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Mindfulness Meditation Training for Attention-Deficit/Hyperactivity Disorder in Adulthood: Current Empirical Support, Treatment Overview, and Future Directions

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Research examining nonpharmacological interventions for adults diagnosed with attention-deficit/hyperactivity disorder (ADHD) has expanded in recent years and provides patients with more treatment options. Mindfulness-based training is an example of an intervention that is gaining promising preliminary empirical support and is increasingly administered in clinical settings. The aim of this review is to provide a rationale for the application of mindfulness to individuals diagnosed with ADHD, describe the current state of the empirical basis for mindfulness training in ADHD, and summarize a treatment approach specific to adults diagnosed with ADHD: the Mindful Awareness Practices (MAPs) for ADHD Program. Two case study examples are provided to demonstrate relevant clinical issues for practitioners interested in this approach. Directions for future research, including mindfulness meditation as a standalone treatment and as a complementary approach to cognitive-behavioral therapy, are provided.

Attention-deficit/hyperactivity disorder (ADHD) is a developmental condition that continues into adulthood for the majority of cases (Barkley, Murphy, & Fischer, 2008). Prevalence rates of ADHD in adulthood are estimated to be 5% in the U.S. and other countries (Willcutt, 2012). This often lifelong condition is characterized by pervasive impairment in multiple domains, including but not limited to academic, occupational, relational, mental health, and self-concept (Matheson et al., 2013; Stein, 2008). Pharmacotherapy (e.g., stimulant medication) is a mainstay of treatment; however, many patients continue to experience impairment or insufficient symptom reduction despite treatment (Safren, Sprich, Cooper–Vince, Knouse, & Lerner, 2010; Wilens, Biederman, & Spencer, 1998; Wilens, Spencer, & Biederman, 2002). In addition, in clinical practice some patients desire to minimize use of medications, and seek alternative or complementary approaches.

Relative to many other forms of psychopathology in adulthood, there has been less research on the effectiveness of nonpharmacological treatment options and fewer empirically based treatment guidelines for clinicians treating ADHD in adults. Among available nonpharmacological treatment options, mindfulness meditation training has received increasing clinical interest and empirical support. The aim of this review is to (a) provide a rationale for the application of mindfulness to individuals diagnosed with ADHD, (b) describe the current state of the empirical basis for mindfulness training in ADHD, (c) summarize a specific mindfulness meditation program designed for adults diagnosed with ADHD, and (d) discuss future clinical and research directions in this area. Two case study examples are also provided to demonstrate particular clinical issues relevant for practitioners. First, however, we provide a brief introduction of mindfulness.

Mindfulness Training: General Overview

Mindfulness-based interventions are part of a "third wave" or "third generation" of behavior therapy (Hayes, Follette, & Linehan, 2004; Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Mindfulness meditation training is derived from the long-standing Eastern tradition of Vipassana meditation and is often defined as adopting a nonjudgmental attention to one's experience(s) in the present moment (Kabat-Zinn, 1990). While defining mindfulness as a construct is challenging and the field of clinical psychology has yet to reach an operationalization that fully addresses the complex Buddhist phenomenology from which it is derived (Grossman, 2008, 2011; Kang & Whittingham, 2010), mindfulness has been widely described in the literature as a psychological process (or practice of such) with two components: (a) orienting one's attention

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purposefully to the present moment and (b) approaching one's experience in the present moment with curiosity, openness, and acceptance (Bishop et al., 2004). Another commonly cited definition conceptualizes mindfulness as a trait or set of skills such as being nonreactive, observing with awareness, acting with awareness, describing with awareness, and adopting a nonjudgmental approach towards one's experience (Baer et al., 2008). Mindfulness training is thought to activate and strengthen such facets either via formal meditation practice or informal practice (e.g., "turning on" a mindful mind state in the midst of daily activities). Thus, trait-based mindfulness characteristics may be malleable and implicate mindfulness training for those low in this trait. Consistent with this, adults with ADHD are lower in trait mindfulness (Smalley et al., 2009).

Initially developed for clinical application as Mindfulness-Based Stress Reduction (MBSR) over 30 years ago for chronic pain (Kabat-Zinn, 1982; Kabat-Zinn, Lipworth, & Burney, 1985), mindfulness has since been adopted for various mental health conditions, such as eating disorders, anxiety disorders, depression, and substance use (Bowen et al., 2014; Brewer, Mallik, et al., 2011; Evans et al., 2008; Goldin & Gross, 2010; Kristeller & Wolever, 2011; Segal, Williams, & Teasdale, 2002; Wupperman et al., 2012) and has been proposed to be an approach that targets transdiagnostic processes across various forms of psychopathology (Greeson, Garland, & Black, 2014). Systematic reviews and meta-analyses indicate that, despite the need for more methodologically rigorous trials, mindfulness-based treatments are effective for a variety of mental health treatment targets (Bohlmeijer, Prenger, Taal, & Cuijpers, 2010; Chiesa & Serretti, 2011, in press; Fjorback, Arendt, Ornbol, Fink, & Walach, 2011). One recent meta-analysis of 209 treatment studies indicated that mindfulness-based therapies yield moderate effect sizes in within group pre-post comparisons, comparisons with waitlist control groups, and when compared to other active comparison groups, while not differing from behavioral and pharmacological interventions (Khoury et al., 2013).

Rationale for Mindfulness-Based Treatment for Adults Diagnosed With ADHD

Studies of mindfulness in non-ADHD samples support its application to ADHD, particularly based on the purported impact of mindfulness training on attention regulation, executive functioning, and emotion regulation. At the intervention level, mindfulness meditation practices involve focusing attention on a particular object (e.g., one's own breath) and returning to this object after becoming distracted. This is proposed to improve attentional control abilities (Keng, Smoski, & Robins, 2011). That is, this practice requires top-down regulation of attention and conflict detection, which can be thought of as a regulatory approach to attention that improves executive processes (Chiesa, Calati, & Serretti, 2011). Since poor attentional functioning is a core symptom cluster of ADHD (American Psychiatric Association, 2013) and executive functioning deficits in ADHD are common (Barkley, 1997; Boonstra, Oosterlaan, Sergeant, & Buitelaar, 2005; Hervey, Epstein, & Curry, 2004), any treatments that purportedly strengthen these processes seem appropriate for ADHD. While many studies have measured the impact of mindfulness training in experienced meditators (e.g., Brewer, Worhunsky, et al., 2011; Taylor et al., 2013), even brief training with meditation novices yields improvements in attention. For example, one study assessed the impact of 5 days (20 minutes per day) of meditation against relaxation (Tang et al., 2007). Posttreatment effects indicated that the meditation group performed significantly better on conflict detection during an attentional task than the relaxation group. Similar findings have been reported following 4 days of meditation training (20 minutes per day) on visuo-spatial processing, working memory, and executive functioning against an active treatment comparison group (Zeidan, Johnson, Diamond, David, & Goolkasian, 2010).

Neuroimaging studies suggest that mindfulness meditation engenders neuroplastic changes in brain areas associated with attentional functioning typically impaired in ADHD. For instance, Hölzel and colleagues (2011) discuss the role of the anterior cingulate cortex, which is involved with executive/attentional processes via detection of conflicting incompatible incoming information. Given that this region is also involved with attentional processing in ADHD (e.g., Cubillo, Halari, Smith, Taylor, & Rubia, 2012; Passarotti, Sweeney, & Pavuluri, 2010), it represents a potential target for mindfulness training in ADHD samples.

Studies on mind-wandering also implicate application of mindfulness for ADHD patients. The phenomenon of mind-wandering has many similarities with and can be incorporated with models of cognitive control (Smallwood & Schooler, 2006). Mind-wandering is associated with neural networks of the brain involved with self-referential processing, also known as the default mode network (Christoff, Gordon, Smallwood, Smith, & Schooler, 2009; Mason et al., 2007; Raichle et al., 2001). The default mode network is implicated in ADHD (Fair et al., 2010) and is associated with poorer attentional regulation in ADHD (Castellanos et al., 2008). Further, pharmacological interventions that improve ADHD symptoms normalize activity within this network (Liddle et al., 2011; Peterson et al., 2009).

One proposed mechanism of mindfulness is reduced activity and altered connectivity in this network (Sood & Jones, 2013). For instance, in one study, central areas of the default mode network (i.e., medial prefrontal and posterior cortices) were deactivated across different types of meditation exercises among experienced meditators relative to meditation-naïve participants (Brewer, Worhunsky, et al., 2011). Further, this study indicated