

Article:

# Improvements in Stress, Affect, and Irritability Following Brief Use of a Mindfulness-based Smartphone App: A Randomized Controlled Trial

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Abstract:

Mindfulness training, which involves observing thought and feelings without judgment or reaction, has been shown to improve aspects of psychosocial well-being when delivered via in-person training programs such as mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT). Less is known about the efficacy of digital training mediums, such as smartphone apps, which are rapidly rising in popularity. In this study, novice meditators were randomly allocated to an introductory mindfulness meditation program or to a psychoeducational audiobook control featuring an introduction to the concepts of mindfulness and meditation. The interventions were delivered via the same mindfulness app, were matched across a range of criteria, and were presented to participants as well-being programs. Affect, irritability, and two distinct components of stress were measured immediately before and after each intervention in a cohort of healthy adults. While both interventions were effective at reducing stress associated with personal vulnerability, only the mindfulness intervention had a significant positive impact on irritability, affect, and stress resulting from external pressure (between group Cohen's  $d=0.44, 0.47, 0.45$ , respectively). These results suggest that brief mindfulness training has a beneficial impact on several aspects of psychosocial well-being, and that smartphone apps are an effective delivery medium for mindfulness training.

Discussion:

A newer, more accessible form of online, self-guided mindfulness interventions have begun to show considerable promise as a means to improve psychosocial well-being (Spijkerman et al. 2016). Online mindfulness interventions have successfully been used to reduce stress in a cohort of university students (Cavanagh et al. 2013) and reduce anxiety, depression, and insomnia in a patient population (Boettcher et al. 2014).

Our findings are largely consistent with previous reports that mindfulness training delivered through in-person or online formats has a beneficial impact on stress (Khoury et al. 2015), positive affect (Garland et al. 2015; Keng et al. 2011), and emotional reactivity and regulation (Britton et al. 2012; Hill and Updegraff 2012). Our results also expand a small but growing body of work suggesting that app-based mindfulness training increases aspects of well-being (Howells et al. 2014; van Emmerik et al. 2017). However, most online or app-based mindfulness studies have utilized wait-list control groups. Use of inactive controls has previously been raised as a methodological limitation, as they do not account for non-specific effects of intervention engagement and can limit interpretation of study findings (Davidson and Kaszniak 2015).

Digital delivery mediums may have the potential to address some of the methodological challenges associated with traditional interventions such as MBSR. For example, estimating the quantity or dose of mindfulness training in meditation research is often problematic

(Davidson and Kaszniak 2015). This is particularly true for interventions that involve self-reported home practice or engagement with an active control that cannot be directly measured. In this study, both the mindfulness and audiobook interventions were delivered via the same smartphone app, allowing engagement to be accurately tracked, and ensuring equal dosage across conditions. A further benefit of using the same delivery medium for both interventions is the ability to match user experience, with both programs featuring the same voice and visual interface.