

Toward the Integration of Meditation into Higher Education: A Review of Research Evidence

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Context: *There is growing interest in the integration of meditation in higher education.*

Purpose: *Here, we review evidence bearing on the utility of meditation to facilitate the achievement of traditional educational goals and to enhance education of the “whole person.”*

Research Design: *We examine how meditation practices may help foster important cognitive skills of attention and information processing, as well build stress resilience and adaptive interpersonal capacities through a review of the published research literature.*

Conclusions/Recommendations: *We offer directions for future research, highlighting the importance of theory-based investigations, increased methodological rigor, expansion of the scope of education-related outcomes studied, and the study of best practices for teaching meditation in educational settings.*

There is growing interest in the integration of meditation into higher education (Bush, 2006) and in the benefits that meditation may provide students. Pioneers in this field have begun to explore the possible

integration of meditation into the curriculum in an attempt to enhance engagement and understanding of subject matter as well as specific skills fundamental to the learning process, e.g., concentration, attention, and open-mindedness. For example, at the University of Michigan School of Music, students can receive a bachelor's degree in a program called "Jazz and Contemplative Studies," which emphasizes meditation; at Brown University, a religious studies course includes meditation "labs" as part of the curriculum (Gravois, 2005); and at Santa Clara University, a counseling psychology graduate program integrates meditation into the curriculum, in an effort to enhance the development of essential therapy skills such as empathy and presence (Shapiro & Izett, 2008). As a final example, Brown University has developed a Contemplative Studies Initiative spearheaded by 20 faculty members who are establishing an undergraduate concentration in contemplative studies that will serve to coordinate students' academic and personal studies in these areas (Roth, 2006).

The intent of this article is to discuss the ways in which meditation might enhance and complement current educational practices. In a review of existing empirical, quantitative research, we point to ways by which meditation may complement the traditional goals of the Academy by helping to develop traditionally valued academic skills as well as help to build important affective and interpersonal capacities that foster psychological well-being and the development of the "whole person." We then offer directions for future empirical research in this nascent area of inquiry, by outlining theoretical models that might help guide research, recommending methodologies to pursue this work, and proposing several important questions for future study.

WHAT IS MEDITATION?

Meditation, a form of contemplative practice, is most often associated with Asian religious traditions, but it is an essential element in all of the world's major contemplative spiritual and philosophical traditions (Goleman, 1988; Walsh, 1999). In recent times, however, meditative practices have also been taught in secular forms that do not require adherence to cultural and religious beliefs. Various methods whose background and techniques are somewhat different from one another, for example, Transcendental Meditation (TM) and mindfulness meditation, are placed under the umbrella term of "meditation." The common ground they share is the intentional training of attention and awareness, such that consciousness becomes more finely attuned to events and experiences in the present.

The family of meditation techniques is large, but most empirical research to date has been conducted on concentrative meditation and mindfulness meditation. Concentrative meditation involves a disciplined, single-pointed focus of attention, outside the realm of mental events. "Attention is focused in a non-analytical, unemotional way, with the intent to directly experience the object of meditation. This object can be located in either the external or internal environment; examples include the breath, a single word (e.g., 'one')" (Benson & Proctor, 1984) or specific sounds (see Carrington, 1998).

In mindfulness meditation, focused attention is supplemented by meta-awareness, which includes knowing the state of the mind at a given moment, including the quality of one's attention, and insight, or clear seeing into the nature of the phenomena that are given attention (Brown & Cordon, 2009; Lutz, Dunne, & Davidson, 2007). Mindfulness meditation involves three core elements, intention, attention, and attitude (Shapiro, Carlson, Astin, & Freedman, 2006). Intention involves consciously and purposefully regulating attention. Attention refers to the ability to sustain attention in the present moment without interpretation, discrimination, or evaluation; attention is a bare registering of what is observed (Brown, Ryan, & Creswell, 2007). Attitude refers to a frame of mind brought to mindfulness meditation; commonly, this is described as openness and acceptance. It is important to note that some meditative practices involve integrated elements of both concentrative and mindfulness types. For example, a person may focus on breathing (e.g., Zen and Vipassana meditation) or a mantra (e.g., TM), but be willing to allow attention to focus on other stimuli if they become predominant before returning to the object of attention.

In describing meditation, it is important to distinguish meditation operationally and in its intention from relaxation training (e.g., Kabat-Zinn, 1996), as typified by progressive muscle relaxation and autogenic training. First, meditation involves a witnessing or observation of events and experiences as they present themselves on a moment-to-moment basis, whereas relaxation training involves the pursuit of a particular psychophysical state of reduced autonomic arousal (Shapiro, Schwartz, & Santerre, 2002). While relaxation is often a by-product of meditation, it is not an objective of the practice. Second, relaxation is taught as a stress management technique, to be used during stressful or anxiety-provoking situations. Meditation, in contrast, is not a technique whose use is contingent upon stressful situations, but rather is conceived as a way of being that is to be cultivated regardless of day-to-day circumstances (Kabat-Zinn, 1996).¹

RATIONALES FOR INTEGRATING MEDITATIVE PRACTICES INTO HIGHER EDUCATION

Meditation may augment and expand current approaches to higher education. The research reviewed for this article points to three major reasons that support the potential application of meditation to higher education, namely, the enhancement of cognitive and academic performance, the management of academic-related stress, and the development of the “whole person.” A traditional, central goal of education is to foster cognitive capacities and their application to promote academic and occupational success. Research discussed below suggests that meditation has the potential to enhance important learning skills, including information processing and attention, as well as academic performance.

Meditation may also help students manage stress and distress more effectively. This is important in an educational context because there is evidence that stress and anxiety can hamper cognitive performance (Eysenck, 1996). While some degree of stress may help to enhance such performance, too much can inhibit cognitive faculties that are crucial to learning and to demonstrations of it. For example, the presence of anxiety and depression can inhibit the capacity to screen out irrelevant stimuli, thereby increasing distractibility, as well as contribute to poor organizational skills and make attentional focus on specific tasks for extended periods more difficult. There is also evidence linking the presence of excessive stress and negative affect to memory impairment, with obvious implications for learning (Bremner & Narayan, 1998).

Lastly, meditation offers a method and mode of learning that may help to address larger goals of higher education, namely the development of the “whole person.” In seeking to complement the existing well-developed pedagogy that focuses almost exclusively on critical reasoning, quantitative analysis, and objective external technologies (Zajonc, 2006), educators have begun to expand the focus of higher education to foster the development of interpersonal skills, emotional balance, and other forms of “intelligence” (e.g., Gardner, 1983; Goleman, 1995, 2006). As Lief (2007) noted, “balanced education cultivates abilities beyond the verbal and conceptual to include matters of heart, character, creativity, self-knowledge, concentration, openness and mental flexibility” (p. 1). Evidence suggests that meditative training may offer a means to develop some of these qualities valued by educators and others with interests in human development.

THE EMPIRICAL EVIDENCE

Four decades of empirical research provide evidence of a number of significant effects of meditation on education-related variables. In this section, we highlight major findings associated with the three rationales for incorporating meditation into higher education outlined above. We begin with research pertinent to traditional educational outcomes (e.g., cognitive performance, academic grades), then turn to outcomes relevant to stress management and mental health, and then to the education of the “whole person.”

RATIONALE 1: EFFECTS OF MEDITATION ON COGNITIVE AND ACADEMIC PERFORMANCE

Several aspects of cognitive functioning are central to successful higher academic performance, including the ability to focus attention and to process information quickly and effectively. Research on concentration-based and mindfulness-based meditation offers some support for the use of both in academic settings. Preliminary research suggests that meditation may impact academic performance as well.

Attention

Attention is critically important to the mental processing central to learning (LaBerge, 1995). Attention is increasingly divided in the modern world, as information flow increases and individuals seek to perform multiple activities simultaneously or seek multiple stimulus inputs. Division of attention can have deleterious effects on student performance, however. For example, in a recent study of multitasking (Foerde, Knowlton, & Poldrack, 2006), the presence of a secondary task produced primarily rote learning; in contrast, attention to a single task produced an additional ability to generalize the learned information to new situations.

Despite the importance to learning, focused attention is rarely if ever systematically trained or cultivated in most educational settings. And yet, attentional training has been the hallmark of meditative disciplines for centuries, and thus the incorporation of these practices into higher education could be of great benefit. Attentional training is particularly evident in the concentrative form of meditation where, as noted in the introduction of this article, focused attention is systematically trained. Practitioners of this form first attempt to retain focus on a particular object (such as the sensation of breathing or a word), notice when the intended focus is lost, discontinue the unintended focus (e.g., worrying

about some impending task) once it is noticed, and then restore the intended focus (Dunne, 2007). Given this emphasis on such attentional training, it is not surprising that research has begun to suggest that meditative practices can, in fact, enhance specific aspects or subsystems of attention in task contexts. As already noted, such research is important to demonstrations of the value of meditation in educational settings, where attentional skills are central to successful learning. For example, close attention to a task can inhibit distraction by nonrelevant stimuli in the task environment (Simons & Chabris, 1999).

To date, little research has examined the effects of meditation on attention in higher education and other academic contexts per se. In a sample of 100 female students aged 17–18 years, Rani and Rao (2000) examined the effects of TM meditation on attention processes with the intent to determine whether effects of practice are transitory or stable. Using a matched design, 50 students practiced TM for 20 minutes twice a day for 18 months, while 42 students from a neighboring university served as no-practice controls. The Star Counting Test (SCT; Das-smaal, De Jong, & Koopmans, 1993) measured attentional control, the Group Embedded Figures Test (GEFT; Witkin, Oltman, Raskin, & Karp, 1971) assessed field independence, and an adaptation of the Stroop Color-Word Matching Test (Stroop; Regard, 1981) measured attentional flexibility (response time and errors). The TM participants were tested twice with 10 days in between, once immediately following meditation, and once on a nonmeditating day; the controls were tested only once. The study suggested that meditation had an immediate effect on the attentional measures, such that following practice, meditators showed significantly higher scores than controls, with effect sizes in the medium to large range (Cohen's $d = .60$ to $.88$). However, on the nonpractice day, the meditators' scores on the attention tasks were higher than controls on only two of the four measures—GEFT and Stroop errors—at a medium level of effect ($d = .43$ and $.56$, respectively). These findings suggest a short-term strong effect but more limited sustained effect of TM practice on attention. While provocative, this study was limited by potential confounds; because the two groups of students came from different schools, one of which advocated the use of TM for academic success, educational culture, self-selection into the study, and expectancy of effects may have influenced responses on the measures of attention used.

Despite the limits of this study, several recent studies with adults offer further evidence in support of meditation for enhancing attentional capacities and attention-related behavioral responses. First, Jha, Krompinger, and Baime (2006) examined three functionally and neuroanatomically distinct but overlapping attentional subsystems: alerting,

orienting, and conflict monitoring. Alerting involves achieving and maintaining a state of preparedness, orienting directs and limits attention to a subset of possible stimulus inputs, and conflict monitoring prioritizes among competing tasks and responses. All three subsystems have clear relevance to learning situations. Jha et al. (2006) used the Attention Network Test (ANT; Fan, McCandliss, Sommer, Raz, & Posner, 2002) to assess the effects of mindfulness meditation on these forms of attention in three groups differing in extent of meditation practice ($n = 17$ in each): One group, among whom many had an extensive meditation practice history, completed a month-long residential mindfulness meditation retreat with a 10–12 hour per day practice schedule (mean age 35 years); a second group naïve to meditation completed an 8-week Mindfulness-Based Stress Reduction (MBSR) program with one 3-hour class per week and a recommended 30 minutes per day of meditation practice (mean age 24 years); and a third group without meditation experience served as controls (mean age 22 years). Analyses tested both the role of practice history (retreat group vs. MBSR and control at pretest) and the influence of two different forms of mindfulness training (retreat vs. MBSR vs. control at posttest) on attention.

At pretest (time 1), participants in the retreat group demonstrated improved conflict monitoring performance, in terms of both reaction time (RT) and accuracy, relative to those in the MBSR and control groups, with medium to large effect sizes (RT $d = .63$; accuracy $d = 1.61$). At posttest (time 2), participants in the MBSR course demonstrated significantly improved orienting reaction times in comparison with the control and retreat participants, while retreat group members demonstrated quicker alerting reaction times relative to control and MBSR participants. The groups did not differ in conflict monitoring performance at posttest. In sum, prior meditation experience was associated with enhanced ability to prioritize attention, for individuals new to meditative practice who took the MBSR program, participation improved the ability to orient attention, while for seasoned meditators engaged in intensive retreat, participation enhancing altering skills important for maintaining receptivity to stimulus inputs. Jha et al. (2007) concede that these results must be considered preliminary, due to lack of random assignment, small sample sizes, differing lengths of time between pretest and posttest for the retreat group relative to the other groups, and other limitations. However, the results suggest that mindfulness training may train attention in ways important to task success and general adaptation.

A second recent study (Slagter et al., 2007) examined the effect of meditative practice on the expansion of attentional limits through investigation of a phenomenon known as “attentional blink.” When two

meaningful stimuli embedded in a rapid stream of events occur in close temporal proximity, the second stimulus is often not seen. This is thought to occur due to suboptimal attentional resource sharing; if too much attention is allocated to one stimulus, a later, equally meaningful stimulus is easily missed.

In this study, 17 participants completed computerized attentional tasks before and after a 3-month mindfulness meditation retreat, during which they meditated 10–12 hours per day, first in stabilizing attention (concentration) then in cultivating a nonreactive sensory awareness. The attentional blink task involved attending to and then recording target numbers embedded in a series of letters that flashed quickly on a computer screen. The findings demonstrated that compared to 23 control participants, who were novice meditators meditating 20 min/day for 1 week before each assessment and matched to retreatants on age and education level, retreatants showed lower attentional blink in a nonmeditative state ($d = .68$); that is, they more accurately identified the second stimulus, which was dependent upon efficient processing of the first stimulus. However, like other studies reviewed in this section, this study was limited by a lack of randomization to conditions and variability in practice history among the retreatants, although extent of prior meditation experience was not associated with preretreat attentional blink task performance or change from pre- to postretreat in attentional-blink task performance.

In a third study with mindfulness meditators, Lazar et al. (2005) found that brain regions associated with attention, interoception, and sensory processing, including the prefrontal cortex and right anterior insula, were thicker in 20 meditation participants (mean age = 38 years) who were matched with control participants on age, gender, race, and years of education. Thickening in selected brain regions in the meditators was correlated with amount (in years) of meditation practice ($r_s = .48$ and $.63$) after controlling for the effects of age and average right hemisphere cortical thickness. These findings suggest that meditation may help to counteract the cortical thinning and associated sensory and cognitive declines that occur with normal aging.

In summary, among the mindfulness-based studies that have been published, many are limited by a lack of randomization to experimental groups, which compromises the ability to make causal inferences about the effects of meditation; other issues include differences in time spent in meditation, a lack of active control groups, and small sample sizes. While preliminary, this research, along with the TM-based study reviewed earlier (Rani & Rao, 2000), has produced substantial effect sizes and suggests that attention and the behavioral responses associated with it may

be flexible skills that can be cultivated through concentration and mindfulness meditation practices (see also Valentine & Sweet, 1999). Of additional relevance to education, recent research also suggests that meditative practice may help to ameliorate the attentional problems associated with attention deficit hyperactivity disorder (ADHD), as assessed by computer-based tasks in controlled laboratory settings and parental report (Woolacott, 2007; Zylowska et al., 2008).

Information Processing

Information processing is a complex cognitive process requiring different levels of elaboration as stimuli are first attended to, perceived, labeled, and assigned meaning based on memory (e.g., Bransford, 1979; Craik & Lockhart, 1972). For a number of theorists (e.g., Sternberg, 1984; see also Snow and Lohman, 1984), information processing is closely related to intelligence, as the ability to attend to, remember, and mentally manipulate information is considered important to general cognitive ability and to academic success.

Much of the research addressing the role of meditation in information processing enhancement has been focused on the utility of TM, a mantra-based form of meditation. A carefully conducted series of three studies by So and Orme-Johnson (1991) assessed the effects of TM on information processing and measures of intelligence in high school and technical school students. In one study in the series, conducted with 99 vocational training students from one school in Taiwan (average age = 18 years), students were randomly assigned by class to a TM or no treatment (control) condition for 12 months. After receiving training in the TM meditation technique, which involved lectures, one-to-one personal instruction in TM, and several group instruction and discussion meetings, treatment group participants meditated 15–20 minutes per day for 12 months. Results demonstrated that students in the TM group improved significantly compared to the control group on several cognitive measures, including information processing speed, fluid intelligence (or the capacity to reason in novel situations), and field independence, a cluster of abilities related to the understanding of visual cues, the separation of parts of an organized visual field, and memory, among other skills. Group difference effect sizes ranged from moderate ($d = .44$) to large ($d = 1.11$).

In a longitudinal TM study lasting 2 years, Cranson et al. (1991) tested the effects of TM on performance on tests of fluid intelligence (using the Culture Fair Intelligence Test; CFIT) and reaction time. One hundred college men and women, 45 from a university specializing in TM training

(Maharishi International University) and 55 from a neighboring institution (University of Northern Iowa), participated as students in introductory psychology courses. The treatment group practiced TM twice daily, whereas the control group received no meditation instruction. Results demonstrated the TM group showed significant, moderate to large effect gains in fluid intelligence ($d = .56$), choice reaction time ($d = 1.83$), and simple reaction time ($d = .42$) over the 2-year study relative to the control group. These differences were found after controlling for the influence of variables that could help to explain the intervention effects in this nonrandomized study, including age, education level, level of interest in meditation, parents' education level, and annual income.

Similar findings on the positive effects of TM on information processing have been reported among high school students. So and Orme-Johnson (1991) randomized 154 high school students in China (mean age 16.5 years) to a TM group ($n = 56$) or a wait-list control group ($n = 58$) that napped during the same 20-minute, twice-per-day time period that the TM group meditated each day for 6 months. All had expressed interest in learning TM. A third group served as no-interest controls ($n = 40$).

Compared to the no-interest control group, the TM group demonstrated significant improvement on all measures of information processing, including field independence ($d = .54$), reasoning in novel situations ($d = .42$), and inspection time ($d = .61$), a marker of processing speed. Compared to the napping group, the TM students demonstrated significant improvements in inspection time ($d = .57$) and field independence ($d = .60$), but not novel reasoning. These results suggest that TM effects may extend beyond those of ordinary rest. However, another study by So and Orme-Johnson (1991) showed that TM effects on information processing were not significantly different from those of contemplative thought practice, with the exception of inspection time, in which the TM group showed faster processing capability (with a moderately sized effect; $d = .39$).

These findings provide good support for the use of TM to enhance several forms of information processing in students, and suggest that such effects may be obtained with minimal daily time investment (e.g., 20–40 minutes). Notable, however, is the finding that, in the few investigations in this area, students practiced meditation for 6 months or more, suggesting that initial and long-term effects of practice may require long-term commitment.

Academic Achievement

Among the traditional goals of education, academic achievement measured in terms of course and examination grades, degree completion rates, and other concrete criteria represents a “bottom line” for any additions to curricula. Several studies have examined the effects of meditative practice on examination grades among college and middle school students. In a controlled trial with college students, Hall (1999) randomly assigned 56 undergraduates to two study groups, one of which included concentration-based meditation. The meditation intervention included a 1-hour session of meditation instruction twice a week for the academic semester, which included guidance in simple attentional focusing and relaxation exercises. Meditation was practiced for 10 minutes at the start and conclusion of each 1-hour study group session. Further, this group was instructed to meditate at home and before exams. The control group also met for 1 hour of study each week and was not introduced to meditation. The groups did not differ in grade point average (GPA) at the beginning of the study, but at the end of the Spring semester after the preceding Fall semester’s training, the treatment group had significantly higher GPA scores compared to the control group.

Generally, research investigating meditation and academic performance is sparse and suffers from numerous methodological problems, including small samples, inadequately delineated interventions, and other issues. Further, the outcomes examined have been limited in scope. It is also unclear exactly how the information processing and attentional capabilities developed in meditation translate into better academic performance. Such issues and questions await further research.

RATIONALE 2: EFFECTS OF MEDITATION ON MENTAL HEALTH AND PSYCHOLOGICAL WELL-BEING

For many students, higher education can be a stressful experience as they grapple with various personal, developmental, social, and academic challenges and pressures as well as the transitional nature of college and graduate life (Deckro et al., 2002; Towbes & Cohen, 1996). The demands of learning new, sometimes complex, material, often under time pressure imposed by the competing demands of full course loads and part-time jobs, can result in considerable stress and adversely affect psychological well-being in undergraduate, graduate, and professional students. The stresses of higher education have been related to numerous mental and

physical health problems (e.g., Labbe, Murphy, & O'Brien, 1997), and may adversely affect academic performance (Hill, 1984; Keogh, Bond, & Flaxman, 2006). As Goleman (2006, p. 268) noted, stress "handicaps our abilities for learning, for holding information in working memory, for reacting flexibly and creatively, for focusing attention at will, and for planning and organizing effectively."

Four decades of research with adult student, community, and clinical populations has provided evidence that meditation may reduce negative mental health symptoms and enhance psychological well-being (e.g., Baer, 2003; Brown et al., 2007; Murphy & Donovan, 1997). Several such studies have been conducted with students in higher education settings (e.g., Jain et al., 2007; Rosenzweig, Reibel, Greeson, Brainard, & Hojat, 2003; Shapiro, Schwartz, & Bonner, 1998). Much of this research has examined the potential benefits of mindfulness-based meditation using the MBSR intervention model. For example, in a randomized, wait-list controlled study with 78 medical and premedical students, Shapiro and colleagues (1998) examined the effects of an 8-week MBSR program on symptoms of anxiety, as measured by the State-Trait Anxiety Inventory (STAI; Spielberger, 1983) and depression, as measured by a subscale of the Hopkins Symptom Checklist 90 (SCL-90-R; Derogatis, 1977). Both symptom types are elevated in medical student populations (Dyrbye, Thomas, & Shanafelt, 2006). Results indicated decreased levels of state anxiety ($d = .49$) and depressive symptoms ($d = .69$) in the MBSR group as compared to the wait-list control group. These reductions were found although posttest measures were taken during a stressful final exam period. Findings were replicated when participants in the wait-list control group received the MBSR intervention. The findings of the above study were supported by a recent study examining the effects of an MBSR course upon stress and mental health symptoms in graduate counseling psychology students (Shapiro, Brown, & Biegel, 2007). This semester-long, 10-week course followed the MBSR program model and included weekly instruction in a variety of mindfulness meditative techniques and home-based practice. Relative to matched, cohort control participants taking didactic courses ($n = 32$), student participants in the MBSR course ($n = 22$) showed significant pre to post declines in perceived stress ($d = .95$), negative affect ($d = .57$), rumination ($d = .87$), state and trait anxiety ($d = .87$ and $d = 1.10$, respectively), and significant increases in positive affect ($d = .68$). Further, relative to controls, MBSR participation was associated with increases in self-reported mindfulness, as measured with the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) ($d = .38$). Further, this enhancement of mindfulness was significantly related to several of the beneficial effects of MBSR participation,

including perceived stress, anxiety, and rumination (d s = 1.19 to 1.63). This finding provides support for the claim that mindfulness is a central feature of MBSR that is related to the positive outcomes of the program and suggests that the enhancement of mindfulness, since it is foundational to MBSR instruction, may be at least partially responsible for its beneficial effects (Shapiro, Carlson, Astin & Freedman, 2006).

The effects of mindfulness meditation on stress and mental health in students appear to extend beyond those of relaxation, a form of psychophysical self-regulation with which meditation is frequently conjoined and even confused. Common to various relaxation practices is a self-directed intent to relax through imagery techniques or through guided mental, emotional, or somatic exercises. With relaxation comes a release of physical tension that acts to oppose the stress response and creates a calm state of mind and body. In contrast, as already noted, mindfulness meditation involves a simple noticing of what is taking place in the mind and body without attempts to alter experience. Recent research provides evidence for unique patterns of psychophysiological response in mindfulness- versus relaxation-based practices (Ditto, Eclache, & Goldman, 2006).

Differences between these practices also appear to translate into psychological effects. In a randomized controlled trial with 83 medical students, graduate nursing students, and undergraduate students majoring in premedical or prehealth studies, all of whom reported distress on the Brief Symptom Inventory (Derogatis, 1977), Jain and colleagues (2007) found that month-long programs in mindfulness meditation and somatic relaxation produced similar salutary effects on distress reduction (meditation $d = 1.37$; relaxation $d = .91$), while mindfulness was associated with a stronger enhancement of positive mood (meditation $d = .71$; relaxation $d = .25$) relative to the no-treatment control students. There was also evidence that the mindfulness meditation program was specific in its ability to reduce distractive and ruminative thoughts and behaviors (cf., Shapiro et al., 2007), and this reduction helped to explain the effect of mindfulness meditation on the reduction of distress in these students.

These studies suggest that mindfulness-based training may enhance students' capacities to tolerate the stresses of higher education, reflected in self-reported decreases in stress, negative emotion, and other psychological symptoms. This research also suggests that mindfulness practice may enhance positive psychological states (see also Davidson et al., 2003; and Shapiro, Schwartz, & Santerre 2002, for review). This is potentially important in educational contexts, since positive emotions have been shown to enhance abilities to process and retain new information, and to create patterns of thought that are flexible and creative (Fredrickson,

1998). Further, individuals who report more positive emotions show more constructive and flexible coping, more abstract and long-term thinking, and more successful affect regulation following stressful events (Fredrickson, 1998).

Studies examining the impact of meditation on mental health in higher education populations are still few in number, but the convergence of findings in controlled, generally well-conducted studies is encouraging. Research using teacher- and peer-reported, psychophysiological, and other non-self-report outcomes is needed to substantiate existing findings, as is research showing whether the mental health benefits of meditation translate into the kinds of academic performance successes reviewed in the previous section.

RATIONALE 3: EFFECTS OF MEDITATION ON DEVELOPMENT OF THE WHOLE PERSON

The development of the whole person is increasingly valued in higher education circles. Many of the literary works and philosophical traditions that initially formed the core or centerpiece of liberal arts education were grounded in the maxim, “Know Thyself” (Astin, 2004). Despite this, in most colleges and universities minimal attention is given to the development of self-awareness or self-understanding, although the development of such insight may be a central skill enabling individuals to understand themselves, the behavior of others, resolve conflict, and so on. As Astin and colleagues (2007) noted:

while we are justifiably proud of our ‘outer’ development in fields such as science, medicine, technology, and commerce, we have increasingly come to neglect our ‘inner’ development - the sphere of values and beliefs, emotional maturity, moral development, spirituality, and self-understanding. (p. 34)

Education of the whole person is in alignment with the traditional values of meditative practice, which include the cultivation of creativity, positive social relationships, compassion for self and others, and empathy (Walsh & Shapiro, 2006). Most research in this area is newer than in the other domains of inquiry already reviewed, but this research offers promise for application to education, where creative expression, social skills, and other psychological strengths and virtues may enhance learning and healthy learning climates.

Creativity

Creativity traits and capacities include perceptual skill, ideational fluency, openness to experience, and emotional flexibility (Csikszentmihalyi, 1990). Related to but distinct from general intellectual ability, creativity is a key aspect of the educational experience as well as success in professions that require creative achievement. Thus, educational researchers have a keen interest in identifying factors that may promote creativity. Preliminary research indicates that meditation may help to do so.

In the TM-based randomized controlled trials with college vocational and high school students by So and Orme-Johnson (2001) discussed previously, the researchers also examined the effects of daily TM practice (versus wait-list/rest and no-intervention controls) on creativity, as measured by the Test for Creative Thinking-Drawing Production (Jellen & Urban, 1986). In the three studies conducted, students randomly assigned to the TM group demonstrated significantly higher creativity than the rest and no-treatment control groups, with moderate to large effect sizes (d range = .49 to 1.21 across studies).

In a small trial comparing the effects of Zazen meditation (which has some similarities to mindfulness; $n = 24$) to relaxation ($n = 10$) on creativity, Cowger and Torrance (1982) had participants in both groups practice for 30 minutes a day for 21 sessions (17 sessions for the relaxation group). Based on the Torrance Tests of Creative Thinking (Torrance, 1974), the meditators showed significant gains on many of the subscales, including heightened consciousness of problems, perceived change, invention, sensory experience, expression of emotion/feeling, humor, and fantasy (d range = .99 to 2.59).

Interpersonal Relationship Functioning

Practices for the cultivation of empathy, compassion, and other qualities with consequences for interpersonal behavior have a long tradition in the meditative disciplines (Walsh, 1999). Mindfulness practice, for example, is believed to lead to a felt sense of trust and closeness with others as well as an enhanced ability to approach stressful interpersonal events as challenges rather than threats (Kabat-Zinn, 1996), perhaps by promoting a capacity to witness thought and emotion so as not to react impulsively and destructively. Thus, meditation may foster not only day-to-day interpersonal functioning but also adaptive responses to social conflict.

Research examining the effects of meditation on such positive interpersonal functioning is still nascent, but is worth noting, given the importance of a sense of closeness and belonging for psychological well-being (Baumeister & Leary, 1995; Ryan & Deci, 2000) as well as the relevance of positive interpersonal behavior for healthy learning climates (Goleman, 2006).

Several studies of mindfulness-based interventions have demonstrated effects on interpersonal qualities. Tloczynski and Tantriella (1998) examined the effects of Zen breath meditation on college adjustment. Seventy-five undergraduates reporting heightened anxiety were randomized into meditation, relaxation, and control groups. The two treatment groups were instructed to practice their assigned technique at least once daily for 20 minutes. While anxiety and depressive symptoms significantly decreased in both meditation and relaxation groups as compared to the control group, only the meditation group demonstrated significant positive change in self-reported interpersonal relationship quality.²

Other research examining the effects of the MBSR program, and adaptations of it, has also demonstrated positive effects on interpersonal relationships (e.g., Carson, Carson, & Baucom, 2004). Recent research has also demonstrated that dispositional mindfulness, measured with the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003), predicts a felt sense of relatedness and interpersonal closeness (Barnes, Brown, Krusemark, Campbell, & Rogge, 2007; Brown, 2007) as well as more adaptive responses to social stress (Barnes et al., 2007; Creswell, Eisenberger, & Lieberman, 2007). Since meditation practice has been demonstrated to increase dispositional mindfulness, as assessed with the MAAS (Cohen-Katz, Wiley, Capuano, et al, 2005; Shapiro et al., 2007), these findings lend some support to the claim that meditation may help to enhance interpersonal relationship.

Empathy

All schools of meditation generally emphasize the cultivation of empathic capacities (Shapiro & Walsh, 2003; Walsh, 1999). Two recent studies with graduate students suggest that mindfulness training may encourage empathic tendencies. In the randomized controlled study noted already, Shapiro et al. (1998) found that MBSR increased levels of self-reported empathy in premedical and medical students relative to wait-list controls. As with other outcomes reported already, these results held during a stressful exam period and were replicated when participants in the wait-list control group received the mindfulness intervention.

The findings of this study are supported by a more recent study

discussed earlier that examined the effects of mindfulness training on a number of psychological variables in graduate counseling psychology students, including self-reported empathy (Shapiro et al., 2007). Counseling students who participated in a 10-week, MBSR-based stress management course ($n = 22$) demonstrated significant pre to post increases in empathic concern for others relative to a matched cohort control group ($n = 32$; $d = .75$). This study also demonstrated that increases in MAAS-assessed mindfulness were related to these increases in empathy (Shapiro & Brown, 2007).

Self-Compassion

Self-compassion, a relatively new construct under study in psychology, has been defined as being kind and understanding toward oneself in instances of pain or failure; perceiving one's experiences as part of the larger human experience; and, holding painful thoughts and feelings in balanced awareness rather than overidentifying with them (Neff, 2004). Self-compassion may be important to the development of the person for two reasons; first, it has been related to other positive psychological features, including wisdom, personal initiative, curiosity and exploration, happiness, optimism, and positive affect, even after controlling for personality style and other qualities related to these features (e.g., Neff, Rude, & Kirkpatrick, 2007); second, there is evidence that self-compassion can be cultivated. Two recent studies, one with health professionals (Shapiro, Astin, Bishop, & Cordova, 2005) and the other with graduate students (Shapiro et al., 2007), demonstrated significant increases in self-compassion through MBSR participation. Self-compassion may be particularly important in dealing with unpleasant life events. Leary, Tate, Adams, Allen, and Hancock (2007) found that self-compassion attenuated college students' reactions to negative personal and interpersonal events in ways that, under some circumstances, were even more beneficial than self-esteem.

The research reviewed here suggests that meditation, particularly mindfulness meditation, may contribute to qualities that produce "well-rounded" persons, reflected in higher creativity and greater capacities for positive interpersonal behavior and healthy social relationships. However, studies are still few in number, and similar to the research on mental health reported earlier, much of the extant evidence is self-reported, making it unclear whether meditation facilitates changes in observable behavior. There is a clear need for behavior-based research, particularly in the study of interpersonal effects, where observable actions are what matter most. Studies could, for example, address the

effect of meditative practice on empathic responses in classroom discussion contexts or in student-patient (or student-client) interactions among medical students and law students, respectively. Research could also broaden the base of outcomes explored, for example, to examine the influence of meditation on the development of wisdom, moral maturity, and other qualities associated with full human functioning that are of increasing interest to educators.

FUTURE RESEARCH DIRECTIONS ON MEDITATION IN HIGHER EDUCATION

As this review suggests, there is promise for integrating meditation into higher education. Still, while the body of meditation research is large and growing, comparatively little empirical research has been devoted to applications in educational contexts specifically, and even less so in higher education. Thoughtful, rigorous empirical study is needed to elucidate how, and to what extent, meditation may complement the higher education enterprise. In this final section, we make five recommendations for future research, drawing upon both the strengths and weaknesses of extant studies such as those reviewed here. These recommendations concern the importance of theory-driven investigation, the need for methodological rigor in future research, an expansion of the scope of outcomes studied, an exploration of processes helping to explain the effects of meditation, and the study of best practices for teaching and researching meditation in educational settings. We discuss each of these in turn.

THEORY-BASED INVESTIGATION

Theory allows researchers to make logical predictions about behavior, to explain it, and to apply research-derived principles of behavior to real-world settings. Thus, theory offers a valuable guide to research investigations. Several cognitive, developmental, and educational theoretical models offer promise as guides for the study of meditation in higher education. In this section, we discuss four examples; while other models are certainly relevant, these four have garnered considerable empirical support and collectively address the three domains of research inquiry reviewed here. Below we review models of attention; of metacognition in learning (e.g., Flavell, 1979); of transformative learning (e.g., Mezirow, 2000); and models of stress, affect regulation, and emotional intelligence (e.g., Salovey & Mayer, 1990).

Attention

Fundamentally, meditation involves training in attention, and attention is a key cognitive capacity in the learning enterprise. Attention has three primary functions: alerting, orienting, and conflict monitoring, and each of these functions is supported by unique attention networks in the brain (Posner & Boies, 1971; Posner & Rothbart, 2007; Raz & Buhle, 2006). “Alerting” attention concerns a steady, uninterrupted attention to one’s experience. The alerting attention network functions to maintain response readiness and alertness, primarily through the steady monitoring and maintenance of sustained attention (Raz & Buhle, 2006; Robertson & Garavan, 2004). “Orienting” attention, to date the most studied type of attention, involves effective scanning and situationally appropriate selection of information in the perceptual field. It is studied through tasks that assess speed of orientation to a cued location (Raz & Buhle, 2006). “Conflict monitoring” (also called executive attention) monitors and resolves conflicts among competing behavioral responses. It has been associated with effortful control, planning and decision making, error monitoring, cognitive and emotion regulation, as well as the ability to overcome habitual actions (Fernandez-Duque, Baird, & Posner, 2000; Raz & Buhle, 2006; Zylowska et al., 2008). This capacity may also be called a metacognitive skill (to be discussed in the following section).

All three forms of attention are invoked in learning and education contexts. Future quantitative research could explore whether meditation enhances attentional capacities in ways that enhance academic performance, as well as important social and emotional capacities that foster whole person development. To date, no such research has been conducted, but recent evidence suggests that both alerting and orienting attention may be enhanced by meditation, especially mindfulness training. For example, Jha et al. (2006; reviewed previously) found enhanced alerting attention effects after a month-long mindfulness meditation retreat, as well as enhanced orienting attention among those receiving in MBSR mindfulness training. Mindfulness may also be associated with enhancements in executive attention in situations requiring self-regulation.

Evidence reviewed by Brown et al. (2007) supports links between dispositional mindfulness, as assessed by the MAAS, and more effective behavioral regulation, emotion regulation, and self-control. The study by Zylowska et al. (2008) reviewed earlier also suggests that mindfulness training (MBSR) may improve executive attention in adolescents and adults with attention deficit disorder. Well-validated laboratory tasks exist to assess all three forms of attention discussed here, including the ANT

(Fan et al., 2002), and education researchers exploring the effects of meditation on attention processes relevant to learning could seek convergence between performance on such tasks and education-relevant outcomes.

Metacognition

Metacognition represents the capacity to be aware of, reflect upon, and exercise control over one's cognitive processes (Statt, 1998), including those important to learning. Examples of such control efforts include planning the approach to a particular task, monitoring one's comprehension of material being read or listened to, and evaluating progress toward the completion of learning tasks. Also implicated in metacognition is the ability to monitor or be aware of one's present knowledge state (i.e., what one knows, what one does not yet understand, what remains to be learned). Many cognitive theorists consider the ability to allocate cognitive resources, such as determining when and how a particular task will best be accomplished, a central feature of intelligence (see, e.g., Sternberg, 1986).

Meditation practices are hypothesized to strengthen certain aspects of metacognition, particularly the capacity to be aware of one's mental processes through monitoring or observation of the activity of the discursive mind. Meditation may also function to increase awareness of one's habitual thought patterns, including those that may weaken concentration, information retention, and otherwise impede learning. Examples of dysfunctional patterns (beliefs) include "Even if I study hard, I won't do well on this test," or "I always do poorly in math." Since such cognitions often operate outside conscious awareness (i.e., are frequently overlearned and automatic), the capacity to dispute their irrational and sometimes absolute nature (cf., Beck, 1976; Ellis, 1962) rests upon first becoming cognizant of the fact that they are present by making them an object of awareness.

Of relevance to stress management, emotional habits, such as being anxious before an exam, are also frequently supported and sustained by dysfunctional beliefs (Wells, 2002). For example, a student prone to worry may be holding a belief that "If I worry, I'll be better prepared," thereby reinforcing a proneness to stress. A meditative awareness of such cognitive and emotional patterns may afford the opportunity to challenge the veracity of dysfunctional thoughts and adopt alternative perspectives (Segal, Teasdale, & Williams, 2002). Indeed, a mindfulness-based approach to cognitive therapy has shown considerable success in alleviating a debilitating mood disorder (chronic depression)

that, in many who have the disorder, is driven by dysfunctional thought patterns (Ma & Teasdale, 2004; Teasdale, Segal, & Williams, 2000). The potential for application of meditative practices to enhance metacognitive skills in students awaits future research.

Transformative Learning

Theories of transformative learning offer promise for guiding research into the potential value of meditative practices to foster whole person education. Prominent among these theoretical perspectives is Mezirow's (1978) perspective transformation, which argues that a primary function of education should be to transform students' perspectives by fostering the development of a particular type of metacognitive awareness, namely developing greater insight into the ways in which assumptions students hold serve to "constrain the way they perceive, understand, and feel about their world" (Mezirow, 1991, p. 167). By recognizing this, there is an opportunity to "change these structures of habitual expectation to make possible a more inclusive, discriminating, and integrating perspective, and, finally, make choices or otherwise act upon these new understandings" (p. 167).

The capacity to take in new information or adopt new models of reality requires that there be at least some degree of openness to considering alternative perspectives and viewpoints, recognizing and appreciating that these perspectives are likely to differ from those we have previously held to be true. This requires a willingness and ability to observe our own viewpoints—that is, to not be entirely embedded in or subject to them. Harvard developmental psychologist Robert Kegan (e.g., 1982, 1994) suggested that this process—of turning subject into object—is a hallmark of human development across the lifespan.

As already discussed in the section on metacognition, meditative practices may strengthen the capacity to observe one's internal, cognitive-emotional processes, including biases, beliefs, and mental perspectives, and through that observation, lessen personal identification with or attachment to them, a process that Shapiro et al. (2006) have termed "re-perceiving." By learning to bring attention/awareness to his or her own preferences, biases, and mental perspectives, the student can begin to see that what is *aware* of a particular viewpoint or perspective is not caught in or limited by that viewpoint or perspective. By bringing awareness to personal, or idiosyncratic viewpoints, the student may cease to be wholly defined by, and potentially limited by, those viewpoints. This may aid the development of critical thinking skills, including the ability to examine assumptions, discern hidden values, evaluate evidence, and

assess conclusions, skills that some consider an indispensable part of training in higher education.

Like the proverbial view from the mountain top, meditative awareness is believed to foster the possibility of broadening perspectives, as well as seeing things in new ways, and with greater clarity, so that one's views are not so deeply colored by memory alone. In this way, meditation may help to further the mission of educational institutions that are committed to helping students develop broader, more inclusive perspectives on themselves, others, and the world, enhancing students' ability to see beyond their own partial and necessarily limited viewpoints, thereby fostering greater openness to new ideas, knowledge, and insight.

Emotional Intelligence, Stress Management, and Affect Regulation

Gardner's (1983, 1993) theory of multiple intelligences attempts to account for a wider range of human intelligence than that encapsulated in the traditional form measured by standardized cognitive ability tests. He posited eight intelligences—linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal. More recently, naturalist. Salovey and Mayer (1990) introduced the concept of “emotional intelligence” (EI), which:

involves the ability to perceive accurately, appraise, and express emotion; the ability to access and/or generate feelings when they facilitate thought; the ability to understand emotion and emotional knowledge; and the ability to regulate emotions to promote emotional and intellectual growth. (Mayer & Salovey, 1997, p. 8; see Goleman, 1995, for an extensive treatment of this construct)

The construct of EI appears to map onto two of Gardner's proposed intelligences, intrapersonal and interpersonal. The inclusion of meditative practices suggests one way to foster the development of intrapersonal and interpersonal (i.e., emotional) intelligence through the cultivation of greater awareness of one's internal (i.e., cognitive, affective, and somatic) states, with the resulting ability to regulate emotions more effectively.

Research has not specifically examined whether meditation facilitates the management or regulation of affect. However, recent research indicates that mindfulness, both as a disposition and as a state induced in the laboratory, is related to better affect regulation. Baer, Smith, Hopkins, Krietemeyer, and Toney (2006) as well as Brown and Ryan (2003) have

found that dispositional mindfulness was related to several indicators of emotion regulation. In an functional magnetic resonance imaging (MRI) study with college students, Creswell, Way, Eisenberger, and Lieberman (2007) found that those higher in MAAS-measured dispositional mindfulness showed less reactivity to emotionally threatening visual stimuli, as indexed by lower amygdala activation (left amygdala $r = -.61$; right amygdala $r = -.60$), as well as stronger prefrontal cortical (PFC) activation in several regions (mean $r = .65$), suggestive of better executive control. More mindful students also showed a stronger inhibitory association between regions of the PFC and the right amygdala (mean $r = -.82$), suggesting better regulation of emotional reactions. Other recent research has shown that induced mindful states can produce a quicker recovery from negative mood states, in comparison to other, common regulatory strategies such as distraction and rumination (e.g., Broderick, 2005). These findings are important because, as noted earlier, mindfulness is a capacity developed through mindfulness meditation practice. The direct link between meditation and emotional regulation awaits future study.

Mindfulness and other meditative practices may provide students with additional skills for managing the stresses and challenges that students typically face, including the often competing demands of school and work, peer and family relationship issues, and existential questions related to identity formation and future life choices. In contrast to many cognitive-behavioral approaches to managing stress and negative affect, meditative practices, and in particular, mindfulness-based approaches, emphasize emotion-focused coping through an allowance or acceptance of difficult cognitive and emotional states. In other words, the emphasis in such meditative practices is on changing one's *relationship* to the contents of awareness (e.g., thoughts, feelings, sensations) rather than attempting to change or control the content itself, which is not always possible or adaptive. That said, recent research indicates that mindfulness is not incompatible with active, problem-solving forms of coping but appears to be inversely related to tendencies toward maladaptive forms of coping with stress, including denial and behavioral disengagement through alcohol, drugs, and other behaviors with mental and physical health costs (Weinstein, Brown, & Ryan, in press). More generally, mindfulness and meditative training appear to offer more "degrees of freedom"—including greater latitude for choice and self-endorsed action—in response to stressful events and experiences (Brown & Ryan, 2003; Levesque & Brown, 2007).

Given the research pointing to the effectiveness of meditation for stress management and affect regulation as well as the focus in many of these practices upon heightening awareness of one's characteristic cognitive-

emotional states, one hypothesis for future research is that these practices might strengthen the following areas identified by Salovey and Mayer (1990) and Goleman (1995) as central components of emotional intelligence: 1) being aware of one's emotions, 2) being able to manage one's emotions, 3) being sensitive to the emotions of others, and 4) being able to respond to and negotiate with other people emotionally.

In sum, the theoretical perspectives reviewed here may serve as valuable starting points for future investigation. Because these perspectives have empirical foundations, the perspectives can help to provide firm footing for research concerning meditation in educational settings. However, this brief survey is not meant to exclude theoretical perspectives that also have promising application to the study of meditation in education, including self-determination theory (e.g., Deci & Ryan, 2002), and flow theory (Csikszentmihalyi, 1990), among others.

INCREASED METHODOLOGICAL RIGOR

In the empirical research sections discussed earlier, a number of methodological issues with the education-relevant meditation research conducted to date were raised. These issues point to six important research design features that will benefit future research studies.

First, a careful specification of the type of meditation studied is important in order to know, most basically, whether it can be considered a form of concentration practice or mindfulness practice. TM practice involves a focusing of attention onto a perceptual object, which appears to represent a concentration practice, but some TM researchers have explicitly stated that this practice is not of this form (So & Orme-Johnson, 2001), and it is not clear what other form this practice may represent. Mindfulness-based interventions involve concentration and mindfulness practices, making it unclear which is responsible for the observed effects. Research that studies each form separately will aid in understanding of meditative effects. For example, concentration practices are thought to foster sustained attention and concentration, and increase clarity and calmness of mind, while mindfulness practices are thought to enhance self-insight, self-regulation, compassion, wisdom, and other outcomes (Shapiro & Walsh, 2003). A new research effort under way by In a clearly specified form of concentration practice called *shamatha* provides an example of this approach.

Second, the careful use of cognitive, affective, and interpersonal assessment tools is important. Well-validated, reliable instruments tapping first-person (subjective), second-person (e.g., peer or teacher report), and

third-person (e.g., behavioral tasks or observations, neurological measures) would provide convergent evidence, where possible, regarding the phenomena under study. Some research, including that investigating new phenomena or those currently difficult to quantify, may include qualitative reports that tap phenomenological changes experienced through meditative practice. This is also important because meditation experiences can be subtle and complex, and may not easily lend themselves to quantification by existing measures. Qualitative research can also provide the internal frames of reference on subjective experiences that facilitate the development of quantitative measures of those experiences.

Third, many studies have used correlational designs. Some meditation research—that examining effects of long-term practice, for example—necessitate correlational designs. However, study of the effects of meditation as, for example, a newly introduced educational activity, is well-suited to quasi-experimental and experimental designs, where participants in different groups are matched on a key set of characteristics (quasi-experimental) or randomly assigned to meditation or control conditions (experimental). Ideally, a control condition will be “active,” involving a nonmeditative program that controls for instructor attention, time commitment, and other elements that provide structural equivalence to the meditation intervention. Such well-controlled designs allow researchers to determine better whether meditation practice itself is responsible for observed effects.

Use of active controls also helps to deal with a fourth methodological issue, that of expectancy effects. When students in treatment and control groups are offered desirable programs, the effects obtained are less likely to be influenced by an expectation of improvement in the intervention group, and a lack thereof in the (inactive) control group. Researchers would also do well to measure participants’ expectation of benefit at the beginning of the study.

Fifth, longer-term follow-up assessment of meditation interventions is important to determine whether the effects of meditation are stable and enduring or fleeting. In this regard, clinical psychological and behavioral medicine research on mindfulness meditation has provided promising models (Reibel, Greeson, Brainard, & Rosenzweig, 2001).

Sixth and finally, large samples drawn from representative student populations will assist researchers and educators to determine whether results obtained are robust and generalizable to a variety of academic institutions. At some colleges and universities, potential student participant pools are small, and researchers at different institutions may do well

to band together collaboratively to perform single, standardized empirical research protocols. Such research would not only increase sample sizes but also enhance the representativeness of the results obtained.

INVESTIGATION OF A BROADER SCOPE OF OUTCOMES

Unquestionably, the major domains of inquiry reviewed here—cognitive performance, mental health, and whole person variables—deserve further investigation. Within these domains, there is room for deeper, more rigorous investigation of the phenomena currently under study (e.g., attention, information processing, course grades, affect regulation, empathy). There is also room for study of other, related phenomena that will help educators to understand better the breadth of the impact of meditative practices upon student experience and behavior. In this regard, it seems important, as we and others (Gardner, 1993) have argued, to expand the traditional definitions of education to include the development of social, emotional, and other valuable forms of intelligence relevant to occupational accomplishment, life satisfaction, ethics, and prosocial engagement. Such research may require the development or implementation of tools to assess phenomena, including emotional or social intelligence, that have received less research attention to date than traditional indicators of learning. These efforts will also require researchers and educators to think beyond the four walls of the classroom by introducing students to meditation and its potential benefits in a variety of ways rather than simply as an academic course. For example, meditation can be taught through Student Life and Residence Life programs as well as through student health centers. Preliminary research examining the effects of a meditation-based program for students in a residential learning center proved highly effective in terms of student interest and positive psychological outcomes (Oman, Shapiro, Thoresen, Plante, & Flinder, 2008).

INVESTIGATION OF EXPLANATORY PROCESSES

It is also essential that researchers explore the processes that can account for the positive effects of meditation practice in education. Several processes relevant to educational settings have been proposed, including attentional refinement, metacognitive skill enhancement, and increased self-regulatory abilities (Baer, 2003; Brown et al., 2007 ; Shapiro et al., 2006). Efforts to understand these processes can lead to a refinement of meditative instruction to make better use of active ingredients in the available practices, and perhaps facilitate the development of new

meditation-based instructional approaches.

Of considerable interest to meditation researchers in recent years has been the investigation of whether amount of time spent in meditation (e.g., number of minutes per day or sessions per week in sitting meditation and other practices) is associated with the outcomes under investigation. To date, research results concerning this question have been mixed, with some reporting positive effects of practice duration or frequency on outcomes (e.g., Carson et al., 2004) and others reporting null findings (e.g., Davidson et al., 2003). There may be thresholds above which meditative practice is more likely to show direct effects on outcomes (Shapiro et al., 2007), and effects may be other than the usual linear relations typically examined in research. It will also be important for researchers to study not only *quantity* of practice time but also *quality* of time spent in meditation, given the wide variation in subjective experience that is possible in such activity (e.g., from sleep to acute alertness).

INVESTIGATION OF BEST PRACTICES

The study of meditation in educational settings comes with questions about how best to implement it in the unique climates that colleges and universities provide. How and where is meditation best taught in such settings? One salient consideration is to address the perceived religious/spiritual overtones of meditation. Because the higher education system is rightly sensitive to religious teachings, it is important to present meditative practices in a secular form and to use descriptive language for meditation that is universally accepted. This is possible because the forms of meditation described here fundamentally concern the cultivation of awareness and attention.

An additional consideration for future research is whether students should be screened in some way, given the potential risks that may be associated with certain forms of meditation (Lansky & St. Louis, 2006; but see Chalmers, 2005). Investigation of preexisting psychological features that predict success in meditative practice (e.g., personality traits, motivation) will also be helpful.

Yet another important issue for future research is the expertise of the meditation teacher. Kabat-Zinn (2003) has argued that personal, regular practice in meditation is essential for those in the instructor role. Without this, an instructor cannot speak with authority about meditation, or adequately speak to student experiences, thereby limiting the capacity to comprehend the deeper “grades of significance” of subjective phenomena that occur in practice (Schumacher, 1977). Personal practice experience may also facilitate the mirroring process that takes in educa-

tional and other social contexts in which the engagement, focus, and presence of the teacher can help to activate those states in the student (Goleman, 2006). A fuller treatment of teacher training in meditation is available in a report on contemplative practices in K–12 education (Garrison Institute, 2005).

CONCLUSIONS

The applications of meditation in higher education are potentially broad, affecting cognitive, emotional, and interpersonal domains. Research addressing the effects of meditation on academic performance, psychological well-being, and interpersonal experience in college, medical school, and other higher education students has shown promising results. In this still nascent field of investigation, thoughtful, well-designed research is required to help guide an emerging interest among educators in integrating meditative and other contemplative practices into the academy. Building on the extant literature, theory-driven investigation can begin to ask more precise questions such as the following: How do we best incorporate meditation into education? What outcome measures and methodologies most effectively capture the multidimensional effects of meditation? What are the processes underlying the effects of various meditative practices?

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Notes

1. It is also important to distinguish between meditation as described here from Benson's Relaxation Response (e.g., Benson & Klipper, 1975), which has elements of relaxation training and concentration meditation. It is also important to distinguish present use of the term mindfulness from the conception of mindfulness described by Langer (e.g., 2002). While both forms of mindfulness include an engagement with current events and experience, the former concerns an alert presence to what is taking place without attempts to change it, while the latter concerns active, cognitive manipulation of stimuli to serve self-chosen ends.

2. This study did not include sufficient information to calculate effect sizes.

3. In discussing metacognition, it is important to note that this term refers to a set of cognitive processes that involve planning and monitoring cognitive activities and checking or testing goal-related outcomes (Schwartz & Perfect, 2002). In the present context, we focus only on the limited aspect of metacognition that concerns a monitoring of cognitive activities.

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