and adolescents and shows promise for preventing and alleviating the psychosocial issues encountered by young people. Indeed, a NIH/CDC Complementary and Alternative Medicine (CAM) therapy survey revealed that 2.1 per cent of children under 18 practice yoga in the USA, and that 4.8 per cent of child/adolescent CAM users were specifically targeting anxiety and stress (Barnes *et al.* , 2008). Two systematic reviews ($n = 24$ and $n = 34$ studies, respectively, with 16 overlapping studies) and two general review papers on the therapeutic effects of yoga for youth also indicate improvements in physical and mental health (Birdee *et al.* , 2009; Galantino *et al.* , 2008; Hagen and Nayar, 2014; Kaley-Isley *et al.* , 2010). Research on school-based yoga programmes is also growing, with preliminary studies suggesting positive effects of these interventions on a variety of student outcomes (reviewed in more detail below) (Serwacki and Cook-Cottone, 2012). School-based mindfulness and meditation programmes, while not an explicit focus of the current paper, have also received increasing research attention (see Zenner *et al.* , 2014 for a meta-analysis of school-based mindfulness research).

School-based SEL initiatives, while not commonly discussed in relation to contemplative practices, share many goals with school-based yoga programmes. In particular, SEL is defined as "implementing practices and policies that help children and adults acquire and apply the knowledge, skills, and attitudes that can enhance personal development, establish satisfying interpersonal relationships, and lead to effective and ethical work and productivity. These include the competencies to understand and manage emotions, set and achieve positive goals, feel and show caring and concern for others, establish and maintain positive relationships, and make responsible decisions" (Weissberg *et al.* , 2015, pp. 7-8). The goal of SEL programmes is to produce students with core competencies in five key areas: self-management (the ability to manage and regulate emotions, including stress), self-awareness (the ability to recognise emotions and be aware of their impact on behaviour), social awareness (appreciating the perspectives of others), relationship skills (establishing and maintaining positive relationships) and responsible decision making (the ability to make positive choices about personal behaviour and social interactions) (CASEL, 2014). There is strong evidence that the promotion of SEL is linked to beneficial student outcomes (Durlak *et al.* , 2011), including positive youth development, mental health, resilience, character strengths, academic performance, reduced drug use and lower antisocial behaviour (Denham and Brown, 2010; Diekstra and Gravesteyn, 2008; Greenberg *et al.* , 2003; O'Connell *et al.* , 2009; Waters, 2011; Zins *et al.* , 2004).

Most educators, parents and students believe that schools need to provide more than academic instruction in order to ensure that children are successful not only in school but also in life (Civic Enterprises *et al.* , 2013; Davidson *et al.* , 2012; Diamond, 2010; Durlak *et al.* , 2011; Greenberg *et al.* , 2003). However, the modern education system faces immense pressure to enhance the academic performance of its students and often has few resources to devote to developing

students' SEL skills. Thus, children emerge from high school with the subject matter knowledge necessary to obtain employment but lack the SEL skills that are crucial for the development of their mental health and well-being (Durlak *et al.* , 2011). In response to this issue, schools are being increasingly pressured to implement educational approaches that enhance not only academic success and meet core curriculum standards but also promote health and prevent problem behaviours; however, many programmes are fragmented and not well-integrated into school cultures (Greenberg *et al.* , 2003). In order to rectify this problem, the education system is in need of programmes that support mental and physical health and can be easily integrated into the school curriculum.

SEL programmes in US schools

In the USA, scholars throughout the nineteenth and twentieth centuries have argued that personal and social development should be an integral component of the education system (Elias, 1990, 1995; James, 1890; Terman, 1914). For example, in the 1890 classic *Principles of Psychology* , William James (1890) suggested that focus, attention, character, self-control, inner strength, health and well-being determined whether a child was in an optimal state to learn and strongly influenced his or her academic success or failure. In *The Hygiene of the School Child* , Terman (1914) discussed the impact of physical, mental and hygienic health on students' academic performance, concluding that "the health and welfare of a child [should be] regarded as one of as much importance as arithmetic and geography" (p. viii). Similarly, Elias (1990) argued that, "Placing an overlay of strong academic demands on the current educational climate is likely to result in few increases in learning and instead exacerbate current stress-related problems [...] among our student population" (pp. 393-394).

A growing interest in promoting SEL in US schools culminated in 1994 when the Collaborative for Academic, Social and Emotional Learning (CASEL) emerged following a Fetzer Institute meeting on positive youth development. CASEL's goal is to address the underlying causes of students' problematic behaviour while supporting academic achievement with comprehensive SEL training from preschool to high school (Greenberg *et al.* , 2003; Kress and Elias, 2006). Since 1994, CASEL has "served as the guide for virtually all school-based SEL interventions" (Kress and Elias, 2006, p. 593). Despite the fact that school-based SEL programmes are not currently being implemented in a standardised way across the USA, interest in these programmes does appear to be growing, with a recent meta-analysis revealing 213 such programmes (Durlak *et al.* , 2011). In addition, CASEL recently released a guide describing 23 evidence-based SEL programs that have the potential for broad dissemination (CASEL, 2012).

Yoga and meditation programmes in US schools

In a review proposing the implementation of contemplative practices such as yoga and meditation in education, Davidson *et al.* (2012) suggest that the

benefits of yoga that have been observed in adults are also relevant for children and adolescents in school-based settings. For example, they suggest that contemplative practices may induce changes in brain structure and function which enhance skills such as self-regulation and pro-social behaviour, thus leading to improvements in student performance. The authors conclude by proposing that contemplative practices have the potential to play a crucial role in enhancing the quality of American public education.

Indeed, substantial interest has begun to emerge in the USA regarding the development and application of meditation- and yoga-based interventions in schools to improve mental health and performance (Davidson *et al.* , 2012; Felver *et al.* , 2013; Jennings, 2008; Roeser and Peck, 2009; Saltzman and Goldin, 2008; Thompson and Gauntlett-Gilbert, 2008). Hyde (2012) points to recent government initiatives in the USA that are focused on educating the "whole child" and suggests that teaching yoga in schools is an important part of this movement. In line with Hyde's ideas, yoga is being increasingly implemented in school settings (White, 2009) with several school-based programmes emerging across the country (Butzer *et al.* , 2015a).

Numerous organisations have also come forward to support these initiatives, such as the Garrison Institute and the Association for Mindfulness in Education. The financial and institutional support provided by these organisations has led to a proliferation of meditation- and mindfulness-based interventions in schools, such as MindUp, .b, and Learning to BREATHE (see Black *et al.* , 2009; Burke, 2010; Meiklejohn *et al.* , 2012; Sprengel and Fritts, 2012; Weare, 2013; Zenner *et al.* , 2014 for reviews of research on mindfulness programmes). Similarly, a recent review of yoga programmes in schools revealed over 30 that are currently being implemented in over 900 schools across North America (Butzer *et al.* , 2015a).

Research on yoga in schools

The current paper is not intended to be a systematic literature review of research on school-based yoga interventions; however, the studies described below are based on a thorough examination of the literature and are expected to give a relatively comprehensive indication of the state of the research in this field. Relevant, peer-reviewed studies were identified through literature searches of databases such as PubMed and PsycINFO using a variety of search terms related to yoga in school settings (e.g. "yoga", "school", "education", "contemplative", "classroom", etc.). Relevant studies were also identified through communication and collaboration with experts in the field. Non-peer-reviewed and unpublished studies, such as doctoral dissertations, are not included. No limitations were placed on the studies' country of origin. While the focus of this review is predominantly on school-based yoga interventions, research on school-based mindfulness and/or meditation interventions is sometimes included, particularly for studies in which the intervention explicitly incorporated

components of yoga-based postures, "mindful movement" and/or breathing exercises.

The results of this literature review revealed, first, that school-based yoga research is a nascent, but growing, field. Given that research on school-based yoga programmes is in its infancy, it is therefore important to note that most existing studies are preliminary and are of low to moderate methodological quality. As outlined in Serwacki and Cook-Cottone (2012), the majority of existing studies have focused on elementary school students, most have not used comparison control groups, very few have used rigorous, randomised controlled group designs and almost none have evaluated the optimal intensity/dose or long-term effects of school-based yoga interventions (Greenberg and Harris, 2012) (however see Bothe *et al.* , 2014; Klatt *et al.* , 2013 for studies that have included follow-up data). Thus, the conclusions that can be drawn from the studies described below are tentative and must be considered in light of the fact that the majority of research on school-based yoga programmes involves small pilot studies that often rely on self-report questionnaires and single-arm trials. Despite these limitations, the evidence available suggests that these interventions show promise for enhancing a variety of student outcomes.

For example, Serwacki and Cook-Cottone (2012) recently conducted a systematic review of 12 published studies of yoga in schools. The studies assessed a variety of yoga programmes, including those that were integrated into the school curriculum, delivered after school and offered at residential establishments. Four of the studies involved children who were deemed to have special educational needs, whereas the remaining eight studies involved typically developing or at-risk youth. Most of the studies were conducted in elementary schools in the USA and were of low to moderate methodological quality. Despite these limitations, Serwacki and Cook-Cottone concluded that the yoga interventions exerted positive effects on several factors, such as emotional balance, attentional control, cognitive efficiency, anxiety, negative thought patterns, emotional and physical arousal, reactivity and negative behaviour. In addition, one review paper (Sprengel and Fritts, 2012) and one systematic review and meta-analysis (Zenner *et al.* , 2014) found positive effects of school-based mindfulness and meditation programmes (including some with a yoga component) on student psychosocial, cognitive and academic outcomes, with the meta-analysis suggesting a significant medium effect size ($g=0.40$).

Our literature review revealed several studies that have been published since Serwacki and Cook-Cottone's (2012) systematic review. These suggest positive effects of school-based yoga on several self-reported aspects of student psychosocial well-being, such as mood state (Felder *et al.* , 2015), mood disturbance (Noggle *et al.* , 2012), negative affect (Noggle *et al.* , 2012), anger control (Khalsa *et al.* , 2012), self-control (Parker *et al.* , 2014; Ramadoss and Bose, 2010), aggression and social problems (Parker *et al.* , 2014), fatigue (Khalsa *et al.* , 2012), resilience (Khalsa *et al.* , 2012; Ramadoss and Bose,

2010), self-regulation (Bergen-Cico *et al.* , 2015; Razza *et al.* , 2013), anxiety (Bothe *et al.* , 2014; Frank *et al.* , 2014; Noggle *et al.* , 2012; Parker *et al.* , 2014), depression (Frank *et al.* , 2014), self-awareness (Ramadoss and Bose, 2010), self-esteem (Sethi *et al.* , 2013; Telles *et al.* , 2013c), coping frequency (White, 2012), mental, social and physical well-being (Chen and Pauwels, 2014), general distress, physical arousal and hostility (Frank *et al.* , 2014) and rumination, emotional arousal and intrusive thoughts (Feagans Gould *et al.* , 2012; Frank *et al.* , 2014; Mendelson *et al.* , 2010). Several studies have also found beneficial effects of school-based yoga on teacher-rated factors such as classroom behaviour and social-emotional skills (Butzer *et al.* , 2015b), concentration, mood, ability to function under pressure (Ehud *et al.* , 2010), hyperactivity (Klatt *et al.* , 2013) as well as attention, adaptive skills, behavioural symptoms and internalising symptoms (Steiner *et al.* , 2013).

In addition, two qualitative investigations of school-based yoga suggest positive effects of these interventions on students' sense of calm, ability to focus, ability to control behaviour under stress and self-esteem (Case-Smith *et al.* , 2010), as well as greater kinesthetic awareness, stress reduction, mood management and social cohesion (Conboy *et al.* , 2013). A small number of studies have also examined the effects of school-based yoga on physiological outcomes and found that yoga participation was associated with decreased cortisol concentrations (Butzer *et al.* , 2015b), more stable breathing patterns (Jensen *et al.* , 2012) and improvements in heart rate variability (Bothe *et al.* , 2014); however one study found no significant differences between a yoga and control group on changes in blood pressure and heart rate (Hagins *et al.* , 2013).

Given the limitations described previously, the results of the aforementioned studies are tentative and should be interpreted with caution. However, it is encouraging to note that scientists are beginning to heed the call for more methodological rigour in school-based yoga research, with the recent publication of several preliminary randomised controlled trials, including mixed-method study designs. For example, in two iterations of a 12-week semester-long group-randomised, controlled trial of a yoga programme at a rural Massachusetts high school, Khalsa *et al.* (2012) and Noggle *et al.* (2012) found that yoga may yield beneficial improvements in self-report measures of psychosocial well-being and prevent increases in aversive mood and general distress. Qualitative interviews with a subgroup of students who participated in the yoga intervention revealed that the programme offered several benefits (Conboy *et al.* , 2013). Additional randomised and quasi-randomised trials of school-based yoga interventions include Hagins *et al.* (2013), Haden *et al.* (2014), Mendelson *et al.* (2010), Telles *et al.* (2013a, b, c), White (2012), Razza *et al.* (2013), Bergen-Cico *et al.* (2015), Parker *et al.* (2014) and Frank *et al.* (2014).

However, while some studies have found positive effects of school-based yoga when directly comparing yoga to control conditions such as standard physical education (Khalsa *et al.* , 2012; Noggle *et al.* , 2012), some studies have found

very few (Telles *et al.* , 2013c; White, 2012) or no (Haden *et al.* , 2014; Hagins *et al.* , 2013) significant differences between groups. In addition, two studies have found counterintuitive effects of school-based mind-body interventions, including post-intervention increases in negative affect (Haden *et al.* , 2014) and perceived stress (White, 2012). Finally, some studies that have examined both teacher- and student-rated outcomes have found significant effects for teacher, but not student, ratings (Ehud *et al.* , 2010; Steiner *et al.* , 2013). In summary, school-based yoga programmes show promise for improving a variety of student outcomes, however it will be important for future studies to continue implementing high-quality research designs such as randomised controlled trials and mixed-methods approaches that include both qualitative and quantitative data, as well as studies focusing on neuroscientific and even economic analyses (Davidson *et al.* , 2012; Greenberg and Harris, 2012).

Theoretical model of school-based yoga: potential mechanisms and outcomes

Existing research on the promising effects of school-based yoga interventions on student outcomes raises questions regarding the potential mechanisms underlying these effects. In other words, why are school-based yoga programmes beneficial and how are they similar or different from existing SEL and meditation programmes. Based on empirical evidence suggesting that yoga has beneficial psychological and physiological effects on the brain and body, we hypothesise that yoga facilitates the development of three key competencies: mind-body awareness, self-regulation and physical fitness which may, in turn, enhance positive student outcomes such as improvements in behaviours, mental state, health and performance (see Figure 1). Below we review research on each of these proposed mechanisms in turn, followed by a discussion of the similarities and differences between current SEL and meditation programmes and the yoga-based model outlined in Figure 1.

Improvements in mind-body awareness

Mind-body awareness refers to an individual's ability to be cognisant of his/her thoughts, feelings, mental state, bodily sensations, movements and cues (Mehling *et al.* , 2011). We hypothesise that increases in mind-body awareness, such as becoming more aware of endogenous cues (e.g. satiety, need for physical activity), leads to positive behaviours and outcomes because of an increased awareness of the rewarding feelings and experiences that occur when one engages in positive behaviours. Many mind-body interventions, including yoga and meditation, specifically focus on enhancing mind-body awareness. Indeed, research suggests that contemplative practices are related to enhanced mind-body awareness in adults (Brisbon and Lowery, 2011; Shelov, 2010; Shelov *et al.* , 2009). We hypothesise that by increasing mind-body awareness, school-based yoga interventions enhance healthy behaviours and outcomes through students' embodied experience of intrinsic rewards, which may be more

likely to be successful at enhancing positive outcomes than strategies that involve improving behaviours via extrinsic rewards/punishments and/or cognitively based instruction from teachers (see below for a more detailed explanation of this hypothesis).

Improvements in self-regulation

Neurobiological evidence is beginning to emerge for the role of contemplative practices in improving stress management and self-regulation. Indeed, recent research suggests that yoga may exert its beneficial psychological effects through physiological mechanisms that calm the nervous system, primarily through stimulation of the vagus nerve, thereby reducing allostatic load and restoring optimal homeostasis (Gard *et al.*, 2014; Schmalzl *et al.*, 2015; Streeter *et al.*, 2012). For example, a recent review by Davidson and McEwen (2012) proposes that the neurobiological changes that are associated with meditation may be linked to improvements in several positive behavioural outcomes such as self-regulation. In other words, it could be the case that participating in mind-body interventions may enhance self-regulation, which may subsequently provide structural and functional changes in the brain that help modulate the effects of stress. In line with these hypotheses, theoretical models have recently emerged suggesting that yoga may facilitate adaptive stress responses by promoting a greater integration of top-down and bottom-up forms of self-regulation (Gard *et al.*, 2014; Schmalzl *et al.*, 2015). A recent review paper also suggests positive effects of yoga on emotion regulation (Menezes *et al.*, 2015). Indeed, yoga and meditation have been linked with improvements in self-regulation in adults, children and adolescents (Bergen-Cico *et al.*, 2015; Broderick and Metz, 2009; Chaya *et al.*, 2012; Davidson and McEwen, 2012; Ehad *et al.*, 2010; Haffner *et al.*, 2006; Hölzel *et al.*, 2011; Hopkins and Hopkins, 1979; Manjunath and Telles, 2001; Meiklejohn *et al.*, 2012; Peck *et al.*, 2005; Razza *et al.*, 2013; Stueck and Gloeckner, 2005; White, 2012). In addition, the cultivation of mind-body awareness may also enhance self-regulation (Oberle *et al.*, 2012; Siegel, 2007).

Improvements in physical fitness

Research suggests that yoga may enhance several aspects of physical fitness, such as improved respiratory function (Liu *et al.*, 2014), increased exercise adherence (Bryan *et al.*, 2011), as well as reduced obesity risk factors (Cramer *et al.*, 2014b), including attenuated weight gain, decreases in body mass index, reduced blood pressure, lowered cholesterol and improvements in food choice (Braun *et al.*, 2012; Gokal *et al.*, 2007; Kristal *et al.*, 2005; Moliver *et al.*, 2011; Sabet Sarvestani *et al.*, 2009; Seo *et al.*, 2012). Studies have also shown that yoga is as effective as, and sometimes better than, standard physical exercise at improving a variety of health-related outcomes (Ross and Thomas, 2010; Smith *et al.*, 2010). Very few studies have examined the specific effects of individual yoga-based physical postures, however

preliminary research suggests that yoga postures may have unique effects on psychosocial well-being. For example, sitting with the spine in an upright position is associated with higher positive affect than slouching (Ceunen *et al.* , 2014). In addition, maintaining an upright posture while waking and sitting is associated with increases in subjective energy levels (Peper and Lin, 2012) and a greater ability to recall positive thoughts (Wilson and Peper, 2004). Specific yoga postures may also be associated with unique mood states. For example, back-bending poses, in which the spine is extended, are linked with increases in positive mood, particularly for individuals who are feeling hostile or depressed (Shapiro and Cline, 2004).

Improved behaviours, mental state, health and performance

The model outlined in Figure 1 suggests that yoga-based improvements in mind-body awareness, self-regulation and physical fitness have potential downstream effects on several positive student outcomes, including improved behaviours, mental state, health and performance. Research is beginning to emerge in support of this hypothesis. For example, studies suggest that mind-body interventions, such as yoga and meditation, may improve several aspects of student performance such as academic achievement (Beauchemin *et al.* , 2008; Benson *et al.* , 2000; Kauts and Sharma, 2009; Nidich *et al.* , 2011; Sibinga *et al.* , 2011), classroom behaviour (Barnes *et al.* , 2003; Koenig *et al.* , 2012; Schonert-Reichl and Lawlor, 2010) and cognitive functioning (Flook *et al.* , 2010; Klatt *et al.* , 2013; Manjunath and Telles, 2001; Manjunath and Telles, 2004; Napoli *et al.* , 2005; Peck *et al.* , 2005; Rangan *et al.* , 2008; Sarokte and Rao, 2013; Sethi *et al.* , 2013; So and Orme-Johnson, 2001). In addition, research suggests that enhanced self-regulation, mind-body awareness and physical activity are linked to greater social-emotional competence (Melnik *et al.* , 2013; Oberle and Schonert-Reichl, 2013; Sahdra *et al.* , 2011). Improved social-emotional skills are, in turn, associated with improvements in several aspects of behaviour (Durlak *et al.* , 2011), academic performance (Denham and Brown, 2010; Durlak *et al.* , 2011; Tangney *et al.* , 2004; Zins *et al.* , 2004) and psychological well-being (Diekstra and Gravesteyn, 2008).

Difficulties with self-regulation are thought to underlie a variety of psychological disorders, with improvements in self-regulation being linked to an alleviation of psychiatric symptoms (Menezes *et al.* , 2015). Indeed, in a sample of 1,000 children followed from birth to age 32, Moffitt *et al.* (2011) found that self-control during childhood predicted physical health, substance dependence, personal finances and criminal offenses in young adulthood. Studies have also found that higher levels of mindfulness (i.e. mind-body awareness) are associated with higher positive emotions, mood regulation expectancies and self-acceptance, which are inversely related to depressive symptoms (Jimenez *et al.* , 2010). Research also suggests that an awareness of bodily cues is associated with positive health benefits for patients with a variety of diagnoses (Mehling *et al.* , 2009). Finally, numerous studies show that physical fitness and exercise are

related to numerous beneficial outcomes, such as improved mood, reduced risk of psychological disorders and enhanced cognitive performance (Fox, 1999; Sibley and Etnier, 2003).

In summary, preliminary research suggests that yoga has beneficial effects on three core competencies (mind-body awareness, self-regulation and physical fitness) which may, in turn, lead to a variety of positive outcomes related to student behaviour, mental state, health and performance. The model outlined in Figure 1 is, of course, a preliminary heuristic that is in need of further investigation. In particular, much of the research on the effects of yoga on mind-body awareness, self-regulation and physical fitness has been conducted on adults. In addition, most existing studies of school-based yoga interventions have focused on the more distal outcomes in our model (i.e. student behaviours, mental health and performance). It is our hope that scientists will use our model as a basis for future mediational analyses examining the potential mechanisms underlying school-based yoga interventions.

SEL, yoga and meditation: similarities, differences and potential integration

Yoga and SEL

The yoga-based competencies and outcomes outlined in Figure 1 are very similar to the desired competencies and outcomes of school-based SEL and meditation programmes, which raises questions regarding the similarities and differences between these approaches to improving student health, well-being and performance. As described previously, SEL programmes generally focus on enhancing student skills in five key competencies: self-awareness, self-management, social awareness, relationship skills and responsible decision-making (Weissberg *et al.* , 2015). We argue that most school-based yoga programmes share these goals and the evidence reviewed in this paper suggests that school-based yoga may be effective at enhancing these social-emotional competencies. As outlined in Figure 1, we hypothesise that school-based yoga enhances mind-body awareness and self-regulation, thereby directly targeting the SEL competencies of self-awareness and self-management. We also hypothesise that as students become more self-aware and are better able to self-regulate, they further develop their social awareness, relationship skills and responsible decision making. Thus, the development of self-awareness and self-management may have downstream effects on social awareness, relationship skills and decision making. In other words, in order to regulate their behaviour in social contexts and make appropriate decisions, students must first develop an awareness of their individual thoughts, feelings and behaviours, as well as the capacity to internally regulate them. This capacity to neurophysiologically stabilise and down-regulate then allows students to more effectively implement other SEL competencies, such as social awareness, relationship skills and decision making. In line with these ideas, prior research suggests that yoga and mindfulness may foster responsible decision making in adults, particularly with

regard to substance use and addiction (Khanna and Greeson, 2013). In addition, unlike traditional mindfulness/meditation practices, school-based yoga often involves social components, such as partner yoga and games. Thus, it is possible that this adaptive interaction with peers within the context of contemplative practice may foster increased social awareness and relationship skills (Roeser and Peck, 2009). Preliminary research supports this idea, in that school-based contemplative interventions have been found to reduce hostility (Frank *et al.* , 2014) and enhance pro-social behaviour (Flook *et al.* , 2015). However, at the moment these hypotheses are tentative and should be further examined in future research.

Despite the fact that school-based yoga programmes share several common goals with school-based SEL and meditation, the model proposed in Figure 1 differs from and expands upon existing models of SEL and school-based contemplative practices in several ways. As described in Weissberg *et al.* (2015), effective SEL programmes typically incorporate four key elements. They are "sequenced: connected and coordinated set of activities to foster skill development; active: active forms of learning to help students master new skills; focused: a component that emphasises developing personal and social skills; and explicit: targeting specific social and emotional skills (p. 10)". We argue that school-based yoga programmes incorporate the first two elements (sequenced and active) and that the majority also include components addressing the third element (focused) (Butzer *et al.* , 2015a). However, one area in which school-based yoga and SEL programmes may sometimes differ is with regard to the fourth element (explicit). In particular, while some school-based yoga interventions may target specific social-emotional competencies, we argue that participation in contemplative interventions may foster social, emotional and other competencies (such as physical fitness) at an intrinsic level, as opposed to requiring extensive amounts of direct instruction.

Indeed, an important difference between yoga and many SEL programmes is that yoga incorporates both the body and mind in the training of self-regulation, mind-body awareness and physical fitness which may, in turn, lead to long-term changes in brain activity and structure (Davidson *et al.*, 2012; Davidson and McEwen, 2012; Lutz *et al.* , 2008). In contrast, most existing classroom-level SEL programmes use cognitive educational approaches (e.g. lectures, lessons and textbooks) that teach students about resources, such as time management, problem-solving skills, parent and teacher support and behavioural changes (e.g. Kraag *et al.* , 2006; Weissberg *et al.* , 2015). While these types of programmes are useful, yoga offers an additional benefit in that it may cultivate self-regulation, mind-body awareness and physical fitness at an intrinsic level. In other words, students begin to develop the ability to regulate their stress and emotions, and pay more attention to their mind and body, not because a teacher or textbook instructs them to do so, but because yoga-based physical movement, breathing exercises, meditation practices and relaxation techniques provide them with an embodied and experiential sense of what it feels like to cultivate these skills.

Importantly, this inculcation of self-regulation and mind-body awareness provides a bottom-up impetus for social-emotional skill development, as opposed to the top-down approaches used by many SEL programmes. Indeed, as described previously, theoretical models have recently emerged suggesting that yoga-based practices enhance stress-coping abilities by facilitating the integration of top-down (cognitive, attentional) and bottom-up (autonomic, interoceptive) forms of self-regulation (Gard *et al.* , 2014; Schmalzl *et al.* , 2015).

This "bottom-up" hypothesis is also illustrated by research examining the effects of yoga on physical fitness. For example, one study demonstrated that engaging in regular yoga practice enhances exercise adherence for all forms of physical exercise (not just yoga), possibly due to improvements in self-awareness, self-efficacy and perceptions of one's ability to engage in regular exercise (Bryan *et al.* , 2011). Prior research also suggests that changes in health behaviours as a result of yoga interventions often occur spontaneously, in the absence of any explicit, external instruction to change these behaviours (Bryan *et al.* , 2011; Kristal *et al.* , 2005; Ross *et al.* , 2012). Given that more than one third of children and adolescents in the USA are considered overweight or obese (Ogden *et al.* , 2012), school-based interventions that encourage the development of not only social and emotional but also physical fitness competencies are needed. Indeed, traditional SEL programmes are often difficult to integrate into the standard academic curriculum, primarily due to limited time and resources (Greenberg *et al.* , 2003). School-based yoga programmes, on the other hand, can be integrated relatively seamlessly into standard physical education settings, thus providing an avenue to teach social-emotional skills without overburdening teachers.

Yoga and meditation/mindfulness

School-based yoga interventions differ from mindfulness/meditation programmes in several important ways. With regard to differences between the model outlined in Figure 1 and existing models of school-based mindfulness programmes, Davidson *et al.* (2012) provide an overarching model regarding the proposed impact of school-based contemplative practices on neural substrates, psychological functions and behavioural outcomes; however, this model does not elucidate the specific effects of school-based yoga, particularly the potential impact of yoga on mind-body awareness and physical fitness. Similarly, Mendelson *et al.* (2010) outline a model of the possible effects of school-based mindfulness interventions on at-risk youth, however this model focuses exclusively on cognitive and emotion regulation and does not include factors such as mind-body awareness and physical fitness.

In addition, meditation/mindfulness interventions focus almost exclusively on cognitive behavioural activities, such as the control of attention. The advantage of mind-body interventions such as yoga is that they include additional activities such as breath regulation and physical exercises and postures. Prior research

has demonstrated several psychophysiological benefits of breath regulation, such as increased attentional resources and better stimulus processing speed and efficiency (Telles *et al.* , 2013b), as well as a greater inhibition of unnecessary responses (Telles *et al.* , 2013a). In addition, an analysis of mindfulness-based stress reduction (MBSR) revealed that, despite being practised less often than the other components of MBSR, practice time for the yoga component was significantly correlated with a greater number of positive outcomes (increased mindfulness skills, reduced symptoms and improved well-being) than practice times for the body scan and sitting meditation components of the intervention (Carmody and Baer, 2008). In summary, the practices that are unique to yoga, such as breath regulation and physical postures, may enhance the meditation component of yoga by preparing students to more effectively practise meditation (e.g. by removing physical tension, promoting psychosocial well-being and reducing autonomic arousal) and by also affecting psychophysiological functioning. Engaging in physical postures may be particularly relevant to facilitating contemplative practices in youth, who might not be comfortable or able to sit still for extended periods of time.

Potential integration

In summary, school-based yoga, meditation and SEL programmes have a number of similarities and differences that are important for researchers and educators to take into consideration. We suggest that it may be possible to integrate these interventions in a synergistic manner to enhance SEL and positive student outcomes (see below e.g.). It is interesting to note, however, that only one of the 23 evidence-based SEL programmes outlined in the recent CASEL (2012) guide was mindfulness/meditation-based (MindUp; Schonert-Reichl and Lawlor, 2010), and that no programmes focused on yoga. As more school-based yoga programmes begin to formalise and explicitly base their curricula on CASEL's core SEL competencies, and conduct more rigorous research on how their interventions might impact social-emotional outcomes, it is possible that future versions of the CASEL guide may include a greater number of yoga programmes.

Summary and implications

The evidence reviewed in this paper suggests that school-based yoga interventions show promise for enhancing students' self-regulation, mind-body awareness and physical fitness, which may have downstream effects on improving positive behaviours, mental state, health and performance (see Figure 1). The high prevalence of psychiatric and behavioural disturbances in children and adolescents, coupled with the reality that most schools do not prioritise training in SEL, suggests that the implementation of mind-body interventions such as yoga and meditation in schools would be of significant value. Indeed, preliminary evidence suggests a strong theoretical rationale for combining

contemplative practices, such as yoga and meditation, with existing SEL programmes (Felver *et al.* , 2013).

A common misconception of school-based yoga, and yoga in general, is that yoga focuses exclusively on body movements and postures. Contrary to this belief, most school-based yoga programmes, and yoga in general, combine physical postures with breathing exercises, meditation/mindfulness practices and relaxation techniques (Butzer *et al.* , 2015a). Thus, we propose that combining and integrating school-based yoga programmes with both meditation interventions and SEL curricula may provide an optimal intervention that addresses student needs at the biological (e.g. physical fitness), psychological (e.g. mental health and cognition) and social (e.g. relationship skills) levels.

Translating rationale into practice

There are several factors that should be taken into consideration by researchers and educators who are interested in implementing and/or studying the effects of yoga programmes in schools (see Mendelson *et al.* , 2013; Cohen Harper, 2010 for a detailed review of these). School-based mind-body interventions will only be adopted to the extent that they are both feasible to implement and effective at improving student outcomes. Thus, it will be important for future research to examine topics such as the appropriate content and dose of yoga-based interventions. Researchers and intervention experts have recently become aware of the need to identify the essential components of yoga and meditation interventions that are necessary to produce desired outcomes (Feagans Gould *et al.* , 2014), as well as to evaluate the optimal intensity or dose of these interventions (Berman and Chesney, 2005; Cook-Cottone, 2013; Davidson *et al.* , 2012; Edenfield and Saeed, 2012; Sannes *et al.* , 2008; Saper *et al.* , 2013; Sherman *et al.* , 2011; Sherman, 2012), especially as very few yoga intervention studies have thoroughly evaluated these aspects of the interventions (Michalsen *et al.* , 2012; Moliver *et al.* , 2013; Saper *et al.* , 2013; Sherman, 2012). It would be particularly worthwhile to compare existing studies of school-based yoga interventions with regard to similarities and differences in dosage and core components. In order to make this type of comparison, it is important for scientists and practitioners to provide explicit details regarding the core components of their intervention (e.g. postures, breathing exercises, meditation, relaxation, didactic activities, etc.), as well as how much time was spent on each component (e.g. five minutes of breathing exercises, 15 minutes of postures, etc.) and the overall intervention duration or dose (e.g. a 12-week intervention in which students received two 30-minute classes per week).

In addition, conducting school-based research often involves the need to balance scientific rigour with the logistical practicalities of evaluating an intervention in a real-world setting (Mendelson *et al.* , 2013). Thus, several practical factors should be taken into consideration by key stakeholders, including researchers, school staff, parents and students. These considerations include questions such

as: what type of yoga programme will be implemented? Will external yoga teachers be hired to teach it, or will existing classroom teachers be used? How and when will these teachers be trained and certified? How will the costs of the yoga intervention, including any training/certification costs, be funded? Where within the school curriculum should yoga be implemented (i.e. during school, after school?).

An additional issue revolves around potential parental concerns over their child's participation in yoga. While the majority of school-based yoga programmes in the USA are completely secular (non-religious) (Butzer *et al.* , 2015a), there have been recent cases in US courts, as well as in the supreme court of India, regarding the issue of whether yoga is inherently religious and whether teaching it in schools violates the separation of church and state (NBC San Diego, 2013). To date, none of these lawsuits have deemed yoga unsuitable for schools; however, it will be important for future researchers and educators to ensure that any programmes that are implemented in schools are non-religious in nature.

It will also be important for researchers and education professionals to consider whether and how to best combine yoga, meditation and SEL interventions within the school setting. As outlined in Felver *et al.* (2013), contemplative practices can be implemented at the individual level (e.g. one-on-one interventions for high-need students, typically administered by a school counsellor or nurse), at the group or classroom level (e.g. "chair yoga" in the regular classroom or mat-based yoga during physical education) and at a school-wide level (e.g. by integrating these practices with school-wide SEL curricula). Prior research suggests that integrating contemplative practices within non-contemplative protocols can yield positive results (Coatsworth *et al.* , 2010); however, it will be useful for future research to examine the effectiveness of a variety of implementation methods. In the current paper we have discussed school-based yoga as a useful complement to existing SEL programmes, however the question remains as to whether yoga is best conceptualised as an "add-on" to SEL interventions, or as an SEL programme in its own right. Particularly useful would be an examination of which existing evidence-based SEL programmes would be most amenable to the inclusion of yoga-based practices, as well as the extent to which existing school-based yoga programmes are explicitly teaching and targeting SEL principles and competencies.

Cross-cultural considerations

It is important to note that this paper has focused almost exclusively on the implementation of school-based yoga programmes within the USA, mainly because the majority of school-based yoga studies appear to have been conducted there. Other countries have shown an interest in implementing school-based yoga interventions, with programmes such as YogaBugs, Yoga'd Up, Yoga at School and The Yoga Factory emerging in the UK, as well as the New Leaf Yoga Foundation and Yoga in Schools in Canada. However it is possible

that school-based yoga programmes are viewed and implemented differently across cultures.

Given that yoga originated in India, one might expect that school-based yoga and meditation programmes would be popular and accepted in that region. For example, the Indian visionary Swami Vivekananda (1863-1902) argued that, "The very essence of education is concentration of mind, not the collection of facts. If I had to do my education once again, I would not study facts at all. I would develop the power of concentration and detachment, and then with a perfect instrument, collect facts at will" (Sahu, 2002, p. 217). In urban India, there have been attempts to introduce interventions to improve the mental health of young people (Balaji *et al.* , 2011; Sinha *et al.* , 2003); however, at the moment India does not have an association such as CASEL to compile, rate and organise these programmes. In addition, there are currently no systematic surveys published regarding the prevalence of yoga in Indian schools, thus is it difficult to ascertain how many of them have adopted yoga as a standardised part of the curriculum. Importantly, yoga is often practised in India with more spiritual and religious components than in the West, which may complicate its implementation in schools. Indeed, the Supreme Court of India is currently considering whether yoga has a religious element as it decides if public schools can teach the ancient discipline. India's school policy considers yoga an integral component of physical education, however the court has expressed caution and is considering the arguments. Despite this difficulty, some schools have adopted yoga and have found demonstrable benefits (e.g. Telles *et al.* , 2013c). The pending legal judgement might well be influenced by research focusing on the health and other benefits of yoga.

Conclusions

Schools play a key role in helping children establish healthy lifestyle behaviours from an early age. Thus, implementing yoga in schools could have far-reaching implications not only for school health but also for society as a whole. Given that school attendance is legally mandated in the USA, school-based yoga programmes have the potential to provide a large-scale intervention that promotes SEL and positive student outcomes. Indeed, the grassroots proliferation of yoga programmes in schools across North America, as well as the increasing popularity of research on yoga in schools and the emergence of high-quality randomised controlled designs (e.g. Hagins *et al.* , 2013; Khalsa *et al.* , 2012; Mendelson *et al.* , 2010; Noggle *et al.* , 2012; Telles *et al.* , 2013c; White, 2012), suggest that implementing yoga interventions in school settings may be advantageous. Given that most psychological disorders have child-adolescent onsets (Kessler and Wang, 2008), it is possible that by providing skills that improve mental and physical health in childhood, school-based yoga programmes may have long-term implications for health in adulthood, as well. Thus it is possible, pending additional high-quality research demonstrating the feasibility, acceptability and cost-effectiveness of school-based yoga

programmes, that yoga could become a well-accepted and universal component of school curricula.

Figure 1 Hypothesised associations between yoga practice, self-regulation, mind-body awareness, physical fitness, performance, health, mental state and behaviours

[Image omitted: See PDF]

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The authors are grateful for the support of Shekhar Agrawal, President of Patanjali Yogpeeth (USA) Trust. The preparation of this manuscript was funded in large part by a generous grant from Patanjali Yogpeeth (USA) Trust, an

affiliate organisation of Patanjali Yogpeeth - Divya Yog Mandir (Trust), Haridwar, India and the Patanjali Research Foundation, Haridwar, India. BB and SBSK were supported in part by a grant from the Institute for Extraordinary Living of the Kripalu Center for Yoga & Health. The authors are also grateful for the contribution of Amanda LoRusso, who assisted with the preparation of this paper for publication.