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The role of task difficulty in theoretical accounts of mind wandering☆

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ABSTRACT

Recent research has indicated that reducing the difficulty of a task by increasing the predictability of critical stimuli produces increases in intentional mind wandering, but, contrary to theoretical expectations, decreases in unintentional mind wandering. Here, we sought to determine whether reducing task difficulty by reducing working-memory load would yield similar results. Participants completed an easy (Choice Response Time; CRT) task and a relatively difficult (Working Memory; WM) task, and intermittently responded to thought probes asking about intentional and unintentional mind wandering. As in prior studies, we found higher rates of intentional mind wandering during the easy compared to the more difficult task. However, we also found more unintentional mind wandering during the difficult compared to the easy task. We discuss these results in the context of theoretical accounts of mind wandering.

1. Introduction

One of the most theoretically important findings in the literature on mind wandering –conceptualized here as *task-unrelated thought*– is that people tend to engage in more mind wandering while completing easy, relative to difficult, tasks (e.g., Giambra, 1989; Smallwood et al., 2011; Teasdale et al., 1995; Thomson, Besner, & Smilek, 2013). Indeed, the finding that rates of mind wandering vary as a function of task difficulty has played a fundamental role in the development of theoretical models of mind wandering, and this common finding has been a central feature of what have arguably been the most influential accounts of mind wandering to date: The Attentional Resource account (Smallwood & Schooler, 2006) and the Executive Control Failures × Concerns account (McVay & Kane, 2010). Although both accounts have pointed to task-difficulty findings to support their respective claims, they have largely diverged in terms of their interpretation of *why* people tend to mind-wander more during easy, relative to difficult, tasks.

On the one hand, according to the Attentional Resource account (Smallwood & Schooler, 2006), good performance on easy tasks requires the employment of relatively few executive resources (as compared to more difficult tasks). Hence, easy tasks leave more resources to be co-opted by mind wandering than do difficult tasks, and as such, rates of mind wandering should be elevated in easy tasks. On the other hand, according to the Executive Control Failures × Concerns account (McVay & Kane, 2010), people experience more mind wandering in easy tasks because such tasks require less cognitive control than difficult tasks, and this relative lack of control is associated with more failures to "defend primary-task performance against interference from … thoughts [i.e., mind

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wandering]" (McVay & Kane, 2010, p. 195). Put differently, according to this account, the relative lack of cognitive control that is required when completing easy tasks permits more frequent intrusions of task-unrelated thoughts into consciousness.

Although these two accounts have been pitted against each other, and although there has been much debate over which of the two accounts is most apt (see, for example, McVay & Kane, 2010), Smallwood (2013) has more recently speculated that these accounts focus on different components of the mind-wandering episode, and that as such, they are *not* mutually exclusive. Specifically, Smallwood proposed a distinction between the "ignition point" of a mind-wandering episode (i.e., the moment at which an episode begins) and the continuation and maintenance of an already initiated episode. He further suggested that, whereas McVay and Kane's (2010) Executive Control Failures × Concerns account is concerned with the ignition point, Smallwood and Schooler's (2006) Attentional Resource account is concerned with the continuation of mind wandering. As such, according to Smallwood (2013), it is not problematic to conclude that (a) easy tasks are associated with more mind wandering because they require less cognitive control than do difficult tasks, and this lack of control permits more intrusions of task-unrelated thoughts (à la McVay & Kane's, 2010, account), and to concurrently conclude that (b) once mind wandering has been initiated, easy tasks will leave available more executive resources to support mind wandering, which should in turn be associated with a higher frequency of mind-wandering reports in easy relative to difficult tasks (à la Smallwood & Schooler's, 2006, account).

While these accounts of mind wandering make general claims about the relation between task difficulty and mind wandering, it is important to consider the possibility that not all manipulations of task difficulty are equal, and that as such, different manipulations of task difficulty might have different effects on rates of mind wandering. Consistent with this view, although most studies have shown that increasing task difficulty leads to lower rates of mind wandering (e.g., Smallwood et al., 2011; Thomson et al., 2013), there is some evidence that an increase in task difficulty can, under certain experimental conditions, (a) lead to *more* mind wandering (e.g., Feng, D'Mello, & Graesser, 2013; Xu & Metcalfe, 2016), or (b) have *no effect* on rates of mind wandering (e.g., Grodsky & Giambra, 1990; see rates of mind wandering during their reading task; Seli, Risko, & Smilek, 2016). With respect to the observation that increased task difficulty can lead to increased rates of mind wandering, Xu and Metcalfe (2016; Experiment 3) had participants study English-Spanish word pairs that were classified either as easy, moderately difficult, or difficult, and obtained probe-caught reports of mind wandering while participants studied the word pairs.[1] Results indicated that, whereas rates of mind wandering were significantly lower in the moderately difficult compared to the easy condition, they were significantly higher in the difficult compared to the moderately difficult condition. With respect to the observation that task-difficulty manipulations need not always influence rates of mind wandering, both Grodsky and Giambra (1990) and Seli, Risko, and Smilek (2016) have found that certain manipulations of task difficulty do not differentially affect rates of mind wandering (i.e., rates of mind wandering were the same across their easy and difficult conditions).

Given the prominent role that task-difficulty findings have played in theoretical accounts of mind wandering (e.g., McVay & Kane, 2010; Smallwood & Schooler, 2006), it is important that the field obtains a clearer understanding of why different manipulations of task difficulty may produce unique patterns of mind wandering. One way to shed light on this issue is to consider the intentionality of mind wandering when examining the effects of task-difficulty manipulations. More specifically, mind wandering has often been measured as a unitary construct, and the intentionality associated with episodes of mind wandering has been largely ignored because it has been assumed that mind wandering is unintentional in nature (e.g., Bixler & D'Mello, 2014; Blanchard, Bixler, Joyce, & D'Mello, 2014; Carciofo, Du, Song, & Zhang, 2014; Qu et al., 2015; Rummel & Boywitt, 2014). However, there is a growing body of evidence, from both the laboratory (e.g., Forster & Lavie, 2009; Robison & Unsworth, 2018; Seli, Ralph, Konishi, Smilek, & Schacter, 2017; Seli, Ralph, Risko, et al., 2017) and the "real world" (e.g., Wammes, Boucher, Seli, Cheyne, & Smilek, 2016; Wammes, Seli, Cheyne, Boucher, & Smilek, 2016), showing that people experience not only unintentional mind wandering, but also intentional mind wandering. Additionally, it has been shown that traditional measures of "overall" mind wandering (which do not distinguish between intentional and unintentional types) conflate these two different types of cognitive experiences (e.g., Seli, Carriere, & Smilek, 2015). Moreover, and critical for the present focus, there is evidence that certain manipulations of task difficulty can differentially impact rates of intentional and unintentional types of mind wandering.

In particular, in recent work, Seli, Risko, and Smilek (2016) had participants complete either an easy or a relatively difficult version of a commonly used go-nogo task known as the Sustained Attention to Response Task (SART; Robertson, Manly, Andrade, Baddeley & Yiend, 1997), and used thought probes to sample rates of intentional and unintentional mind wandering during the tasks. In the difficult version of the SART, participants were presented a series of single digits (1–9) and were instructed to respond (via button press) to each digit except the digit '3', to which they were to withhold their response. Importantly, in this difficult version of the SART, the target digit was pseudo-randomly presented, which made it difficult for participants to predict its occurrence. Conversely, in the easy version of the SART, the presentation of the target digit was completely predictable (it was presented every ninth trial), which made the task relatively easy. Critically, results of Seli, Risko, and Smilek's study showed that, whereas rates of intentional mind wandering were greater in the easy relative to the difficult task, rates of unintentional mind wandering were greater in the difficult relative to the easy task. This latter finding was surprising because it is at odds with the general view that unintentional mind wandering ought to *decrease* with increasing in task difficulty (e.g., McVay & Kane, 2010; Smallwood & Schooler, 2006).

Importantly, in Seli, Risko, & Smilek's (2016) study, the task-difficulty manipulation used was unique in that reducing task difficulty involved making the "easy" task more predictable. This unique aspect of the easy task might have led to the counterintuitive finding that unintentional mind wandering was greater in the difficult than in the easy task. Indeed, given that many trials in the easy

[1] The probe-caught methodology involves intermittently presenting participants with "probes" that ask them to report whether they are focused on a task or engaged in task-unrelated thought.