



From Teachers' Mindfulness to Students' Thriving: the Mindful Self in School Relationships (MSSR) Model

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Abstract

Objectives Initial evidence indicates positive effects of mindfulness in schools, for both teachers and students. However, theoretical conceptualization and empirical evidence of the mechanisms underlying them is scarce.

Methods We propose such a model for education, which draws on other fields of mindfulness research, especially psychology and neuroscience. Furthermore, we propose moving beyond the typical research focus on effects of mindfulness interventions in schools on students, and suggest a focus on the interpersonal contexts in which students operate and develop, in which teachers are key.

Results The theoretical model presented here aims to address some of these issues by presenting an integrative model focusing on the effects of teachers' mindfulness in schools. This model—the *mindful self in school relationships* (MSSR)—points to teachers' decreased self-centered psychological mode of processing as a core mechanism underlying the positive effects of teachers' mindfulness, as it contributes to teachers' caring capacities, such as emotion regulation, empathy, and compassion, which promote their aptitude to nurture effective relationships with students, facilitate teachers' well-being and effectiveness, and thus affect students' well-being and social and academic development.

Conclusions The MSSR model can provide testable predictions about the mediating role of decreased self-centeredness (and the neural/cognitive activity associated with it) and enable a coherent understanding of psychological and interpersonal mechanisms underlying the effects of teachers' mindfulness, from a systemic perspective. As such, it can be a helpful framework for understanding mindfulness effects in schools and delineate a relevant research agenda, potentially applicable for other organizations.

Keywords Mindfulness · Schools · Teachers · Teacher-student relationships · Self-centeredness

In recent decades, educators, policymakers, and researchers around the world have been concerned about the limited

ability of schools to provide students with sufficient social and academic skills and knowledge to enable successful coping in their later life (e.g., Barton et al. 2013; Polanczyk et al. 2015). Extensive studies have consistently shown that teachers are the single dominant factor that promotes students' development and achievement (Barber and Mourshed 2007) and have pointed to teacher-student relationships as core in educational processes, significantly affecting students' social and academic competence as well as their well-being (e.g., Bryk and Schneider 2002; Roorda et al. 2011; Wubbels and Brekelmans 2005). However, teachers deal with multiple stressors in their daily work and rarely have the resources or training to be supportive initiators and models of positive interactions in adverse situations, for example when facing student misbehavior or stressful academic demands (Chang 2013). In fact, teachers, who are dealing with increasing numbers of students per teacher (Ingersoll et al. 2018), have a high stress load and show high burnout rates (Hakanen et al. 2006; Schaufeli and Buunk 2003), mainly due to the challenging

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interpersonal and emotional demands of teaching (Johnson et al. 2005; O'Connor 2008).

A vast body of publications on meditation highlight its beneficial effects in relation to social skills and well-being (Dahl and Davidson 2018; Tang et al. 2015), albeit there are novel findings that highlight some adverse effects observed in long-term meditation practitioners (Lindahl et al. 2017). There is growing evidence that mindfulness-based interventions increase teachers' well-being and may enhance their ability to cope with the high stress load and emotional demands of teaching (Hwang et al. 2017). Yet, the underlying mechanism for these effects is still obscure, as is the explanation for the salutary effects on teacher-student relationships and on students' achievement and well-being. The present theoretical account suggests such an underlying mechanism related to teachers' decreased self-centeredness, by presenting an interdisciplinary theoretical model for a pathway from teachers' mindfulness to students' thriving, by bridging and building on accumulating evidence from education, psychology, and contemplative neuroscience. Specifically, contemporary conceptual models of mindfulness effects in schools suggest that mindfulness may foster/nurture "habits of mind" (Roeser et al. 2012), which are professional dispositions that reflect tendencies to "gather data through all of the senses, to be aware of and reflect on experience in a nonjudgmental manner, to be flexible when problem solving, to regulate emotion and be resilient after setbacks, and to attend to others with empathy and compassion" (Roeser et al. 2012, p. 167). In the present paper, we suggest that the mindfulness practice effects that involve the development of such habits of mind are rooted in the transition from a self-centered processing mode toward interconnected/selfless processing. In the present paper, we will review the research that leads to this understanding and delineate the implications for teachers, students, and schools, as well as for future research.

The model we propose emphasizes two notions: the accumulating literature showing that mindfulness training shifts one's self-awareness mode and the core understanding that education is an interpersonal, relational endeavor, which requires teachers to shift from a "self-centered" (or "self-focused") processing mode, in order to enable effective, nourishing teacher-student relationships. Based on related psychological and neuropsychological literature, the model suggests that the shift in self-awareness mode, which can be attained and maintained by a regular *practice of mindfulness*, is the underlying mechanism that in turn can promote meaningful, supportive teacher-student relationships, which benefit both teachers and students. Thus, the proposed theoretical model—the *mindful self in school relationships* (MSSR)—delineates how mindfulness practice decreases teachers' self-centeredness, shown to be affected by mindfulness practice, which in turn can enhance teachers' and students' well-being and functioning in school by promoting teacher-student

relationships and the faculties that foster them (i.e., teachers' improved emotion regulation and increased empathy and compassion capacities). To support the MSSR model, we employ findings and theories from educational, psychological, and cognitive neuroscience literatures. Because there is very little empirical evidence for certain parts of the model (i.e., the effects of teachers' mindfulness on students), some of the discussion will be theoretical. Still, such theoretical understanding of the connections between teachers' mindfulness and students' well-being should be highly relevant for understanding mindfulness effects in schools and for forming a deep, integrative research agenda for mindfulness in educational institutions (and perhaps lead the way to a similar kind of exploration of mindfulness effects in other contexts). However, in the last section, we offer some preliminary data to support the MSSR model.

Mindfulness Practice in Schools

Mindfulness practice originally stems from Buddhist Theravada traditions (Olendzki 2010) and is often described as nonjudgmental attention to experiences in the present moment. Typically, in mindfulness practice, attention is directed to embodied experience without interpretation, with an attitude of acceptance, engendering warm, and friendly openness and curiosity, while emphasizing a detached observation of the constantly changing experience—focusing on awareness to the experience itself rather than to its relevance to the self (Brown et al. 2007; Kabat-Zinn 2009). Since the 1990s, mindfulness meditation and practice has been applied to multiple mental and physical health conditions (Gotink et al. 2015; Kabat-Zinn 2009; Khoury et al. 2013) and has received much attention in psychological (Davidson and Kaszniak 2015) and neuroscientific research (Tang et al. 2015).

The growing body of research showing the effects of mindfulness on improved emotion regulation (Chambers et al. 2008; Farb et al. 2010; Farb et al. 2012a, 2012b; Rosenberg et al. 2015), enhanced attention (Jha et al. 2007; Malinowski 2013), and well-being cultivation (Brown and Ryan 2003; Siegel 2007) has led to surging interest in mindfulness within educational setups (Davidson et al. 2012; Hwang et al. 2017; Meiklejohn et al. 2012; Schonert-Reichl and Roeser 2016). Over the past 15 years, several mindfulness-based programs have been developed for teachers (e.g., Jennings 2016; Lantieri et al. 2016; Roeser 2016) and for students (e.g., Galla et al. 2016; Heineberg 2016; Maloney et al. 2016; Parker and Kupersmidt 2016; Sheinaman and Hadar 2017), and the cultivation of a mindful attitude in schools has been linked to several desirable outcomes for both students and teachers (e.g., Albrecht et al. 2012; Waters et al. 2015). While they are not the focus of this paper, we briefly mention that student mindfulness training programs were found to affect students' well-being, social competence, executive

functioning, attention, academic achievement (reviewed by Waters et al. 2015), meta-cognitive abilities (Vickery and Dorjee 2015), and mental health (reviewed by Carsley et al. 2017), including stress and resilience (reviewed by Zenner et al. 2014). Such meditation programs also had school-level outcomes, such as fewer fights in the schoolyard following mindfulness training (Waters et al. 2015), and were suggested to cultivate students' agency (Ergas and Berkovich-Ohana 2017, p. 9).

While acknowledging these compelling effects and their importance, in the present paper we suggest, based on educational literature, that a sustainable, scalable change in students is almost always related to the school environment in which they dwell and, more specifically, to their teacher. Thus, we turn our attention to teachers as key education agents whose notable effects on students' behavior, well-being, and achievement in school have been well-established (Barber and Mourshed 2007; Hattie 2009; Jennings and Greenberg 2009; Wubbels and Brekelmans 2005). Teachers were found to be the single dominant factor that promotes students' development and achievements (e.g., Barber and Mourshed 2007; Hattie 2009). Teachers' ability to create influential and warm interactions in class was associated with student achievement and social competence (Wubbels and Brekelmans 2005). Furthermore, teachers' attitudes and feelings at work were closely associated with their functioning and with student outcomes. For example, teachers' sense of meaning affected their relationships with students (Lavy and Bocker 2018), and teachers' commitment and resilience were linked with students' achievement (Day 2008). One of the main challenges of teachers is to sustain warm, effective relationships with their students, despite the many challenges that they face—such as student misbehavior (Chang and Davis 2009), stressful demands for student achievement, high workloads, and role conflict (de Heus and Diekstra 1999; Hakanen et al. 2006)—emotional demands that often make teachers feel drained, exhausted, and burned out (Chang and Davis 2009; Hakanen et al. 2006; Johnson et al. 2005) and diminish their effectiveness, especially their ability to positively respond to students (Lavy and Eshet 2018; Montgomery and Rupp 2005).

We suggest that mindfulness can be an effective antidote for teachers' burnout and exhaustion and positively affect their emotional responses, because it can improve their ability to face daily challenges and effectively cope with the emotional demands of teaching. In the MSSR, this positive effect of mindfulness is suggested to stem from the role of mindfulness in decreasing teachers' "self-centered" processing, which contributes to improved caring capacities—better emotion regulation and increased empathy and compassion. In turn, these improved capacities promote teachers' ability to develop and sustain sensitive and effective relationships with their students, which facilitate teacher well-being and effectiveness and student well-being and social and academic development. We will now elaborate on the rationale and evidence for these proposed connections and processes.

What Do We Know About Teachers' Mindfulness?

A growing number of studies have investigated the effect of mindfulness practice for teachers and indicated its positive effects (recently reviewed by Hwang et al. 2017), including a decrease in teachers' stress (Anderson et al. 1999; Beshai et al. 2016; Gold et al. 2010; Roeser et al. 2013; Taylor et al. 2016); interpersonal problems (Gouda et al. 2016); burnout (Anderson et al. 1999; Flook et al. 2013; Jennings et al. 2013; Roeser et al. 2013); and psychological distress, including somatization, interpersonal sensitivity, hostility (Franco et al. 2010), anxiety, and depression (Anderson et al. 1999; Franco et al. 2010; Gold et al. 2010; Kemeny et al. 2012; Roeser et al. 2013). Studies have also indicated positive effects of mindfulness practice on teachers' calmness and present-moment awareness (Frank et al. 2015), well-being (Beshai et al. 2016; Jennings et al. 2013), satisfaction at work and home (Crain et al. 2017), and self-compassion (Beshai et al. 2016; Flook et al. 2013; Frank et al. 2015; Roeser et al. 2013). Furthermore, there are several indicators that teachers' mindfulness may specifically affect teachers' caring and relationship capacities, such as studies showing that mindfulness training increased teachers' emotion regulation capacities (Gouda et al. 2016; Kemeny et al. 2012) and fostered their kindness (Anderson et al. 1999; Gold et al. 2010) and compassion for others (Kemeny et al. 2012). It has also been shown that mindfulness training and/or practice are connected to improved teachers' self-efficacy (Jennings et al. 2013; Taylor et al. 2016), classroom organization (Flook et al. 2013), instruction, teacher-student relationships, and classroom management (Meiklejohn et al. 2012).

There is also initial evidence for the effects of teachers' mindfulness on students from a study of three preschool teachers' mindfulness practice effects on their students with mid intellectual disability, which suggested its association with decreased student maladaptive behavior and negative interactions and with increased compliance behavior (Singh et al. 2013). In addition, research pointed to the unique effects of mindfulness training conducted by teachers compared with that by non-teachers (Waters et al. 2015). However, the cause of these effects was not ascertained. In fact, it was suggested that further research was required in order to advance our understanding of the mechanisms and processes that underlie the effects of meditation/mindfulness in schools (Gouda et al. 2016; Waters et al. 2015).

In the present paper, we suggest that a basic process/mechanism underlying the effects of mindfulness on teachers and students is the shifting self-awareness mode, characterized by decreased self-centeredness, which increases caring capacities and fosters creation and nourishment of high-quality interactions and relationships. In support of this proposition, one recent paper (Adair et al. 2018) showed the effects of changes in trait mindfulness on changes in feelings of social

connection with others (i.e., social connectivity) and empirically demonstrated that this change process was mediated by changes in individuals' decentering—their “mental separation... between awareness of experience and the perceived self-focus of that experience” (p. 739)—and another (Hanley et al. 2017) indicated a positive relationship between selflessness (reflecting a decreased focus on the self), dispositional mindfulness, and psychological well-being and indicated that selflessness mediated the relationship between dispositional mindfulness and psychological well-being. Building and elaborating on this accumulating evidence and on additional psychological and neuroscientific literature reviewed below, we point to the role of decreased self-centeredness in driving the effects of teachers' mindfulness in schools.

Self-centeredness and Its Relation to Mindfulness Practice

The “Self” and Psychological Functioning

The concept of “self” is one that has been broadly discussed in clinical and social psychology, typically used to describe individuals' inner representation or schemas of themselves (sometimes in relation to the world around them) (Deci & Ryan, 2000; Mischel and Shoda 1995). People's self-concept can affect their perceptions, thoughts, feelings, and behavior in adaptive and/or maladaptive ways, with a main goal of maintaining a coherent, and often positive, self-concept (Baumeister et al. 1996; Deci & Ryan, 2000). For example, a stable sense of self is considered “a crucial source of coherence and continuity, and invaluable means of defining ... existence, organizing experience, predicting future events, and guiding social interaction” (Swann Jr and Buhrmester 2003, p. 407).

It should be noted that the need for a stable sense of self can have undesirable outcomes, for example when leading to exaggerated self-verification motivations. Such motivations can result in intensified self-judgment and rumination, which have been linked with depression (Neff 2003). They can also develop into narcissism among people with exaggerated self-views and can drive people with negative self-views to be involved in destructive relationships (Swann Jr 2011; Swann Jr and Buhrmester 2003). Overall, an extended need for self-verification seems to lead individuals with high self-judgment to be preoccupied with themselves and its protection in different ways. This process can impede social connections—for example, when individuals are demeaning, devaluing others, or aggressive as a strategy to fight threats to their ego (Baumeister et al. 1996). Furthermore, being preoccupied with the self (i.e., self-centeredness) decreases the ability to listen and to acknowledge and respond to others and their needs. This psychological mode that is preoccupied with the self

may be characterized by self-centered processing (Dambrun and Ricard 2011). *Self-centeredness* (also called “self-focus”; Feeney and Collins 2001) is “the extent to which an individual is concerned primarily with his or her own interests and welfare” (Cacioppo et al. 2017, p. 1126). It has been associated with a decreased ability to care for others (Feeney and Collins 2001) and was a robust predictor of loneliness in cross-sectional and longitudinal studies (e.g., Cacioppo et al. 2017). It was suggested to drive intolerance of unpleasant emotion, experiential avoidance, reactivity to internal experience, anxiety, and depression (Bernstein et al. 2015; Dambrun and Ricard 2011).

In contrast to the stable, highly judgmental, evaluative self, which is related to a strong need for self-validating, an integrative yet flexible and non-evaluative self has been considered a more adaptive form of self, which can contribute to interconnectedness with others and to decreased preoccupation with the self (Neff 2003). According to Deci and Ryan's (2000) self-determination theory, *adaptive self-schema* (or *self-concept*), which is the basis for self-determined action, is created when the self is gradually elaborated and refined through integrating processes. In such processes, the self-schema comprises a set of “flexible, unified regulatory processes, values, and structures, that allow people to engage volitionally in activities” (p. 248). Neff (2003) delineates a related paradigm, in which a kind, non-evaluative perspective on the self and emphasis on its interconnected components (acknowledging the “common humanity” of one's experiences; p. 85) enhances a positive yet flexible and adaptive perspective on the self, which can counter tendencies that can be harmful/maladaptive (such as self-centeredness) and their undesirable consequences. This kind of integrative, non-judgmental, interconnected, and flexible-yet-coherent self is related to decreased self-centeredness (Dambrun and Ricard 2011). Based on the literature on integrated/coherent self-concept and its correlates (Deci & Ryan, 2000; Neff 2003), we propose that such self-concepts are less easily threatened, and thus, people with this kind of self-schema that have a flexible-yet-coherent self-concept, sometimes called hypoegoic (Leary 2004; Leary et al. 2006), are less preoccupied with their self-concept and its protection (e.g., from threats).

We propose that this integrated, flexible, interconnected self is also related to decreased self-centeredness (or selflessness) as it is discussed in the social neurosciences, which is typically used to qualify psychological functioning characterized by a lower (i.e., not exaggerated) degree of importance given to the self. In this literature, Dambrun and Ricard (2011) propose three interrelated markers in interpersonal self-configurations, which are the degree to which the self is treated as a real, solid, and independent entity. At one pole of this self-configuration continuum, the self is experienced as sharply defined, solid, and independent. This experience is reflected in a self-centered psychological processing mode. At the other

pole, the self is experienced as lacking reification and entification, fundamentally interconnected, and arising from a dynamic, interactive network. This experience is reflected in a psychological processing mode in which there is decreased self-centeredness (or selflessness) (Dambrun and Ricard 2011). The style of decreased self-centered psychological processing was found to be closely related to characteristics such as altruism, kindness, respect, empathy, compassion, and the search for harmony (Dambrun and Ricard 2011). Importantly, it was also empirically linked with meditation in both psychological studies (Dambrun 2016; Garland and Fredrickson 2019; Hanley et al. 2017) and neuroscientific studies described consequently.

Mindfulness Meditation and Decreased Self-centeredness—Neuroscientific Evidence

It is largely accepted that mindfulness meditation causes neuroplastic changes in the function of the brain regions involved in regulation of attention, emotion, and self-awareness (Tang et al. 2015). These mechanisms work synergistically and might come into play to varying degrees at any specific moment during mindfulness meditation (Hölzel et al. 2011). Moreover, it has also been suggested that the core process that undergoes neuroplastic changes following meditative training and underlies the regulation of attention and emotion is the alteration in neural circuits used for the representation of the self (Brewer and Garrison 2014; Davidson 2010; Vago and Silbersweig 2012). This is in accord with a corpus of studies showing that mental processes are biased by the degree to which the processed information is relevant for the self (Northoff 2016). Such bias is relevant to processes related to attention (Humphreys and Sui 2016), perception and memory (Sui & Humphreys, 2015), emotion regulation (Herbert et al. 2011; Herwig et al. 2010), and emotional response (Lindquist et al. 2012).

The neural network commonly thought to support self-referential processing (i.e., processing of content that is linked or referred to the self) is the default mode network (DMN) studied extensively by functional magnetic resonance imaging (fMRI) (Gusnard et al. 2001). The DMN classically includes the medial prefrontal cortex (mPFC), the posterior cingulate cortex (PCC), the anterior precuneus, the inferior parietal lobule (IPL), and the hippocampus (Buckner et al. 2008). These structures show high activity during rest, mind-wandering, and conditions of stimulus-independent thought (Christoff et al. 2016; Mason et al. 2007) and have been shown to be involved in episodic memory, future planning, mental time traveling, and self-centered thoughts (Bar 2009; Gusnard et al. 2001; Northoff et al. 2006; Qin and Northoff 2011).

Growing neuroscientific evidence shows that mindfulness-related practice lowers activity and alters connectivity in various nodes of the DMN (recently reviewed by Millière et al. 2018). Specifically, it has been shown that various mindfulness-related

techniques decreased blood-oxygen-level-dependent (BOLD) fMRI activation in several areas of the DMN during practice, including the precuneus (Ives-Deliperi et al. 2011; Tang and Posner 2009), mPFC (Brewer et al. 2011; Farb et al. 2007; Ives-Deliperi et al. 2011), PCC (Brewer et al. 2011; Pagnoni 2012; Tang and Posner 2009), and lateral temporal cortex (Pagnoni et al. 2008). Even more interesting, it was shown that these effects can become permanent, thus a trait and not only a state effect, as similar BOLD fMRI reductions in PCC and IPL activity were shown during task or rest (Berkovich-Ohana et al. 2016a; Garrison et al. 2015), as well as reduced functional connectivity between various DMN nodes during spontaneous resting-state fluctuations in long-term meditators (Berkovich-Ohana et al. 2016b; Taylor et al. 2016). Others reported increased functional connectivity among various DMN nodes (Jang et al. 2011; Taylor et al. 2013), as well as altered functional connectivity between DMN nodes and other networks (Brewer et al. 2011; Hasenkamp and Barsalou 2012; Jang et al. 2011; Kilpatrick et al. 2011). Similarly, electrophysiological studies have provided evidence that long-term practitioners of mindfulness meditation, compared with controls, exhibit reduced resting-state DMN activity (Berkovich-Ohana et al. 2012) and connectivity (Berkovich-Ohana et al. 2013), which proposes less engagement in self-referential processing. A seminal paper in the field (Farb et al. 2007) showed that reduced mPFC (the frontal node of the DMN) activity is indeed related to a reduced tendency to engage in self-referential processing. Specifically, Farb et al. (2007) showed that after an eight-week mindfulness intervention, participants were better able to disengage from a “narrative self-focus” in the trait judgment task (typically employed to investigate self-referential processes), as evidenced by more pronounced reductions in the mPFC activity compared with the control group. This demonstrates that even brief training can reduce the activation in the regions supporting the narrative self. Another line of research, investigating the phenomenon of self-face bias, found reduced bias in neural (event-related potential) responses to the self-face (versus other’s face) for long-term meditators compared with controls, suggesting a decreased focus on the self and potentially more availability to focus on others (Trautwein et al. 2016).

The reduction in self-centeredness following meditation practice can derive from various processes. One example (briefly mentioned here to illustrate one possible path) is decentering (Dahl et al. 2015). Decentering is “the greater mental separation that mindfulness fosters between awareness of experience and the perceived self-focus of that experience” (Adair et al. 2018, p. 739). It is considered a main component of mindfulness (Papies 2016) and reflects the meta-cognitive awareness that one’s thoughts and experiences are in essence no more than mental events that can be observed without requiring response or reaction from oneself (Bernstein et al. 2015; Chambers et al. 2009; Grabovac et al. 2011; Shapiro et al. 2006). This process can be thought of as the opposite of

self-referential processing, which is the process of associating external and internal stimuli and events with one's self, causing stimuli to no longer be experienced as simply "objective" events but as related to the self (Northoff et al. 2006). Thus, decentering is one mechanism through which mindfulness can reduce self-referential processing, building on training attention. Other processes that were claimed to be caused by a reduction in narrative self-processing and enhanced embodied self-processing following meditation (Berkovich-Ohana et al. 2019) include change in time experience, related to more attention to present-moment experiences and less preoccupation with mind-wandering (Berkovich-Ohana and Wittmann 2017; Mrazek et al. 2012), and heightened perceptual awareness (Barušs 2003; Carter et al. 2005), which enables attunement to one's own and others' concurrent behaviors and feelings. (Note that each of these processes in itself can impact teachers' caring capacity, enabling increased sensitivity to students' needs and better ability to address them, even in times of conflict; Berkovich-Ohana et al. 2019).

Taken together, the body of knowledge presented here, based on research on mindfulness-related processes and integrating evidence and theoretical understandings from psychological and neuroscientific research, suggests that mindfulness practice may lead to decentering and decreased self-centered psychological processing. Such decreased self-centeredness can be very valuable for teachers.

Decreased Self-centeredness—Implications for Teachers

Teacher education literature suggests that knowledge of the self and the ability to connect it to daily work is critical to teachers' way of constructing the nature of their work, as well as to their relationships with students, instruction, and overall effectiveness (Day 2008; Korthagen 2004). For example, teachers' perceptions of themselves and of their students in relation to themselves have notable impact on teachers' ability to make appropriate and effective adjustments in their practice and their beliefs about it and effectively engage with their students (Korthagen 2004, 2014). When the self-concept requires less active attention, because it is more flexible and interconnected, people seem to be able to exert resources to pursue other goals, including regulated interpersonal behavior (Neff 2003). Thus, as teachers, they may have more resources to deal with students' difficulties and to invest more attention and energy in attending to students' needs and thus developing their relationships with them. Furthermore, as suggested by the studies on decreased self-centeredness, this psychological mode can foster teachers' relationship-promoting capacities (e.g., Adair et al. 2018).

Potential Effects on Teachers' Caring and Relationship Capacities

Teacher-student relationships are the most robust predictor of students' academic success, social skills, and well-being (e.g., Roorda et al. 2011; Wubbels and Brekelmans 2005). Supportive, positive teacher-student relationships have been linked with students' self-esteem, well-being, motivation, investment in school, self-efficacy, resilience (Den Brok et al. 2004; Lavy and Naama-Ghanayim 2020; Lavy and Ayuob 2019; Roeser and Eccles 1998; Wubbels and Brekelmans 2005), and academic functioning and achievement (reviewed by Hamre and Pianta 2006; Hattie 2009), as well as with school engagement, positive behaviors and attitudes toward school (Gruman et al. 2008; Roorda et al. 2011; Wubbels and Brekelmans 2005), and peer acceptance (Hughes and Kwok 2006). Mindfulness is suggested to promote capacities that enhance positive teacher-student relationships, through its effect on teachers' reduced self-centeredness.

Although mindfulness is considered a personal practice, in Buddhist tradition, it was closely connected with prosocial ethical values and was typically taught in conjunction with the "four immeasurables"—compassion, loving-kindness, empathic joy, and equanimity (Wallace and Shapiro 2006). Buddhist writings also propose that mindfulness in itself may contribute to development and maintenance of healthy nourishing relationships, as it fosters interacting with others more attentively and less judgmentally (Kabat-Zinn 2009). Contemporary research corresponds with these ideas and suggests that mindfulness is associated with adaptive relationship-related perceptions of oneself and others (Sahdra et al. 2011; Shaver et al. 2007), improves adaptive socioemotional functioning, and supports relationship-promoting capacities such as emotion regulation, empathy, and compassion (Barbosa et al. 2013; Floman 2018; Hwang et al. 2017; Rosenberg et al. 2015; Sahdra et al. 2011).

These three capacities—emotion regulation, empathy, and compassion—shown to be affected by mindfulness (e.g., Chambers et al. 2009; Haimovitz et al. 2011) are considered key for teachers' work, because they are crucial for teachers' ability to identify and effectively respond to students' needs (e.g., Jennings and Greenberg 2009; Maysel 2015). They are considered required teacher professional dispositions (Dottin 2009), which enable highly effective teaching (Haimovitz et al. 2011), and are also expected to be positively affected by decreased self-centeredness.

Emotion regulation, defined as the intentional modification of the experience or expression of emotions (Gross 1998; Oplatka 2009), has been highlighted as one of the most important tasks of teachers, required for their professional functioning and effectiveness, as well as for their psychological well-being (Jennings and Greenberg 2009; Oplatka 2009; Yin and Lee 2012). It was suggested to affect teachers' ability to

cope with the stressful challenges of teaching, to help them effectively manage student misbehavior, and to nurture healthy, strong, and effective relationships with students, which in turn promote educational processes (Chang 2013; Sutton 2004). In fact, emotion regulation was shown to be a key predictor of performance, job satisfaction, and well-being in various professions, including teaching (Hülshager and Schewe 2011; Lavy and Eshet 2018; Philipp and Schupbach 2010), and it mediated the link of teachers' emotional demands with their well-being (Yin et al. 2016). Ample studies have demonstrated the effect of mindfulness on improved, effective emotion regulation capacities (Chambers et al. 2009; Farb et al. 2010; Farb et al. 2012a, 2012b; Roemer et al., 2015; Tang et al. 2015; Waters et al. 2015). Among teachers, mindfulness training resulted in improved stress management, decreased experiences of stress (Beshai et al. 2016; Jennings et al. 2013; Roeser et al. 2013; Taylor et al. 2016), more calmness (Frank et al. 2015), and accelerated recovery from autonomic arousal following threat (Kemeny et al. 2012).

Empathy consists of the ability to share and understand the emotional experience of another person (Zaki and Ochsner 2012). It is considered a central capacity required for social interactions (Hemmerdinger et al. 2007), essential for human survival, because it motivates individuals to connect with each other and consider the benefit of others in their actions (Batson et al. 2015). Accumulating evidence points to two separate systems for empathy: an emotional system that supports our ability to empathize emotionally and a cognitive system that involves cognitive understanding of the other's perspective (Gonzalez-Liencre et al. 2013; Shamay-Tsoory 2011; Shamay-Tsoory et al. 2009). The two systems were shown to depend on separate anatomical substrates: While emotional empathic abilities rely on shared embodied representations of affective states, where "the self represents the other" (Decety and Chaminade 2003), and involve the mirror neuron system (e.g., inferior frontal gyrus), cognitive empathy relies on regions involved in theory of mind (e.g., ventromedial prefrontal cortex). Empathy is especially important for care providers, as it enables them to respond more accurately to the needs of those they care for (Batson et al. 2015). Specifically, teachers' empathy was highlighted as a core capacity required when caring for students (Jennings and Greenberg 2009), having cooperative communication with them (Wubbels and Brekelmans 2005), and generally maintaining better teacher-student relationships (Barnes et al. 2007). Studies have validated the positive effect of meditation on empathy (e.g., Barbosa et al. 2013; Zenner et al. 2014), showing that mindfulness training increased participants' empathy (Krasner et al. 2009) and participants exhibited significant gains in perspective taking (Birnie et al. 2010) and empathic response to suffering (Rosenberg et al. 2015) from pre- to post-training.

Compassion is defined as a concern for the suffering of another accompanied by the motivation to help (Goetz et al. 2010; Singer and Klimecki 2014). It has been consistently linked with well-being and positive emotions (Klimecki et al. 2013), and researchers have argued for its central contribution to relationships, as it promotes not only sensitivity to suffering but also behaviors reflecting commitment, cooperation, and altruism (Goetz et al. 2010), including prosocial behavior and social support (e.g., Batson and Shaw 1991; Sprecher and Fehr 2005). Compassion is particularly crucial for teachers' awareness of student needs, questions, and confusion while trying to learn new things and for teachers' capacity to "see beyond" student problem behavior to its underlying motives, which often involve needs for safety, care, reassurance, or limit-setting. It is also essential for teachers' ability to build and maintain the relatively long-term relationships with students and colleagues, in which conflicts are inevitable (Eldor and Shoshani 2016; Haimovitz et al. 2011). Mindfulness is closely linked with the cultivation of compassion. In fact, compassion is considered a pivotal aspect of mindfulness practice (e.g., learning how to be present, compassionate, and forgiving with oneself and others; Kabat-Zinn 2009). Initial research shows that compassion is increased following mindfulness practice, as shown in pre-post self-reported compassion (Moll et al. 2015; Sahdra et al. 2011), as well as in behavioral (e.g., prosocial behavior; Kirk et al., 2016; Lim et al. 2015) and emotional (e.g., automatic facial expressions; Rosenberg et al. 2015) manifestations of compassion. In a neuroscientific study, meditation practice was associated with self-reported compassion (Trautwein et al. 2016). While studies of mindfulness-induced compassion in teachers are still scarce, preliminary results suggested that teachers' meditation training increased activation of cognitive networks associated with compassion (Kemeny et al. 2012) and that a mindfulness-based intervention helped teachers to compassionately acknowledge emotions that arose in their work with challenging students (Haimovitz et al. 2011). While compassion builds upon the ability to empathize with others, it constitutes different ways of responding to another's emotional needs. In contrast to empathy, compassion does not necessarily involve a common feeling between the observer and the observed, just as a frightened person will not induce fear but pity and potentially helpful behavior in the observer (Gonzalez-Liencre et al. 2013). Like empathy, it requires the ability to form representations of others' emotions, even though the emotion is not necessarily shared (and thus is closer to cognitive empathy than to emotional empathy). Finally, being compassionate to others and to oneself entail additional skills that are not necessarily inherent in empathy, including sensitivity to another's needs, stress tolerance, attention, imagery, and nonjudgment (Gonzalez-Liencre et al. 2013).

The effects of mindfulness on these three capacities (i.e., emotion regulation, empathy, and compassion) are proposed

to stem from decreased self-centeredness, with its previously related psychological processes: decentering, a heightened focus on present-moment experiences, heightened perceptual awareness, and increased positive emotions (see review by Berkovich-Ohana et al. 2019). Decentering reduces self-bias and can enable a more balanced and less judgmental, reactive observation of one's own emotions (expected to improve emotion regulation) and more balanced and less biased and judgmental attention to others' emotions (expected to improve empathy and enable compassion). Increased focus on present-moment experiences and heightened perceptual awareness enable more attention to one's own and others' emotions and behaviors, which can foster a more accurate and detailed understanding of these emotions, and decreased mind-wandering can decrease criticism and judgment. Positive emotions broaden the repertoire of interpretations and reactions (Fredrickson 2013) and also foster connectedness—all expected to positively affect the caring capacities. However, it should be acknowledged that as emotion regulation, empathy, and compassion represent different constructs (that are not always positively related), the effects of these processes may be different for each of them. For example, as empathy can be a negative experience leading to empathic fatigue (Batson et al. 1981), it can be suppressed in emotion regulation processes (Cameron and Payne 2011; Gray 2017), and thus, a process or tendency that enhances, for example, heightened perceptual awareness may elicit awareness of others' pain but also of our unpleasant reaction to it, thus promoting its regulation, for example by suppressing the emotional empathic response. We suggest that lower levels of self-centeredness would enable the use of emotion regulation strategies that do not require suppression of negative emotions but rather enable a balanced acceptance of all emotions; however, whether this is the case for teachers (or for experienced meditators) remains to be scientifically explored.

Effects on Teachers, Students, and School Environment

These expected effects of decreased self-centeredness on teachers' relationship capacities and on the resultant quality of their relationships with students can have further effects on teachers, students, and the school environment. For teachers, caring and respectful teacher-student relationships expand teachers' opportunities to contribute to students' development and well-being, in school and in life (Lavy and Naama-Ghanayim 2020), and they are considered an important vehicle for making a positive impact on students' learning and personal development (Oplatka, 2006; Wubbels and Brekelmans 2005). Thus, they also facilitate teachers' senses of job satisfaction and fulfillment (Spilt et al. 2011; Lavy and Bocker 2018), which in turn contribute to teacher efficacy and

functioning and to student outcomes (e.g., Caprara et al. 2006; Lavy and Eshet 2018).

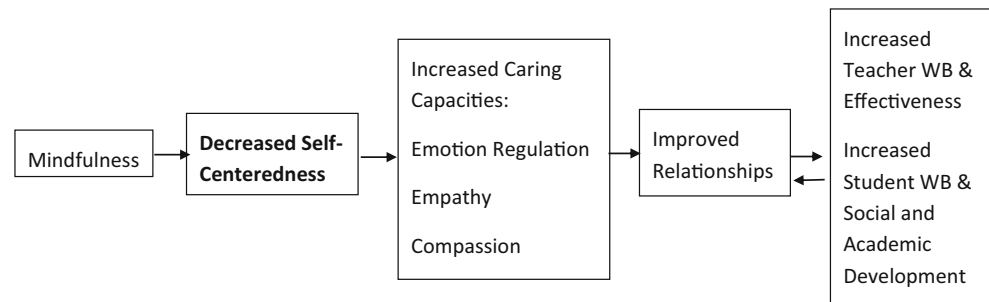
Regarding students, the improved caring capacities of teachers and relationships with them are expected to contribute to students' well-being, as well as to their social and academic development, due to the positive effects of improved relationships (e.g., Hamre and Pianta 2006; Roorda et al. 2011) but also due to the direct effects of teachers' decreased self-centeredness on their ability to sensitively attend to students, thus being able to better fulfill their needs, and the modeling of such behavior, driven by decreased self-centeredness, for students' own behavior. This kind of processing is expected to yield less self-centered behavior among students, which fosters connectedness and consideration among class members (e.g., in times of success and excitement and in the face of a student's difficulty or class challenge) (see also Jennings and Greenberg 2009). Such processes can further contribute to teacher-student relationships and elicit a potential upward spiral of improved relationships, well-being, and growth (see also Roeser et al. 2012).

Implications and Contribution of the MSSR Model

The MSSR model (Fig. 1) serves as a conceptual framework for understanding the underlying mechanisms giving rise to intra- and interpersonal processes related to teachers' mindfulness and its effects. It proposes that the personal psychological process that mindfulness triggers in teachers, which eventually affects their students, is mediated by decreased self-centeredness and its effects on relationship-promoting capacities such as emotion regulation, empathy, and compassion. This interdisciplinary model was made possible by building on findings from education, psychology, and neuroscience research and has specific predictions for research agendas, designs, and methods, pointing to the necessity of exploring intrapersonal, as well as interpersonal, processes related to mindfulness effects in schools (see next section). Critically, the conceptualization brought forward in this paper emphasizes the acute need for linking interdisciplinary knowledge in order to provide a full understanding of the effects of mindfulness on individuals and relationships creating society. The MSSR model proposes a more profound understanding of mindfulness effects, which was not possible when basing the model on evidence from only one field.

The MSSR model complements other educational models linking teachers' mindfulness with teachers' well-being, relationships, and student outcomes. One such influential model is the prosocial classroom model (Jennings 2015; Jennings and Greenberg 2009). This model builds on the close relationship between mindfulness-based initiatives in education and social-emotional learning (SEL), as mindfulness-based initiatives are

Fig. 1 The mindful self in school relationships (MSSR) model



aligned with the goals of SEL, which involves the cultivation of self-awareness, self-management, social awareness, relationship skills, and responsible decision-making (Lawlor 2016). The prosocial theoretical model proposes that teachers who are more socially and emotionally competent have more supportive relationships with their students, engage in more effective classroom management strategies, and are more effective teachers of the social and emotional curricula. This, in turn, correlates with a healthy classroom climate, which directly contributes to children’s social, emotional, and academic outcomes. Roeser et al. (2012) further develop this model and suggest that teachers’ mindfulness fosters teachers’ habits of mind that contribute to teachers’ health, well-being, and engagement and to positive classroom outcomes, which in turn contribute to student outcomes. Another related model is the developmental model of the stress and coping process (Skinner and Beers 2016). This model builds on psychological understanding that constructive coping can transform previously stressful interactions into opportunities for learning and development, contributing to higher-quality engagement in teaching and greater levels of well-being. The authors (Skinner and Beers 2016) suggest that mindfulness holds the promise of transforming stressful experiences into opportunities for teachers to learn and grow, by influencing the regulation of stress and coping in various ways, thus promoting the development of robust personal resources for everyday resilience. The MSSR model adds to these models by specifying the cognitive mechanism that underlies the effects of mindfulness on teachers—suggesting decreased self-centeredness as core in these processes (which foster effective habits of mind, elicit caring/relationship capacities, etc.). It further builds on evidence from contemplative neuroscience to suggest an actual neural underlying mechanism that mediates the effects of mindfulness on teachers’ emotional capacities and, in turn, relationships and school outcomes.

An important message of this model, in alignment with the prosocial classroom model (Jennings 2015; Jennings and Greenberg 2009), is that although mindfulness is typically considered an individual experience, the individuals who practice it almost always dwell in a social and/or organizational context. Thus, others are likely to be affected by it. This understanding is especially important in education, which is

considered a social and interpersonal endeavor, but it may prove highly relevant to other social and organizational contexts, as evidence suggests that the effects of mindfulness on decreased self-centeredness and on relationship-promoting capacities are not limited to teachers or schools. Thus, if validated, the model may provide a framework for understanding the effects of employees’ mindfulness in other organizational contexts, especially those in which relationships are core (such as health and service organizations). We hope that this work will encourage the development of related integrative models that include intra- and interpersonal effects of mindfulness in other social and organizational contexts.

The Model’s Predictions and Initial Empirical Support

The MSSR model provides several specific predictions that incorporate interdisciplinary understandings. For example, it suggests that the teachers’ decreased self-centeredness mediates the effects of teachers’ mindfulness on their (1) caring capacities; (2) relationships with students; (3) students’ well-being; and (4) students’ social and academic development. The teacher’s decreased self-centeredness should be measured using several measures, as it is still an open question which measure could capture best this dimension. For example, one could use self-reports such as the self-focus measure (Feeney and Collins 2001), decentering (as measured by the Experience Questionnaire; Fresco et al. 2007), or the Self-centeredness/Selflessness Questionnaire (Dambrun 2017). Instead of self-reports, one could use cognitive tasks tacking implicit self-prioritization effects, such as the perceptual shape-matching task (Sui et al. 2012) or self-bias task (Trautwein et al. 2016), or neural measures of neural activation of the DMN, including both electrophysiology (e.g., Berkovich-Ohana et al. 2012, 2013) and resting-state fMRI (e.g., Berkovich-Ohana et al. 2016a, 2016b).

Such predictions can be examined in longitudinal studies of mindfulness interventions on teachers that incorporate examination of changes in their (and their students) self-reports of their experiences (e.g., of their mindfulness, relationships, well-being, competence) or their ratings in cognitive tasks

assessing capacities related to mindfulness and caring (such as attention, emotion regulation, see examples in Rosenberg et al. 2015; Sahdra et al. 2011). Such interdisciplinary studies can provide a nuanced understanding of the psychological and interpersonal processes related to the mediating effects of self-processing mode on the impact of teachers' mindfulness and the related neural mechanisms.

Importantly, beyond the accumulating evidence for each part of the suggested model, there is also initial evidence pointing specifically to decreased self-centeredness as underlying the effects of mindfulness on teachers. A study of 155 teachers from Jewish schools in Israel showed that mindfulness was indeed associated with better teacher-student relationships and that this association was mediated by teachers' increased decentering (Maoz et al. 2020). Another study, of 31 Arab elementary school teachers in Israel, showed a significant increase in decentering in teachers who participated in a mindfulness intervention (but not in teachers in the control intervention). Teachers in the mindfulness intervention also reported increased self-regulation and self-compassion following the intervention, effects that were not evident for teachers in the control group. Furthermore, increased decentering following a mindfulness intervention mediated the association of teachers' mindfulness levels with their increased emotion regulation and self-compassion levels (following the mindfulness intervention) (Shanbour 2019).

Limitations and Future Research

The MSSR model, in its current form, has a few limitations that should be acknowledged. First, the model incorporates cognitive functions that are challenging to measure with cognitive tools, especially self-awareness (Nyklíček 2020). Also, we should acknowledge the scarcity of empirical research on compassion and empathy in relation to both the constructs of mindfulness and self-centeredness. This renders the model challenging for empirical testing, both on the cognitive and the neural levels. Second, in its current form, the model includes students mostly as recipients of the effects of mindfulness. Future research can examine the potential positive effects of teachers' decreased self-centeredness and increased caring capacities on students' caring capacities, and their subsequent contribution to teacher-student relationships. As noted by other researchers (Jennings 2015; Jennings and Greenberg 2009), teachers' relationship-related capacities may directly impact the development of such competencies among their students, which can, in turn, affect teacher-student relationships and class outcomes and enhance their potential effects on students' and teachers' functioning and well-being.

A third point that should be considered is that there may be additional effects related to the model. For example, if indeed teachers' mindfulness decreases their self-centeredness and

subsequently their caring capacities, as hypothesized, teachers' improved emotion regulation may lead to upward spirals eliciting more positive affect and less negative affect, which further improve their ability to cope with stressful situations without becoming burned out (Lavy and Eshet 2018). Furthermore, modifications and moderations of the model in different contexts should also be portrayed in the future. For example, the effects of social class and ethnicity on the self and self-concept are well-established in the literature (Shoshana 2016, 2017); thus, it would be beneficial to examine whether the effects of teachers' decreased self-centeredness and increased caring capacities on student outcomes are amplified in schools serving disadvantaged students (Lavy and Ayuob 2019). Similarly, it may be required to adapt the model in different cultural contexts (see Finefer-Rosenbluh and Perry-Hazan 2018).

Although the different parts of the model have been examined and are supported by empirical evidence (as noted), empirical examination of the full interdisciplinary model—in schools or in other organizational contexts (similar or different), is still needed, for example, in a longitudinal study examining the expected positive effects of teachers' mindfulness on their self-centeredness (assessed either with neurological, cognitive, or self-report tools) and on their emotion regulation, empathy, and compassion toward students (as reported by teachers and students) and the expected positive associations of these capacities with subsequent quality of teachers' relationships with students, teachers' well-being and work effectiveness, and students well-being and social and academic development.

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Compliance with Ethical Standards

This article does not contain any studies with human participants or animals performed by any of the authors (it is a theoretical article).

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