



Review Article

Effects of preventive online mindfulness interventions on stress and mindfulness: A meta-analysis of randomized controlled trials

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ABSTRACT

Empirical evidence suggested that mind-body interventions can be effectively delivered online. This study aimed to examine whether preventive online mindfulness interventions (POMI) for non-clinical populations improve short- and long-term outcomes for perceived-stress (primary) and mindfulness (secondary). Systematic search of four electronic databases, manuscript reference lists, and journal content lists was conducted in 2016, using 21 search-terms. Eight randomized controlled trials (RCTs) evaluating effects of POMI in non-clinical populations with adequately reported perceived-stress and mindfulness measures pre- and post-intervention were included. Random-effects models utilized for all effect-size estimations with meta-regression performed for mean age and %females. Participants were volunteers (adults; predominantly female) from academic, workplace, or community settings. Most interventions utilized simplified Mindfulness-Based Stress Reduction protocols over 2–12 week periods. Post-intervention, significant medium effect found for perceived-stress ($g = 0.432$), with moderate heterogeneity and significant, but small, effect size for mindfulness ($g = 0.275$) with low heterogeneity; highest effects were for middle-aged individuals. At follow-up, significant large effect found for perceived-stress ($g = 0.699$) with low heterogeneity and significant medium effect ($g = 0.466$) for mindfulness with high heterogeneity. No publication bias was found for perceived-stress; publication bias found for mindfulness outcomes led to underestimation of effects, not overestimation. Number of eligible RCTs was low with inadequate data reporting in some studies. POMI had substantial stress reduction effects and some mindfulness improvement effects. POMI can be a more convenient and cost-effective strategy, compared to traditional face-to-face interventions, especially in the context of busy, hard-to-reach, but digitally-accessible populations.

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1. Context

Mindfulness can be described as deliberately paying attention, non-judgmentally, in the present moment with simultaneous awareness of thoughts, emotions, and physical sensations (Gunaratana, 1993). Traditionally, this concept originated in the Vipassana components of Theravada Buddhism from South-East Asia and Mahayana Buddhism (e.g., Zen) from East Asia (Kitagawa, 1979). These traditions, recognizing the busy mind, prized attaining a sense of choice and improving internalized control. In Western cultures, mindfulness is practiced as a spiritual exercise of Buddhism, but more commonly, as either a complementary psychotherapy for certain clinical conditions (i.e., treatment) or as secular attitudinal training for enhancing psychological functioning and relieving stress (i.e., prevention) (Chiesa, 2010). To date, no clear operational definition of “mindfulness” exists and terms like “meditation” and “mindful attention” are used interchangeably.

1.1. Rationale

Persistent stress leads to health problems such as cardiovascular disease, stroke, depression, upper respiratory tract infections, and autoimmune disorders (McEwen, 1998). For adults, it affects work performance and, for students, academic achievement through reduced productivity, high absenteeism and presenteeism that generate substantial financial burdens. For example, the estimated cost of U.S. workplace stress alone was \$125–190 billion per year (5%–8% of national health spending) (Goh et al., 2016). Numerous preventive mindfulness interventions have focused on managing occupational stress and enhancing work efficiency (Cohen-Katz et al., 2005). However, many face-to-face stress reduction interventions are fraught with excessive human resource allocations and time conflict issues. Meanwhile, mindfulness interventions conducted for treatment purposes (Reibel et al., 2001) outnumber those conducted for prevention of unhealthy conditions; for example, mindfulness studies designed to treat eating disorders (Kristeller and Hallett, 1999; Kristeller and Wolever, 2011; Kristeller et al., 2006) outnumber those for improving eating behaviors of non-clinical populations (Barnes et al., 2016). Nevertheless, recent surveys indicate that some wellness-related mind-body practices are increasingly popular among both U.S. adults and children (Black et al., 2015; Clarke et al., 2015; Stussman et al., 2015).

Online interventions are appealing because they are more cost-effective and user-friendly (Cutshall et al., 2011). In modern society, digital access and internet use have increased considerably (Zickuhr and Smith, 2012), especially among young people (Pew Research Center's Internet and American Life Project, 2012), with sizable portions of computer and smart phone use devoted to non-occupational pursuits, such as social networking and health tracking (Pew Research Center's Internet and American Life Project, 2012). While use of face-to-face interventions in institutional and community settings increased during the past decade as a strategy of complementary treatment, worksite performance enhancement, or stress management (Bohlmeijer et al., 2010; Grossman et al., 2004; Tsai and Crockett, 1993), preventive online mindfulness interventions (POMI) remain relatively uncommon. Mindfulness interventions conducted exclusively for prevention have varied widely by targeted health outcome and participant type, with only a few conducted online (Aikens et al., 2014; Allexandre et al., 2016; Cavanagh et al., 2013; Glueck and Maercker, 2011; Mak et al., 2015; Morledge et al., 2013; Wahbeh et al., 2016; Wolever et al., 2012). Therefore, a critical need exists to systematically assess the effectiveness of mindfulness interventions delivered online for the purpose of reducing perceived stress and increasing mindfulness since such an assessment has not yet been undertaken.

1.2. Objectives

To examine whether POMI, designed for non-clinical population improves short- and long-term outcomes related to perceived-stress (primary outcome) and mindfulness (secondary outcome), this meta-analysis reviewed randomized controlled trials (RCTs) comparing perceived stress and mindfulness outcomes of participants against non-participating control groups.

2. Evidence acquisition

2.1. Protocol

Inclusion criteria, outcome measures, and analysis methods were specified prior to literature search (Fig. 1) and documented in a protocol (Liberati et al., 2009).

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