Motivating meta-awareness of mind wandering: A way to catch the mind in flight?

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ABSTRACT

Given the negative effects of mind wandering on performance, it may be profitable to be aware of task-unrelated thoughts (TUTs) as they occur. The present study investigated whether motivating people to catch TUTs increases meta-awareness. We offered incentives for increased self-catching during reading. To enhance the veracity of these self-reports, we used a "bogus-pipeline" procedure; we convinced participants that their mental states were being covertly monitored using physiological measures. In reality, mind wandering was assessed covertly by a secondary task ("gibberish detection"), and overtly by experience sampling. The results showed that incentives increased the number of self-catches without increasing overall mind wandering. Moreover, both the bogus pipeline and the opportunity for incentives increased the validity of self-reports, evidenced by significantly increased correlations between self-caught and behaviorally assessed mind wandering. We discuss the relevance of this methodological approach for research on mind wandering and research building on introspective reports more generally.

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1. Introduction

As conscious beings, we share one common experience; we often lose track of our thoughts. Rather than focusing on the here and now, we get lost in thoughts that are unrelated to the current context, a phenomenon referred to as mind wandering (Antrobus, Singer, Goldstein, & Fortgang, 1970; Smallwood, McSpadden, & Schooler, 2008; Smallwood & Schooler, 2006). Findings from experience sampling studies suggest that mind wandering pervades almost half of our waking hours (e.g., Killingsworth & Gilbert, 2010; Risko, Anderson, Sarwal, Engelhardt, & Kingstone, 2011). Remarkably, much of this time, the very fact that we are mind wandering escapes our conscious experience. In these instances, mind wandering is said to occur without meta-awareness (e.g., Schooler, 2002).

There are good reasons to want to be meta-aware of one's mind wandering. Mind wandering leads to severe performance deficits on a broad range of tasks, including attention and memory tasks (Carriere, Cheyne, & Smilek, 2008), reading comprehension (Schooler, Reichle, & Halpern, 2004; Smallwood et al., 2008), and error detection (e.g., Schad, Nuthmann, & Engbert, 2012; Zedelius et al., in preparation). In situations in which it is critical to focus one's attention on the here and now, such as when driving a car, mind wandering can even lead to life-threatening accidents (Galera et al., 2012; Stutts, Reinfurt, Staplin, & Rodgman, 2001). Thus, it is not hard to see why it would be desirable to become aware of it when one's mind wanders

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off-task. The goal of the current study was to test whether increasing people's motivation to become aware of their mind wandering can help increase their meta-awareness of it.

A number of studies have investigated the distinction between mind wandering occurring with and without meta-awareness (e.g., see Schooler, 2002; Schooler et al., 2004, 2011; Smith et al., 2006). These studied have usually employed an experimental paradigm in which participants are asked to monitor their thoughts while performing a task (e.g., reading text) and to press a button whenever they catch themselves mind wandering. In addition to these self-catches, participants are given "thought probes" at random moments cuing them to report whether they were mind wandering in that moment. Whenever a participant responds positively to a thought probe but has failed to self-catch, it is assumed that the person was unaware of their mind wandering prior to being probed. It is typically found that participants are meta-aware of only a small proportion of their mind wandering episodes (e.g., Schooler et al., 2004).

Few studies have tried to discern the processes that lead to meta-awareness. The findings from these studies suggest that contextual factors can affect the likelihood that a person becomes meta-aware of his/her task-unrelated thoughts. For instance, alcohol consumption (Sayette, Reichle, & Schooler, 2009) and cigarette craving (Sayette, Schooler, & Reichle, 2010) both reduce self-caught mind wandering, while simultaneously increasing the frequency of probe-caught mind wandering episodes, indicating reduced meta-awareness of mind wandering. In these studies, the reduction of meta-awareness was attributed to executive failure, due to craving for an addictive substance (alcohol or cigarettes).

Only one study (Baird, Smallwood, Fishman, Mrazek, & Schooler, 2013) can be said to have touched on motivational influences on meta-awareness. In this study, participants attempted to suppress thoughts about a previous romantic relationship. Interestingly, those participants those who had a stronger desire to re-connect with their previous partner, compared to those who had "moved on", were less likely to self-catch spontaneous thoughts about their partner, yet they were more likely to report such thoughts when probed. Thus, the desire to re-connect had a similar effect as alcohol or cigarette craving. Motivation may play a role in this pattern in so far as individuals who have a greater desire to re-connect with their former partner may be motivated to suppress thoughts of their former partner from entering their awareness.

While these previous studies have revealed that contextual factors can lead to a *decrease* in meta-awareness, the present study is the first to test whether it is possible to *increase* meta-awareness of task-unrelated thoughts. Specifically, we tested whether meta-awareness can be increased by offering incentives for frequent self-catching of task-unrelated thoughts. It is well-documented that promising incentives for a task increases motivation and causes people to allocate greater mental resources toward executing the task, leading to better performance (e.g., Bonner & Sprinkle, 2002; Locke, Shaw, Saari, & Lathem, 1981; Ridderinkhof, van den Wildenberg, Segalowitz, & Carter, 2004). Thus, we reasoned that offering incentives for catching task-unrelated thoughts would facilitate keeping the goal of self-catching in mind and increase efforts at monitoring one's thought content and detecting conflict when task-unrelated thoughts arise (see Botvinick, Cohen, & Carter, 2004). As a result, we predicted that incentives tied to self-catching would increase meta-awareness.

Offering incentives for performing a behavior that is assessed only by self-report, such as self-catching task-unrelated thoughts, introduces a special methodological challenge: If the self-reported behavior is increased, this could reflect a genuine increase in meta-awareness, or it could reflect inaccurate or untruthful self-reports. For instance, offering incentives for self-catching could result in participants adopting a more liberal interpretation of what constitutes a task-unrelated thought, leading to more frequent reports of mind wandering. Indeed, recent research has shown that people vary in the confidence they have in their own self-reports of mind wandering (Seli, Jonker, CHeyne, Cortes, & Smilek, 2015), suggesting that there is room for introducing bias. Moreover, given people's eagerness to gain rewards, offering incentives for frequent self-catching may encourage participants to make untruthful reports, again leading to over-reporting of mind wandering. The problem of verifying self-report measures is a problem not only for mind wandering research, but for any research using measures that rely on introspection and metacognitive judgments (see Jack & Roepstorff, 2002; Jack & Shallice, 2001; Marcel, 2003; Overgaard & Sandberg, 2012; Schooler & Schreiber, 2004).

Previous studies have addressed the problem of inaccurate or dishonest self-reports in the context of mind wandering (Seli et al., 2015; Vinski & Watter, 2012). Instead of self-caught mind wandering, these studies focused on participants' self-reports in response to thought probes. Seli et al. (2015) asked participants to report not only whether they were mind wandering or not during a task, but also how confident they were in their self-reports. They found that self-reports made with high confidence showed a stronger relationship with behaviorally assessed mind wandering than low-confidence self-reports. Vinski and Watter (2012) focused on experimentally increasing the likelihood of honest self-reports of mind wandering. They implicitly primed participants with words related to the concept of honesty (compared to neutral words) before asking them to perform a sustained attention task (Robertson, Manly, Andrade, Baddeley, & Yiend, 1997) with thought probes. The authors reasoned that more honest self-reports should be reflected in a stronger correlation between self-reported mind wandering and behavioral indices of mind wandering derived from task performance. And indeed, for participants primed with honesty, compared to those in the control condition, a stronger correlation between probe-caught mind wandering and performance was observed. These results suggest that the validity of self-reports to thought probes can be enhanced by implicitly motivating participants to be honest.

In the present study, a more heavy-handed approach was taken to encourage truthful self-reports. First, we used a so-called "bogus-pipeline" procedure (see Jones & Sigall, 1971), that is, we convinced participants that we could covertly monitor their mind wandering using eye-tracking measures while they read a story for comprehension. Specifically, we told participants that mind wandering could be assessed reliably by measuring pupil dilation and eye movements. Because we only created a facsimile of an eye-tracker for this manipulation, these claims were "bogus" in the present work. However