Teaching Mindfulness Skills to Kids and Teens

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Many meditation and awareness practices derived from contemplative religious traditions are increasingly studied in clinical and scientific circles. In traditional contexts, meditation practices are used to attain “insight” or a perceptual shift in the experience of self and world called “awakening.” In modern secular contexts, similar practices are being used to address a wide range of psychological disorders, including anxiety (Evans et al., 2008; Kim et al., 2009), depression (Bondolfi et al., 2010; Kuyken et al., 2008; Ma & Teasdale, 2004; Teasdale et al., 2000), bipolar disorder (Williams et al., 2008), suicidal behavior (Williams, Duggan, Crane, & Fennell, 2006), psychosis (Chadwick, Hughes, Russell, Russell, & Dagnan, 2009; Johnson, Penn, et al., 2011), personality disorders (Soler et al., 2012), pain (Kabat-Zinn, Lipworth, & Burney, 1985), eating disorders (Wanden-Berghe, Sanz-Valero, & Wanden-Berghe, 2011), addiction (Hsu, Grow, & Marlatt, 2008), autism (Spek, van Ham, & Nyklicek, 2013), and traumatic brain injury (Bedard et al., 2003). Beyond the individual patient in the clinic, meditation practices are also being used and studied in both K–12 classrooms (Greenberg & Harris, 2012; Kaiser-Greenland, 2010; Meiklejohn et al., 2012; Mind and Life

\[^1\]While the term “traditional” could refer to any religion, including Christianity, Hinduism, Islam, and Buddhism, in this chapter the term “traditional” refers specifically to Buddhism. Similarly, the term “Eastern” also refers to Buddhism and not other Eastern cultures or religions.
Education Research Network et al., 2012) and in higher education settings (Shapiro, Brown, & Astin, 2011).

The growing interest in meditation in the culture has been matched by an interest in the scientific study of meditation, especially in relation to clinical applications and brain sciences. However, neuroscientific models are faced with the daunting task of sorting out and integrating the effects of different practices into a unified theory that might explain, beyond placebo effects, why these practices could be beneficial for so many different kinds of conditions and problems. Despite the challenges, a few models are gaining traction. This chapter reviews the neurobiological research supporting the idea that certain functions of the prefrontal cortex associated with mental health and well-being can be strengthened through contemplative practices such as meditation and mindfulness.

**Regions Associated with Distress That Respond to Meditation Interventions**

The prefrontal cortex is perhaps the most important area of study in understanding how meditation operates in the brain. It is located just behind the forehead and underlies functions that include thinking, planning, and keeping behavior in line with goals (Miller & Cohen, 2001). The “cognitive control” element of the prefrontal cortex is also called “executive function” and is described in more detail by Mark Bertin (Chapter 20, this volume). Executive function includes controlling and shifting attention, cognitive flexibility, self-monitoring, planning, impulse control, and working memory capacity (Roth et al., 2006; Wood & Smith, 2008). The prefrontal cortex also controls aspects of the limbic system and the default mode network, another important process in understanding meditation that is described below.

The limbic system is a set of interconnected brain areas that includes the hippocampus, amygdala, and nucleus accumbens, among others. These regions are involved in memory, emotion, motivation, and reward (Morgane, Galler, & Mokler, 2005). The amygdala, which is involved in detecting emotional salience, works closely with the endocrine and sympathetic nervous systems. It triggers the “fight-flight-freeze” response, and so is often associated with the expression of emotional reactions (Davidson, Jackson, & Kalin, 2000). The prefrontal cortex exerts inhibitory control on limbic structures such as the amygdala (Davidson et al., 2000; Mayberg et al., 1999; Ochsner, Bunge, Gross, & Gabrieli, 2002; Ochsner & Gross, 2005; Ochsner et al., 2004; Urry et al., 2006). Lack of such inhibitory control results in a hyperactive amygdala (Siegle, Steinhauer, Thase, Stenger, & Carter, 2002; Siegle, Thompson, Carter, Steinhauer, & Thase, 2007) and an associated increase in emotional disturbance, reactivity, and sympathetic hyperarousal (Baxter et al., 1989; Bench, Friston, Brown, Frackowiak, & Dolan, 1993; Blumberg et
al., 2004; Clark, Iversen, & Goodwin, 2002; Davidson, 2000; Mayberg et al., 1999; Meyer et al., 2004; Siegle & Hasselmo, 2002; Siegle et al., 2002).

Some areas of the prefrontal cortex, along with other brain areas that are involved in attention (the dorsal attention system, or DAS) also inhibit a group of brain areas that are often called the “default mode network,” or DMN. This network of midline brain structures is active during “rest,” or when the brain is not otherwise engaged. The system is also thought to be involved in mind wandering and self-referential thought (Qin & Northoff, 2011). The DAS and the DMN are typically “anticorrelated” (Fox et al., 2005), which means that when one is highly active, the other is less active. The real-life experience of this makes sense: If you are raptly engaged in reading this chapter, the DAS is engaged—and you haven’t been planning your grocery list or worrying about the future because the DMN is suppressed. Conversely, if you notice that your mind is producing a lot of thoughts that have nothing to do with this chapter, the DMN is geared up, and therefore your ability to sustain attention on something specific has suffered, because the DAS is less active.

It is the DMN that is partly responsible for creating a sense of an enduring or continuous “self.” It is dependent on the construction of a self-narrative—“the story of me”—that connects disparate experiences over time into a whole of “self” (Gallagher, 2000). Because this sense of continuity must be continually constructed, such self-related processing represents the DMN of our brains and is always active except when our attention is otherwise engaged. Essentially, when we are not busy, our minds just get back to work creating and sustaining self-narrative. However, even though thinking about ourselves appears to be a favorite human pastime, such self-referential processing is highly associated with distress, anxiety, rumination, and depression (Buckner & Vincent, 2007; Farb et al., 2007; Gentili et al., 2009; Hamilton et al., 2011; Lemogne, Delaveau, Freton, Guionnet, & Fossati, 2010; Segal, 1988; Sheline et al., 2009; Whitfield-Gabrieli et al., 2009; Zhao et al., 2007).

Low activation in the prefrontal cortex (“hypofrontality”) is associated with a wide range of psychological disturbances with negative affect (Clark, Chamberlain, & Sahakian, 2009; Couyoumdjian et al., 2009), such as unipolar depression (Baxter et al., 1989; Bench et al., 1993) and a number of disorders characterized by poor affect regulation, including bipolar disorder (Blumberg et al., 2004; Clark et al., 2002; Meyer et al., 2004), obsessive-compulsive disorder (van den Heuvel et al., 2005), schizophrenia (Carter et al., 1998; MacDonald & Carter, 2003; MacDonald et al., 2005), and addiction (Goldstein et al., 2009; Hester & Garavan, 2004). Because poor prefrontal control appears in a range of psychiatric conditions, we think of hypofrontality as a risk factor for many disorders and as the very condition we want to change. If hypofrontality is associated with numerous problems, it stands to reason that treating it has the potential to alleviate or prevent such problems. Later in the chapter we examine the positive impact of meditation on hypofrontality more specifically.
Neuroplasticity and “Cognitive Rehabilitation”

The growing understanding of neuroplasticity—the idea that the brain structure can actually change in response to experience or practice—is one of the most important paradigm shifts in modern science and medicine. Rather than being fixed, our brains, along with our personalities and behaviors, are in fact quite malleable. Just as exercise and training strengthen physical muscles within parameters, the brain can be strengthened and even grow in gray matter in corresponding neural networks. For example, networks related to spatial processing increase in taxi drivers as they develop interior maps of city streets (Maguire, Woollett, & Spiers, 2006), and other parts of the brain change in response to practicing music (Rodrigues, Loureiro, & Paulo Caramelli, 2010) or juggling (Draganski et al., 2004). Whether or not we realize it, we are always practicing something and therefore always changing our brains. Choosing which qualities or abilities to cultivate and which ones to let wither is the fundamental principle of contemplative practice. Choosing to cultivate certain types of mindful attention appears to reverse hypofrontality and its related problems described earlier (Lazar, et al. 2005). Other regions of the brain (described below), many associated with psychopathology, also appear to change for the better after meditation.

In adults, restoration of the prefrontal cortex can be achieved by engaging the region through cognitive training over time. Because impairment in the area plays a central role in so many psychiatric disorders, many studies have attempted to use cognitive “remediation” exercises to restore and boost prefrontal functioning. The rationale behind what is generally termed “neurocognitive rehabilitation” is that training on prefrontal cortex-dependent tasks—or “working out” the area with sustained attention task—will improve functioning and subsequently improve emotion regulation and dysfunctions that are associated with its impairment.

In patients with schizophrenia, Penades et al. (2006) found that 12 weeks of multicomponent attention training improved performance on prefrontal cortex-dependent tasks and appeared to decrease hypofrontality and psychological distress. In another study of “cognitive control training” in unipolar depression, Siegle, Ghinassi, and Thase (2007) used two types of focused attention tasks to increase prefrontal functioning and decrease mood disturbance. Well's attention training (Papageorgiou & Wells, 2000) is a 15-minute task in which participants focus on a single sound and an arithmetic task that engages working memory and executive control. Results of the six-session attention training protocol indicated improved depressive symptoms and emotion regulation, with reduced hypoactivation in parts of the prefrontal region and reduced hyperactivation in the amygdala.

Meditation and associated practices can be considered as neurocognitive rehabilitation approaches aimed at increasing prefrontal cognitive control and thus addressing hypofrontality and its associated problems. In this
way, such intensive attention training can lead to better affective regulation and emotional well-being. Many studies of adults have found that meditation practices increase activation of the prefrontal cortex; decrease limbic and DMN activity; and improve attention, emotional reactivity, rumination, addictions, and mood disorders, and are associated with increased activity in parts of the prefrontal cortex (Allen et al., 2012; Baerentsen, 2001; Baron Short et al., 2010; Brefczynski-Lewis, Lutz, Schaefer, Levinson, & Davidson, 2007; Farb et al., 2007, 2010; Hasenkamp, Wilson-Mendenhall, Duncan, & Barsalou, 2012; Ritskes, Ritskes-Hoitinga, Stodkilde-Jorgensen, Baernts, & Hartman, 2003) and even with a larger volume of gray matter with practice (Hölzel et al., 2008; Lazar et al., 2005; Luders, Toga, Lepore, & Gaser, 2009). These studies demonstrate most clearly that meditation raises prefrontal activity.

Meditation practices have been found to improve a range of attention and executive function tasks associated with the prefrontal cortex (Brefczynski-Lewis et al., 2007; Bushell, 2009; Chambers, Lo, & Allen, 2008; Chan & Woollacott, 2007; Davidson, Goleman, & Schwartz, 1976; Jha, Krompinger, & Baime, 2007; Lazar et al., 2000; Lutz et al., 2009; Pagnoni & Cekic, 2007; Slagter et al., 2007; Srinivasan & Baijal, 2007; Tang et al., 2007, 2011; Valentine & Sweet, 1999; Wenk-Sormaz, 2005), including sustained attention (Jha et al., 2007; Kaul, Passafiume, Sargent, & O'Hara, 2010; MacLean et al., 2010; Valentine & Sweet, 1999) and self-regulation (Chambers et al., 2008; Heeren, Van Broeck, & Philippot, 2009; Ortner, Kilner, & Zelazo, 2007; Tang, Yang, Leve, & Harold, 2012; Tang et al., 2007; Zeidan, Johnson, Diamond, David, & Goolkasian, 2010; Zylowska et al., 2008). Bertin (Chapter 20, this volume) describes the importance of executive function as the foundation for lifelong mental health and functioning. Still, not all studies have found positive effects on attention from meditation practice (e.g., Anderson, Lau, Segal, & Bishop, 2007).

Another explanation for how meditation practices work comes from studies of the amygdala, site of emotional reactivity. A number of studies with adults have found decreased activity in the amygdala following different forms of meditation (Brefczynski-Lewis et al., 2007; Creswell, Way, Eisenberger, & Lieberman, 2007; Desbordes et al., 2012; Farb et al., 2007, 2010; Taylor et al., 2011; Way, Creswell, Eisenberger, & Lieberman, 2010).

Multiple studies have found that various forms of meditation training are associated with decreased DMN activity, the region that is associated with the creation of a sense of self and the associated problems (Baerentsen, 2001; Baerentsen et al., 2009; Berkovich-Ohana, Glicksohn, & Goldstein, 2011; Brewer et al., 2011; Farb et al., 2007, 2010; Goldin, Ramel, & Gross, 2009; Hasenkamp et al., 2012; Taylor et al., 2011; Travis et al., 2010). However, others have found increased DMN activity (Goldin et al., 2009; Goldin, Ziv, Jazaieri, & Gross, 2012; Goldin & Gross, 2010; Hölzel et al., 2011).
A number of studies of various meditation practice found decreased sympathetic hyperarousal in meditators (Barnes, Treiber, & Davis, 2001; Carlson, Specia, Faris, & Patel, 2007; Maclean et al., 1994; Ortner et al., 2007; Sudsuang, Chentanez, & Veluvan, 1991; Tang et al., 2007), but increases in arousal have also been reported (Britton, Haynes, Fridel, & Bootzin, 2010; Holmes, 1984). The sympathetic nervous system is associated with stress and the fight–flight–freeze response, and a range of research points to the multiplying effect of stress on a variety of physical and psychological disorders. Thus by decreasing sympathetic arousal and lowering stress, we create the conditions that better facilitate the healing process.

Other studies have also suggested a relationship between mindfulness and reduced reactivity to stress and emotion, including dampened emotional responses to threat and faster recovery from transient negative emotions (Arch & Craske, 2006, 2010; Brewer et al., 2009; Britton, Shahar, Szepenwol, & Jacobs, 2012; Broderick, 2005; Campbell-Sills, Barlow, Brown, & Hofmann, 2006; Erisman & Roemer, 2010; Goldin & Gross, 2010; Kuehner, Huffziger, & Liebsch, 2009; McKee, Zvolensky, Solomon, Bernstein, & Leen-Feldner, 2007; Ortner et al., 2007; Pace et al., 2009; Proulx, 2008; Raes, Dewulf, Van Heeringen, & Williams, 2009; Tang et al., 2007; Weinsten, Brown, & Ryan, 2009).

Meditation and Mindfulness: A Closer Look

The research described above, although offering some promising evidence that various forms of meditation practice change the brain in regions associated with the problems we see in learning, behavior, and mental health, should be regarded as preliminary. The state of the research suffers from a wide range of limitations, including nonstandardized meditation practices, methodologies, control conditions, and a mix of different populations, including both secular clinical novice meditators as well as advanced meditators. Making research more difficult, scientists who study meditation are confronted with a wide range of different practices that are collectively meditation or mindfulness.2 A

2The terms “meditation” and “mindfulness” are common but ambiguous terms that refer to a wide range of contemplative practices. Jon Kabat-Zinn used the word “mindfulness” as an “umbrella term” and “a place-holder for the entire dharma” or all of the teachings of the Buddha. While the program that he developed, Mindfulness-Based Stress Reduction (MBSR), draws heavily from both Theravada and Mahayana (Zen) Buddhist meditation practices, it also includes approaches derived from Hindu Vedanta and other non-Buddhist spiritual teachers (Kabat-Zinn, 2011). Thus, what is commonly called “mindfulness meditation” may refer to any number of practices from different religious traditions, and has led to much ambiguity in science and much criticism from Buddhist scholars (Lopez Jr., 2009).
recent U.S. government report cited “confusion over what constitutes meditation” (p. 209) as the central obstacle in meditation research (Ospina et al., 2007), preventing any strong conclusions about meditation's benefits.

Because of this confusion, researchers are attempting to standardize terms and practices in a way that both honor traditional theory and reflect the practicalities of clinical applications and research. Antoine Lutz et al. created the terms “focused attention” and “open monitoring” as two broad categories of practices that are thought to have different neural underpinnings and different cognitive, affective, and behavioral consequences (Lutz, Slagter, Dunne, & Davidson, 2008; Rapgay & Bystrisky, 2009). Close study of the mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT) manuals indicate that these 8-week programs spend about half of the time on focused attention and the other half on open monitoring (Santorelli & Kabat-Zinn, 2003; Segal, Williams, & Teasdale, 2002), so the widespread but ambiguous term mindfulness meditation could also be described in terms of a mixture of the two practices.

**Focused Attention Meditation**

Focused attention (FA) practice involves intentionally directing and sustaining attention on a chosen object or anchor of attention (e.g., the breath, a visual object, a sound) while “deselecting” other stimuli. Thoughts, emotions, and body sensations that are not the meditation anchor are viewed as distractions. The meditator’s goal is to remain anchored, monitor the mind’s wandering, and return attention to the object when the mind has wandered. Beginning this practice involves effort and frustration, and can produce fatigue and sleepiness, not to be confused with meditative calm. Such sleepiness is counteracted with renewed vigilance and energy (Britton, Lindahl, Cahn, Davis, & Goldman, 2013). Progress in FA is measured by the ability to hold attention on the object without distraction, which becomes easier with practice. Sustaining and redirecting attention back to an object (e.g., the breath) over and over again builds the attentional “muscle” of the DAS (Hasenkamp et al., 2012). When this system is strong and engaged, the limbic (amygdala) and DMN systems become less active, with the possible result being a calm and tranquil mind. Tranquility and mental calm are nice side effects, but are actually not the goal of many traditional or secular meditation practices.

Because the tranquility is transient and easy to get attached to, many teachings downplay the advanced cultivation of focused attention in favor

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3 In many Buddhist systems the term *shamatha* or *samatha* is used to describe initial focused awareness or “tranquility” practices. However, this term becomes confusing, because in some systems (Theravada), *shamatha* refers to focusing on an object, but in other systems (Tibetan), later stages of *shamatha* are objectless and therefore no longer fit the criteria for focused awareness.
of the more enduring transformations that come through “insight.” Nevertheless, some mastery of concentration is important as a foundation, just as physical exercise and stretching cannot be done without a foundation of some muscle strength. From the inside, strengthening the DAS network is like sharpening the focus of a microscope or telescope, or “keeping the tripod steady.” When our telescope is steady and in focus, we now see that what appear to be stars are, in fact, planets. Or, through a microscope, we can see that an onion skin is not “solid,” as we perceive it by the naked eye, but made of individual cells. When our minds are calm, we can see everything more clearly, including the subtleties. Thus, the ultimate purpose of FA is to stabilize the mind for deeper inquiry and insight.

Open-Monitoring Meditation

In contrast to FA practice, open-monitoring (OM) practice involves a continuous monitoring of any and all stimuli (thought, emotions, body sensations, sounds, etc.) that arise in experience, without privileging any particular object. In such practice, all stimuli—including disturbing thoughts, judgments, and emotions—are possible objects of meditation, and are not viewed as distractions or any other type of problem or obstacle. In Theravada Buddhism as well as MBSR (Kabat-Zinn, 1990, 2011), the goals of practice include insight into the “three characteristics”—the impermanence, unsatisfactoriness, and non-self—of all phenomena. In other forms of Buddhism (Mahayana), insight is described in terms of the “emptiness” of persons and phenomena. In either case, the development of insight involves a “reperceiving” (Shapiro, Carlson, Astin, & Freedman, 2006) of the self and the world, so that they come to be understood as less solid and fixed.

At an experiential level, we can now see that the emotions that we have identified with as intrinsic to ourselves are nothing more than passing thoughts (mental images, words) and body sensations (pressure, tightness, heat). Because they are fleeting and insubstantial, thought and emotions are neither reliable nor able to give lasting satisfaction or threat. Seeing thoughts and emotions as transient events rather than as accurate views of reality has been called “metacognitive awareness” (Teasdale et al., 2002), “decentering” (Watkins, Teasdale, & Williams, 2000), and “cognitive defusion” (Masuda, Feinstein, Wendell, & Sheehan, 2010). Whatever the term, this state is characterized as a spacious, nonreactive way of observing the mind’s process, like a bird’s-eye view.

On a neural level, this ability to see thoughts as thoughts is apparent when the dorsal anterior cingulate cortex (dACC) is coactivated with the DMN (Brewer et al., 2011; Hasenkamp & Barsalou, 2012) without a decrease in amygdala activity (Taylor et al., 2011). Usually these two brain areas are anticorrelated: For example, it’s hard to daydream or worry and pay attention at the same time. But if we are monitoring, we can make the worry
or daydream itself become the object of our meditation. *Unpleasant thought, body sensation, or memory?* Not a distraction and not a problem!

**Selflessness**

As we get better at watching our minds, we eventually see that all of these fleeting thoughts and body sensations are not who we really are, nor do they necessarily reflect how the world really is: *I am not my thoughts, and my thoughts and perceptions do not necessarily reflect objective reality, if there even is an objective reality.* These “mental events” no longer feed into to DMN to construct a solid or permanent “thing” called a self that we have to defend, protect, or worry about being good enough.

This change in how we think about ourselves and the world may represent an unusual neural shift whereby the awareness/monitoring area (dACC), which is usually mutually exclusive with self-referential thinking/mind wandering DMN, turn on at the same time (Brewer et al., 2011; Hasenkamp & Barsalou, 2012; Josipovic, Dinstein, Weber, & Heeger, 2012). This coactivation creates the opportunity to remain aware while the process of self-construction is happening, instead of losing the metacognitive awareness as emotional patterns take over. When both are active, then we can truly step back and observe the way we construct ourselves, seeing how the sense of self is built from a complex set of images, narratives, and associated body sensations. So rather than suppressing the DMN, as in focused attention (which is still a good skill to have), the narrative self arises—but it can be observed, even if not believed, as a solid, permanent entity.

Like looking under the hood of a truck to see the running motor, we can get a closer look at the process of consciousness as it unfolds, and by doing so, we are less captivated or in thrall. The experience is akin to knowing the illusion behind the magic show; the illusion loses its ability to trick us. Such insight into selflessness can be sudden or gradual, and may be liberating or distressing, depending on the context and theoretical preparation provided (Castillo, 1990). These factors of context and preparation underscore the need for knowledgeable and experienced teachers.

As scientists begin to collaborate with practitioners and scholars of contemplative traditions, a more complex picture of meditation is emerging that challenges the often simplified notions that appear in research and clinical applications. In particular, the confusion about the differences in the goals of concentration/FA and insight/OM practices has led to a conflation of the term *mindfulness* with the practice of insight/OM. However, many of the outcomes from “mindfulness” programs such as MBSR and MBCT are more in line with the goals of cognitive control and mental calm, which are more associated with FA. Furthermore, although “mindfulness meditation” is often considered an “insight” practice, there has been very little actual research on the process and experience of insight. These distinctions have profound
implications for the applications of meditation-based practices in both adults and youth, as certain practices may be more suitable for certain goals and populations than others.

Contemplative Practices for Youth

Because of the widespread popularity, application, and scientific study of meditation in adults, there has been much interest and enthusiasm in applying these practices earlier in life, during childhood and adolescence. There is a strong empirical rationale for this idea, as hypofrontality appears to start early in life with similar consequences. The idea that we could, at an early age, build resilience to so many forms of distress is appealing for a number of reasons.

In children and adolescents, poor prefrontal control and impaired executive functioning, including self-regulation problems and attentional control difficulties, are associated with a host of negative outcomes across the lifespan, including behavior problems, aggression, antisocial behavior, attention-deficit/hyperactivity disorder (ADHD), problems with peers, school failure, depression, substance abuse, and criminal offenses, as described elsewhere in this volume (also see Eigsti et al., 2006; Ivanov, Schulz, London, & Newcorn, 2008; Mahone & Hoffman, 2007; Moffitt et al., 2011; Perner, Kain, & Barchfeld, 2002; Riggs, Blair, & Greenberg, 2003). Conversely, better executive functioning is associated with greater professional and academic achievement; relationship success; and positive social, emotional, behavioral, economic, and health outcomes (Blair & Peters, 2003; Blair & Razza, 2007; Carlson, Mandell, & Williams, 2004; Carlson & Moses, 2001; Lefevre et al., 2013; Moffitt et al., 2011).

Given that prefrontal control and executive function predict such a wide range of outcomes in both adults and children, there has been considerable interest in offering attention training techniques, such as meditation and mindfulness, to the developing minds of young people. The prefrontal cortex does not fully develop until young adulthood, and so is highly susceptible to influences on development throughout childhood and adolescence (Davidson & McEwen, 2012; Huttenlocher & Dabholkar, 1997; Mind and Life Education Research Network et al., 2012). Because neural plasticity and behavior change are more possible in children than adults, training executive function at a young age may be, from a prevention and public health perspective, the best time to intervene (Dahlin, Nyberg, Backman, & Neely, 2008; Diamond & Lee, 2011). Diamond (2013; Diamond & Lee, 2011) reviewed programs designed to foster self-regulation and executive function in youth, and concluded that executive function can be improved through training, with the strongest evidence from well-designed trials for computerized training, interactive games, martial arts, and specific school curricula, with positive results
but weaker-quality research for aerobics, yoga, mindfulness, and other school curricula (Blair & Diamond, 2008; Dahlin et al., 2008; Diamond, 2013; Diamond & Lee, 2011). Many such programs are described in greater detail earlier in this volume.

Mindfulness and meditation-based interventions have been applied to both clinical and nonclinical populations of children and adolescents. On the clinical side, mindfulness-based programs have been applied to a range of psychological problems, including anxiety, (Beauchemin, Hutchins, & Patterson, 2008; Biegel, Brown, & Shapiro, 2009), rumination and depression (Napoli, Krech, & Holley, 2005), and attention problems (Semple, Lee, Rosa, & Miller, 2010; Zylowska et al., 2008). In addition to clinical populations, numerous schools have adopted mindfulness and meditation-based programs, either as electives or institutionwide curricula (Meiklejohn et al., 2012; Schoeberlein, Koeffler, & Jha, 2005).

Notes of Caution

Both the scientific research and the subjective accounts of meditation training have occurred almost exclusively with adults. Even in countries where monastic training has been commonplace for centuries or millennia, historical accounts suggest that meditation played a very minimal role in the lives or training of monks, and almost no role in the lives of laypeople, until the 20th century. Most young monastics spend their preteen and teenage years engaged in the memorization of liturgical and philosophical texts and are rarely required to meditate as part of their training. Very few people within large-scale monastic institutions engage in extensive practice before completing their scholastic study, a process that can take upward of 20 years of training in some cultures (Dreyfus, 2003; Sasson, 2013; Sharf, 1995). Thus, like the modern Western idea of using meditation practices to treat psychopathology, the idea of using meditation with children is a novel and mostly untried concept, both East and West. Nor do Eastern models of psychology have a clear theory of child development or age-appropriate practices from which to draw; rather, existing practices are being adapted now.

Training the developing brain through meditative practices offers a promising opportunity to correct or even prevent certain types of developmental trajectories, especially those associated with poor prefrontal control and its associated difficulties. However, since the only existing neuroscientific studies are of adults, and we have little idea how meditation may affect the developing brain, a note of caution is warranted. It may be worth asking whether certain capacities need to be established before engaging in certain forms of training. For example, the idea of a self emerges between ages 2 and 3, solidifying through childhood and adolescence into early adulthood. The emerging sense of self is highly malleable and strongly influenced by
developmental changes in brain structure and the resulting cognitive abilities (Harter, 2006; Lewis & Carmody, 2008). As described, brain areas associated with self-concept (the DMN) are often deactivated during different meditation practices, and self-concept is deliberately deconstructed during insight practice. Psychologist Jack Engler (1984) warns that a fully “cohesive and integrated self” is a prerequisite for insight meditation and suggests that this practice may be contraindicated for individuals who have not yet established a fully mature and coherent sense of self.

The research in adults is starting to ask whether mindfulness or meditation training is equally beneficial for everyone, or whether some individuals may be better off with other forms of treatment. Indeed, studies in adults have found that preexisting characteristics predict treatment outcome (Cordon, Brown, & Gibson, 2009), and that mindfulness or meditation-based interventions may be maximally effective (Arch & Ayers, 2013; Ma & Teasdale, 2004; Teasdale et al., 2000), ineffective (Jazaieri, Goldin, Werner, Ziv, & Gross, 2012; Mularski et al., 2009), or even “contraindicated” for certain types of people (Arch & Ayers, 2013; Ma & Teasdale, 2004).

Many school-based programs are implemented at the institutional level so that all students receive meditation as part of the school day—not by individual choice—making the question of individual differences in response to meditation even more urgent. So far, the effects of mindfulness-based training programs with children and adolescents have been found to be affected by preexisting characteristics, including baseline levels of executive function (Flook et al., 2010), developmental age (Schonert-Reichl & Lawlor, 2010), family environment (Barnes, Gregoski, Tingen, & Treiber, 2010), and gene-by-environment interactions (Gregoski et al., 2012), indicating that some children benefit more than others, and some do not benefit at all.

Since possible side effects of meditation (Epstein & Lieff, 1981; Lazarus, 1976; Shapiro, 1992)—including depersonalization (Castillo, 1990; Kennedy, 1976), psychosis (Chan-Ob & Boonyanaruthee, 1999; Kuipers, van der Heijden, Tuinier, & Verhoeven, 2007; Sethi, 2003), epilepsy (Lansky, 2006), and mania (Yorston, 2001)—have been reported in some adults (Lustyk, Chawla, Nolan, & Marlatt, 2009), it has been recommended that “researchers need to be cognizant of the possibility of iatrogenic effects that certain practices could have with children of different ages and characteristics” (Greenberg & Harris, 2012, p. 164). Indeed, studies of children have also reported unwanted effects. An 8-week randomized controlled trial of a yoga-based mindfulness intervention with fourth- and fifth-grade girls found that girls in the yoga intervention reported larger increases of perceived stress than wait-list controls, and that this increase in distress was associated with amount of home practice (White, 2012). Mark Greenberg cautions, “Consumer interest and marketing have expanded such practices without sufficient knowledge of their outcomes, which might be positive, minimal, or even iatrogenic. . . . Because there is currently little quality research on outcomes,
widespread use is premature” (Greenberg & Harris, 2012, p. 121). Christine Burke (2009) offered sound advice for the future of the field:

Advancing the empirical research is vital, as it is clear that the popularity of mindfulness-based approaches is on the rise in all age groups, including children and adolescents, despite the absence of empirical evidence of the efficacy of these interventions with younger populations. Now, with a reasonable base of support for the feasibility and acceptability of mindfulness-based interventions with children and adolescents, it is time that the field embarks upon a more rigorous course of gathering empirically sound evidence of the efficacy of these interventions. (p. 11)

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