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## Better control with less effort: The advantage of using focused-breathing strategy over focused-distraction strategy on thought suppression



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### ABSTRACT

It has been suggested that unwanted thoughts usually intrude during mind wandering due to a shortage of mental resources. However, strategies for suppressing such thoughts have never been examined from a mind wandering perspective. Here, we compare the effectiveness of two types of attention distraction strategies that either redirect users' attention to their own breathing (focused-breathing strategy, FBS) or to a mental image (focused-distraction strategy, FDS) as related to working memory capacities. Eighty-two undergraduates were randomly assigned into a FBS or FDS group. They completed a concentration task and a thought suppression task, in which mind wandering and thought intrusions were each measured. Our results support the hypothesis that mind wandering is positively correlated to thought intrusions and shows that FBS is more effective than FDS in reducing mind wandering and thought intrusions. Moreover, in contrast to FDS, the effect of FBS is independent of users' mental resources.

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## 1. Introduction

How to effectively reduce the intrusion of unwanted thoughts is worth attention as such thoughts usually indicate one's failure of mental control and are associated, in their extreme forms, with psychological disorders such as depression, post-traumatic stress disorder, obsession, and anxiety. Additionally, if someone tries to suppress a thought directly, paradoxically, the unwanted thought is more likely to come to consciousness (for reviews, see [Abramowitz, Tolin, & Street, 2001](#); [Wenzlaff, Wegner, Sciences, Antonio, & Hall, 2000](#)). According to the ironic process of mental control theory ([Wegner, 1994, 1997](#)), unwanted thoughts are most often prone to occur during mind wandering, which is a phenomenon that describes one's attentional shift away from an ongoing task toward unrelated thoughts ([Smallwood & Schooler, 2006](#)). Mind wandering is usually a result of mental control failure ([Kane & McVay, 2012](#); [McVay & Kane, 2010](#); [Wegner, 1997](#)). However, it has never been examined from the perspective that the effectiveness of a thought-suppression strategy is related to how well it can reduce the tendency of mind wandering. In the current study, we aim to test this hypothesis by comparing two commonly-used strategies – focused-breathing strategy (FBS) and focused-distraction strategies (FDS) in terms of their effectiveness in reducing unwanted thought intrusions and mind wandering. In addition, we further examine their effects with respect to individual differences in mental capacities to test whether the two strategies involve similar underlying mechanisms of attention regulation.

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FBS and FDS are commonly mentioned thought suppression strategies among other promising ones (Wegner, 2011). Both of them are considered attention distraction strategies, with which a user shifts his attention to a specific distractor (Van Dillen & Papies, 2015). FDS users redirect their attention to a specific mental object or image (e.g., Lin & Wicker, 2007; Najmi, Riemann, & Wegner, 2009; Salkovskis & Campbell, 1994; Wegner, 2011). FBS instead has practitioners focus on a physical activity – their own breath. Attention distraction strategies are often regarded as effortful self-regulation strategies requiring exertion of mental resources (e.g., Muraven & Baumeister, 2000; Van Dillen & Papies, 2015). They are thought likely to inhibit mind wandering and intrusions of unwanted thoughts via top-down control.

Some evidence supports the effectiveness of attention distraction strategies in reducing unwanted thoughts. For example, in laboratory studies, FDS is reported to reduce thought intrusions or emotional reactions toward an unwanted thought (will be reviewed later). FBS, as a component of mindfulness intervention, has been found to be effective in reducing the strength of negative emotional responses elicited by negative stimuli or thoughts in clinical circumstances (Arch & Craske, 2006; Feldman, Greeson, & Senville, 2010; Goldin & Gross, 2010; Hooper, Davies, Davies, & McHugh, 2011). However, the effect of FBS per se has never been demonstrated using a thought suppression paradigm and has never been compared to FDS.

In the following, we review the effectiveness of FDS on thought suppression, followed by an analysis of the potential differences between FDS and FBS in terms of reducing mind wandering. Our prediction and two other possible alternatives about the relative effectiveness of these two strategies on reducing mind wandering and on thought intrusion as related to participants' working memory capacities will be discussed.

As the literature shows, FDS is generally useful to enhance the performance of thought suppression tasks, in which participants are asked to suppress one thought from consciousness for a short period (the suppression period). For example, redirecting attention to mental images or thoughts of a concept (e.g., a red Volkswagen) helps individuals to decrease the occurrence of a suppressed thought (such as "white bears") during or after the suppression period (Salkovskis & Campbell, 1994; Wegner, Schneider, Carter, & White, 1987). Another study also reported that, compared to those not instructed with specific strategies, participants told to focus on a familiar scene (such as one's own kitchen) decreased the intrusion of an embarrassing thought during the suppression period (Lin & Wicker, 2007). Another study, in which a recollection of an event was used as the distractor, instead reported that FDS reduced negative emotional reactions elicited by unwanted thoughts but not the frequency of intrusion (Najmi et al., 2009). In sum, previous studies of FDS generally show some beneficial effects of thought suppression, although they are different in terms of distractors used, the types of the to-be-suppressed thought, and the type of benefits. Since attention distraction strategies involve effortful top-down control, taking individual differences in cognitive capacity and the nature of the distractor into consideration should be helpful to further clarify their usefulness.

We hypothesize there are two reasons that FBS is a more effective way to reduce mind wandering and thought intrusions with less top-down effort when compared to FDS. First, in terms of the type of distractor, FDS appears to be more cognitively demanding than FBS as the former needs to represent or search for mental events continuously but the latter only has to stay attuned to an existing physiological activity. Second, several studies of mindfulness training, which include focusing-on-breath practice as one of the components, suggest that FBS is likely to quiet the mind with little top-down processing involved. As recent neuroimaging studies have shown, mindfulness training reduces the activation of the default mode network, a brain area known to be responsible for mind wandering (e.g., Holzel et al., 2007; Pagnoni, Cekic, & Guo, 2008). Long-term mindfulness practice is found to improve self-regulation without activating executive control regions (Chiesa, Serretti, & Jakobsen, 2013; Westbrook et al., 2013). Although a brief focusing-on-breath induction is known to be helpful for reducing mind wandering in a following cognitive task (Mrazek, Smallwood, & Schooler, 2012), whether FBS alone effectively reduces thought intrusion using less top-down control than other attention distraction strategies remains unclear.

To test the above hypothesis, we compared FDS with FBS in effectiveness on reducing mind wandering and unwanted thoughts with respect to individuals' mental capacities. We predict that (1) people using FBS in general will outperform those who use FDS on the tendency of mind wandering and the occurrence of unwanted thoughts, particularly participants with low working memory capacities; (2) the effectiveness of FDS relies on the users' working memory capacities; whereas there is no such correlation for the FBS group; (3) the tendency of mind wandering is positively correlated with the frequency of thought intrusion as the ironic process of mental control theory claims.

There are two other plausible relations between the types of strategy and participants' mental capacities. First, some might argue that individuals with higher working memory capacities always suppress better than those with lower ones, regardless of the strategy used. This account supports the speculation that FBS is just a subtype of attention distraction strategy and works through effortful top-down regulation as does FDS as Wenger suggests (2011). This is also in line with the general finding that participants' working memory capacities are negatively associated with a tendency of mind wandering or the occurrence of unwanted thoughts when no particular strategy is taught (Brewin & Smart, 2005; Kane & McVay, 2012; Kane et al., 2007; McVay & Kane, 2012).

Second, some argue that the correlation between individuals' working memory capacities and the frequency of intrusions is positive for FBS users and negative for FDS users. Rummel and Boywitt (2014) found that the relation between individuals' working memory capacities and their mind-wandering tendencies changes as the demands of the task vary. When task demand is high, those with low cognitive capacities find it more difficult to maintain the task goal and their thoughts are more likely to wander than people with higher capacities. In contrast, the group with greater capacities has extra mental resources to mind wander when task demand is low. Therefore, the correlation between participants' working memory

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