



Priming performance-related concerns induces task-related mind-wandering



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ARTICLE INFO

Keywords:

Mind wandering
Stereotype threat
Executive control

ABSTRACT

Two experiments tested the hypothesis that priming of performance-related concerns would (1) increase the frequency of task-related mind-wandering (i.e., task-related interference; TRI) and (2) decrease task performance. In each experiment, sixty female participants completed an operation span task (OSPAN) containing thought content probes. The task was framed as a math task for those in a condition primed for math-related stereotype threat and as a memory task for those in a control condition. In both studies, women whose performance-related concerns were primed via stereotype threat reported more TRI than women in the control. The second experiment used a more challenging OSPAN task and stereotype primed women also had lower math accuracy than controls. These results support the “control failures × current concerns” framework of mind-wandering, which posits that the degree to which the environmental context triggers personal concerns influences both mind-wandering frequency and content.

1. Introduction

Everyone has experienced starting a task, such as reading a journal article, only to find later that their thoughts have drifted to something else. Mind-wandering can involve intrusive thoughts that are somewhat related to the current task (e.g., “This article is confusing. I’m struggling to understand it.”), which is known as task-related interference (TRI). Other times the intrusive thoughts are completely unrelated to the task (e.g., “I’m getting hungry. What should I make for dinner?”), which are called task-unrelated thoughts (TUTs). TUTs have been the primary focus of mind-wandering research whereas mind-wandering about task performance is less well-studied (McVay, Meier, Touron, & Kane, 2013). It has been proposed that the degree to which one’s environmental context triggers one’s current concerns influences the *frequency* and *content* of one’s mind-wandering experiences (McVay & Kane, 2010). The current studies examine the effect of priming personal, performance-related concerns on mind-wandering (particularly TRI) as well as task performance.

2. Variations in frequency and content of mind-wandering

Mind-wandering occurs frequently with younger adults, on average, spending one third to one half of their daily lives thinking about something other than their current task (Kane et al., 2007; Klinger & Cox, 1987-1988; McVay, Kane, & Kwapil, 2009). Mind-wandering is even more frequent during laboratory tasks (Jackson & Balota, 2012; McVay et al., 2013). The frequency of mind-wandering varies among individuals, with individuals with lower executive control abilities mind-wandering more often (Kane et al.,

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<http://dx.doi.org/10.1016/j.concog.2017.08.002>

Received 25 April 2017; Received in revised form 4 August 2017; Accepted 5 August 2017

Available online 18 August 2017

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2007; McVay & Kane, 2009, 2012a, 2012b) than those with higher executive control abilities.

There are contrasting theories explaining the relationship between mind-wandering and executive control. One perspective posits that mind-wandering requires executive resources (Smallwood & Schooler, 2006). Individuals experience fewer TUTs during tasks with greater cognitive loads (Antrobus, 1968; Teasdale et al., 1995). Additionally, in-the-moment TUT reports predict performance errors on the ongoing task (Smallwood et al., 2004) and individual differences in executive control abilities are positively correlated with TUT frequency on simple tasks (Levinson, Smallwood, & Davidson, 2012). This suggests that individuals with more executive control resources use their additional resources to engage in mind-wandering.

However, other theories of mind-wandering propose that we use our executive resources to prevent mind-wandering experiences. According to the “control failures x current concerns” framework of mind-wandering proposed by McVay and Kane (2010), off-task thoughts are continuously and automatically generated in response to cues in one’s environment, and we use executive control resources to prevent these off-task thoughts from entering into conscious awareness. Mind-wandering is therefore believed to result from an interplay between one’s executive control abilities, one’s motivation to prevent off-task thoughts from entering consciousness, and the degree to which the environmental context primes one’s current concerns. There is evidence supporting this perspective. Individual differences in TUT frequency are positively correlated with control abilities on simple tasks (Levinson et al., 2012). Furthermore, frequency of TUTs predicts performance deficits on more attention-demanding tasks (McVay & Kane, 2009; McVay et al., 2009; Smallwood et al., 2004) as well as executive control attempts on ongoing, everyday tasks (Kane et al., 2017). Finally, individuals with greater executive control suffer as much as those with lower control in terms of task performance when they engage in mind-wandering (McVay & Kane, 2012a, 2012b). These outcomes suggest that, rather than using our executive control resources to engage in mind-wandering, we may instead use them to try to prevent mind-wandering when the ongoing task is difficult.

In addition to offering predictions regarding the frequency of mind-wandering, the “control failures x current concerns” framework can also predict the *content* of mind-wandering experiences. As mentioned, mind-wandering can be about things completely unrelated to the task (TUTs) or about concerns that are somewhat related to the task, such as evaluating one’s task performance (TRI). TRI differs conceptually from TUTs because they are task-related. However, TRI experiences are not quite on-task or directly about responding appropriately to the task stimuli and task demands. Although TRI is distinguishable from TUTs, many researchers consider TRI to be a variety of mind-wandering, given that TRI and TUTs are similarly associated with in-the-moments performance deficits (McVay & Kane, 2009; McVay et al., 2013; Mrazek et al., 2011; Smallwood, O’Connor, & Heim, 2005). Research conducted on the default mode network (DMN), a brain network that is active when individuals are at rest, has revealed that TUTs are associated with higher levels of DMN recruitment and on-task thoughts with lower levels of DMN recruitment. While TRI is not associated with as much DMN recruitment as TUTs, both TRI and distraction due to external environmental stimuli are associated with more DMN recruitment than on-task thoughts (Gonçalves et al., 2017). Given these findings, we also characterize TRI as a type of mind-wandering. TRI has been studied less frequently than TUTs and the thought probes used in many mind-wandering studies do not include TRI as a response option. Participants in these studies may therefore misclassify their TRI experiences as being on-task. In laboratory studies that have included TRI as a thought probe response option, younger adults report more TUTs, relative to both their TRI and TUTs by older adults, whereas older adults report more TRI, relative to both their TUTs and TRI by younger adults (Frank, Nara, Zavagnin, Touron, & Kane, 2015; Giambra, 1989; Grodsky & Giambra, 1990; Jackson & Balota, 2012; Krawietz, Tamplin, & Radvansky, 2012; McVay & Kane, 2012a; McVay et al., 2013). While the typical academic laboratory testing environment may cue everyday school-related concerns in younger adults (resulting in increased TUTs) this same testing environment may instead trigger concerns about cognitive decline in older adults (resulting in increased TRI). Therefore, the finding that younger adults report more TUTs and older adults report more TRI corroborates the perspective that one’s current concerns and the extent to which they are primed by the environmental context determines frequency and content of one’s mind-wandering experiences.

In the current studies, we provide a direct test of the “control failures x current concerns” framework by priming *performance-related concerns* in younger adults and assessing the impact on probe-caught off-task thoughts regarding the task (TRI). More specifically, we prime current, performance-related concerns in these younger adults using a stereotype threat intervention.

3. Stereotype threat and intrusive thoughts

Stereotype threat, or risk for behaving in a way that confirms a negative stereotype about a group one belongs to (Steele & Aronson (1995), has been linked to performance deficits on a variety of tasks in various marginalized groups. Different mechanisms have been proposed to explain the performance impairments typically observed in those under threat (for a review, see Schmader, Johns, & Forbes (2008)). These mechanisms include increased physiological stress, increased regulation of negative emotions, and increased monitoring of task performance. If a person under threat uses their resources to engage in task performance monitoring and active suppression of negative emotions (Schmader, Forbes, Zhang, & Mendes, 2009; Schmader et al., 2008; Schuster, Martiny, & Schmader, 2015), then fewer resources are available to respond appropriately to task stimuli and demands, resulting in impaired performance (Beilock, Rydell, & McConnell, 2007; Cadinu, Maass, Rosabianca, & Kiesner, 2005).

Although it has been proposed that stereotype threat increases task-related worries, research on the topic has been limited by the methodologies used to measure off-task thoughts. For example, previous work on stereotype threat and off-task thoughts has relied primarily on open verbal reports of intrusive thoughts. Coding schemes for these verbal reports may not include both TUTs and TRI (Cadinu et al., 2005) or may rely on participants thinking back and reporting on their mind-wandering episodes after the testing session is completed (Beilock et al., 2007). Retrospective mind-wandering assessments may result in mind-wandering episodes being systematically overlooked, because individuals may not always recognize or remember when their thoughts have drifted (Schooler, 2002; Smallwood, McSpadden, & Schooler, 2008).

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