



# Effects of mindfulness, reappraisal, and suppression on sad mood and cognitive resources



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## ABSTRACT

The present study investigated the relative effects of mindfulness, reappraisal and suppression in reducing sadness, and the extent to which implementation of these strategies affects cognitive resources in a laboratory context. A total of 171 Singaporean undergraduate participants were randomly assigned to receive brief training in mindfulness, reappraisal, or suppression prior to undergoing a sad mood induction. Individual adherence to Asian cultural values was assessed as a potential moderator of strategy effectiveness. Participants rated their mood and completed a Color-Word Stroop task before and after mood regulation instructions. Analyses using multi-level modelling showed that the suppression condition caused less robust declines in sadness over time compared to mindfulness. There was also a nonsignificant trend in which mindfulness was associated with greater sadness recovery compared to reappraisal. Suppression resulted in lower average sadness compared to mindfulness among those high on Asian cultural values, but not those low on Asian cultural values. Both mindfulness and reappraisal buffered against increases in Stroop interference from pre- to post-regulation compared to suppression. The findings highlight the advantage of mindfulness as a strategy effective not only in the regulation of sad mood, but also in the preservation of cognitive resources in the context of mood regulation.

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## 1. Introduction

Emotion regulation (ER) is a process through which individuals modify the expression and experience of their emotions (Gross, 1998). Disruptions in ER have been found to underlie a broad range of psychopathology, such as mood and anxiety disorders (Broderick & Metz, 2009; Goldin & Gross, 2010; Roemer et al., 2009). Specific strategies to achieve ER may be adaptive or maladaptive in different contexts. Two commonly examined strategies are reappraisal and suppression. Considered as an element of cognitive behavior therapy (CBT), reappraisal is frequently taught as a strategy to help patients re-interpret the meaning of emotion-inducing situations to reduce their emotional impact on them (Hofmann & Asmundson, 2008). Suppression, on the other hand, refers to attempts to inhibit both the external expression and internal experience of emotion (Dunn, Billotti, Murphy, & Dalgleish,

2009).

An additional ER strategy is mindfulness. Key to “third wave” behavioral therapies that emphasize present moment awareness, acceptance, and experiential change strategies as key elements of treatment (Hayes, Follette, & Linehan, 2004), mindfulness is taught as a practice to facilitate greater awareness and acceptance of one’s emotions. Mindfulness is commonly defined as the ability to pay attention to experiences in the present moment in an intentional, open, and nonjudgmental manner (Kabat-Zinn, 1994). There is a need to better understand the functions and effects of mindfulness compared to other established intervention techniques or regulation strategies.

To date, several studies have compared the effects of mindfulness or related processes to those of other strategies in regulating emotions. Studies examining the effects of acceptance (a subcomponent of mindfulness) have found a benefit for acceptance over suppression in lowering subjective anxiety (Braams, Blechert, Boden, & Gross, 2012; Levitt, Brown, Orsillo, & Barlow, 2004) and physiological arousal (Dunn et al., 2009; Hofmann, Heering, Sawyer, & Asnaani, 2009; but see Szasz, Szentagotai, & Hofmann, 2011; Hofmann et al., 2009). In one study, suppression was found

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to be more effective than acceptance in lowering subjective fear (Dunn et al., 2009), although it should be noted that in this study, instructions to suppress one's emotions also included suggestions to reappraise emotion-inducing stimuli. There is further evidence that acceptance instructions promote quicker recovery of negative emotions compared to suppression (Liverant, Brown, Barlow & Roemer, 2008), which is consistent with past research that demonstrated paradoxical increases in unwanted experience or physiological arousal as a result of suppression (Gross, 1998; Wegner & Zanakos, 1994). When compared with reappraisal, acceptance was either equally (Hofmann et al., 2009; Wolgast, Lundh, & Viborg, 2011) or less effective (Szasz et al., 2011) in lowering anxiety, anger, or distress in response to lab-induced stressors.

A related line of research has also examined the effects of experimentally-induced mindfulness, which typically involves instructions to regulate one's attention (with breath as a common anchor of attention) as well as acknowledge and accept experiences that arise moment-by-moment without judgment. Brief mindfulness exercise has been shown to be more effective than rumination or no instruction in alleviating subjective distress in healthy university students (Broderick, 2005), previously depressed individuals (Singer & Dobson, 2007), and currently depressed individuals (Huffziger & Kuehner, 2009). Brief mindfulness training has also been demonstrated to be superior to worry or control inductions in reducing emotional reactivity and down-regulating negative affect in non-clinical populations (Arch & Craske, 2006; Erisman & Roemer, 2010). A recent study (Keng, Robins, Smoski, Dagenbach, & Leary, 2013) found that both mindfulness and reappraisal instructions were equally effective in reducing sad mood in a sample of mildly depressed adults. It is unknown however the extent to which the findings generalize to healthy populations, as well as the relative effects of experimentally-induced mindfulness versus other known strategies, such as suppression.

Apart from subjective affect, one important outcome of ER concerns the cognitive costs and advantages of different ER strategies. As emotions often arise in the context of pursuing important goals, an advantageous strategy would be one that maintains optimal cognitive performance and self-regulation (Richards & Gross, 2000). To date, research has suggested that mindfulness may be a cognitively efficient ER strategy. A study by Keng et al. (2013) found that mildly depressed participants who engaged in a mindfulness induction performed better on a Stroop task compared to those assigned to a reappraisal condition following a negative mood induction procedure. Reappraisal is also a relatively cognitively efficient strategy (when compared to suppression; Richards & Gross, 2000; Richards, Butler, & Gross, 2003), although it is associated with increased cognitive load when implemented as an online strategy (i.e., after an emotional situation begins to unfold; Sheppes & Meiran, 2008; Urry, van Reekum, Johnstone, & Davidson, 2009). The findings suggest that both mindfulness and reappraisal may have context-dependent cognitive advantages as well as costs. With regard to suppression, studies conducted in Western contexts have consistently demonstrated increased cognitive and physiological cost associated with use of the strategy (Dunn et al., 2009; Hofmann et al., 2009; Richards & Gross, 2000) compared to reappraisal or acceptance. No study has yet directly compared the cognitive costs of mindfulness, reappraisal, and suppression in the context of sad mood regulation in an Asian, non-clinical sample.

As suggested above, the adaptiveness of emotion regulation may vary based on contextual factors. One important but often neglected contextual variable is culture. As cultures shape and reinforce emotional responses differentially, they may influence the extent to which different ER strategies are valued and help individuals

achieve desired goals (Kitayama, Markus, & Kurokawa, 2000; Matsumoto, 1990). One dimension of culture that has received some attention is endorsement of Asian cultural values, which emphasize interdependence, social harmony, emotion control, and hierarchy (Ford & Mauss, 2015; Kim, Atkinson, & Umemoto, 2001). In particular, research has investigated the role of Asian cultural values as a moderator of the effects of suppression. Whereas suppression is often used to promote self-protective purposes (especially in the context of social threats) in Western contexts, it may function to promote self-restraint and interpersonal harmony, which are highly valued in Asian cultures (Butler, Lee, & Gross, 2007). While suppression has largely been associated with maladaptive consequences in Western cultural contexts (Gross, 1998; Soto, Perez, Kim, Lee, & Minnick, 2011), there is evidence that use of the strategy is associated with less maladaptive psychological (Cheung & Park, 2010) and interpersonal outcomes (Butler et al., 2007) among individuals of Asian heritage or those adhering to Asian cultural values. As the majority of research on the association between culture and suppression is conducted in Western contexts, it is not known the extent to which the findings would be replicable in an Asian context, where endorsement of Asian cultural values is expected to be higher generally. Further, no research has yet explored whether adherence to Asian cultural values may differentially predict the effectiveness of ER strategies other than suppression, for example, mindfulness or reappraisal.

### 1.1. Specific aims and hypotheses

The present study aimed to compare the effects of mindfulness versus reappraisal and suppression on the regulation of sad mood in a nonclinical, Singaporean undergraduate sample. Based on past research, it was hypothesized that both mindfulness and reappraisal would be more effective than suppression in lowering sad mood. It was further predicted that mindfulness would result in the least depletion of cognitive resources, followed by reappraisal, and then suppression. A secondary goal of this study was to explore the potential role of Asian cultural values as a moderator of the effects of the three strategies, in particular suppression. We hypothesized that high endorsement of Asian values would predict more effective use of suppression, as reflected by greater reductions in sadness and less depletion of cognitive resources, relative to low endorsement of Asian values. It was an exploratory question whether Asian cultural values might also moderate the subjective and cognitive effects of mindfulness and reappraisal.

## 2. Methods

### 2.1. Participants

A total of 171 participants were recruited and randomly assigned to receive brief training in mindfulness ( $n = 57$ ), reappraisal ( $n = 57$ ), or suppression ( $n = 57$ ). Inclusion criteria were 1) age between 18 and 55 and 2) proficient in English. Participants were recruited from National University of Singapore (NUS)'s Department of Psychology undergraduate research subject pool and the larger student community. This population was selected as it was expected that there would be a range of adherence to Asian cultural values in the sample. In particular, the student body consists of English-speaking students from a number of Asian cultural backgrounds, with a majority endorsing Chinese heritage. Participants received either course credits or twenty dollars for completing the study. The study was approved by NUS' Institutional Review Board.

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