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# Spontaneous Repetitive Thoughts Can Be Adaptive: Postscript on McKay and Vane (2010)

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When researchers use the term *mind wandering* for task-unrelated thoughts in signal detection tasks, we may fall into the trap of believing that spontaneous thoughts are task unrelated in a deeper sense. Similar negative connotations are attached to common terms like *cognitive failures*, *resting state*, *rumination*, *distraction*, *attentional failures*, *absent-mindedness*, *repetitiveness*, *mind lapses*, *going AWOL in the brain*, *cortical idling*, and the like. Nevertheless, it seems obvious that mathematicians and scientists often engage in spontaneous repetitive thoughts and that the results of those thoughts are by no means maladaptive. Yet that seems to be implied by the standard use of common terms in the research literature. As humans, we know that spontaneous ideation goes on during all of our waking hours, during dreams and even in slow-wave sleep. It is unlikely that such a great allocation of mental resources has no useful adaptive function. This view of the spontaneous stream is consistent with the perspective of global workspace theory on conscious contents, which suggests that conscious events are not like unconscious cognitive representations. Rather, conscious events trigger widespread adaptive changes in the brain, far beyond their cortical origins. The brain evidence for such "global broadcasting" triggered by conscious (but not matched unconscious) events throughout the cortex is now quite compelling. Spontaneous conscious thoughts, even if they appear to arbitrary, irrelevant, unwanted, or intrusive, may still play an important adaptive role in life-relevant problem solving and learning.

*Keywords:* consciousness, spontaneous thought, experience monitoring, resting state, default state



What scientists expect their subjects to do may not be what those subjects end up doing. This point may be critical when researchers study spontaneous thoughts by assigning people a competing task, especially one that may be personally unimportant. The spontaneous stream of thought has been studied using thought reports concurrent with signal-detection tasks, asking subjects for both "task-related" and "task-unrelated" thoughts (Antrobus, 1999; Singer, 1993). Yet a tricky question emerges: When is the experimenter entitled to define task-relevance? After all, being in an experiment is only a fleeting episode in the subject's life. When we use the term *mind wandering* for task-unrelated thoughts, we may be falling into the trap of believing that spontaneous thoughts are task unrelated in a deeper sense. A similar stigma is attached to terms like *cognitive failures*, *resting state*, *rumination*, *distraction*, *attentional failures*, *absent-mindedness*, *repetitiveness*, *mind lapses*, *going AWOL in the brain*, *cortical idling*, and the like (Smallwood, O'Connor, & Sudberry, 2007; Smallwood & Schooler, 2006). Indeed, the spontaneous activity of the brain during rest breaks from an experimental task was initially called a "default" or "resting state," when it is in fact an extremely active state and one that is plausibly in pursuance of fundamental life tasks (Dehaene & Changeux, 2005; Delamillieure et al., 2009).

Are we being misled by such tendentious labels? I believe we often are. William James remarked, when he was accused of being absent-minded, that he was really just present-minded to his own thoughts (Barzun, 1983). Smallwood and Schooler (2006) made a similar point by suggesting that "mind-wandering can be seen as a goal driven process" (p. 946). Nevertheless, Christoff, Gordon, Smallwood, Smith, and Schooler (2009) wrote that "neural recruitment in both default and executive network regions was strongest when subjects were unaware of their own mind wandering, suggesting that mind wandering is most pronounced when it lacks meta-awareness" (p. 8719). The problem is that human beings are likely to be the most deeply absorbed and hence the least self-aware during the most important experiences of their lives. The absence of self-consciousness at such times may not be mind-wandering but rather, as James called it, present-mindedness to what is most important.

The stream of spontaneous thought is remarkably rich and self-relevant, reflecting one's greatest personal concerns, interpersonal feelings, unfulfilled goals and unresolved challenges, worries and hopes, inner debates, self-monitoring, feelings of knowing, visual imagery, imaginary social interactions, recurrent beliefs, coping reactions, intrusive memories, daydreams and fantasies, future plans, and more—all of which are known to guide the stream of thought. Spontaneous ideation goes on during all of one's waking hours, according to randomly timed thought-monitoring studies (Klinger, 1999; Singer & Salovey, 1999). However, it continues even during sleep. All humans have 90–120 min per night of REM dreams, which involve vivid, emotional, and dramatic experiences, judging by both brain activity and immediate reports (Payne, Stickgold, Swanberg, & Kensinger, 2008). Surprisingly, even slow-wave sleep shows reportable inner speech,

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especially in the first half of the night (Steriade, 2006). It is unlikely that such a great allocation of mental resources has no cognitive function.

Take spontaneous repetitiveness, which may occur so often as to appear highly redundant to an outside observer. Ruminative thought has often been found to be a feature of depressive mood (Smallwood et al., 2007). But in a comprehensive review, Smith and Alloy (2009) have pointed out that "there is no unified definition of rumination or standard way of measuring it. In addition, it remains unclear how rumination relates to other similar constructs, such as private self-consciousness, emotion focused coping, worry, or *repetitive thought processes more generally*" (p. 116; italics added).

The conceptual danger is that one may confuse the mere repetitiveness of thoughts with negative or depressogenic thinking. The research literature has focused on negative thoughts for obvious reasons. But much evidence suggests that the stream of spontaneous thoughts in general cannot be viewed as depressogenic. For example, there is evidence that frequent spontaneous positive thoughts may increase positive mood (Cohn, Frederickson, Brown, Mikels, & Conway, 2009). More generally, it seems intuitively likely that mathematicians, expert chess players, and other mental problem solvers spend much time dwelling on repetitive ideas but that the results are highly functional.

This does not contradict the link between "brooding" and depression. It merely emphasizes that the content of repetitive thoughts is as important as the mere fact of repetition. Conway, Csank, Holm, and Blake (2000) made this distinction clear by renaming the relevant construct "Rumination *on Sadness*" (Table 1; italics added). Further research may even distinguish what may be called "resilient, problem-solving rumination on sadness" versus "helpless rumination on sadness." The latter may keep people worrying and brooding in a helpless way. Yet resilient, problem-solving thinking about life problems may well lead to genuine solutions. That idea certainly drives a great deal of cognitive therapy.

It seems that one's approach to negative thoughts may be either depressogenic or healthy. Thus, Cohn et al. (2009) showed that spontaneous positive thoughts predicted both resilience and life satisfaction. Such findings should not come as a surprise. After all, learning and problem solving often take conscious rehearsal, and that fundamental fact may apply to the inner stream of thought as well as external events.

This more adaptive view of the spontaneous stream of thought is consistent with the perspective of global workspace theory on conscious contents, which suggests that conscious cognitions are not like unconscious ones. Rather, conscious cognition is a special kind of cognitive event that triggers widespread adaptive changes in the brain, far beyond its cortical origins. The evidence for such "global broadcasting" triggered by conscious (but not matched unconscious) events throughout the cortex is now quite compelling (e.g., Baars, 1988, 1997, 2002; Baars & Gage, 2007; Dehaene & Changeux, 2005; Doesburg, Green, McDonald, & Ward, 2009). Spontaneous repetition of conscious thoughts, even if they are unwanted and intrusive, may therefore play an important adaptive role. Because the domain of spontaneous thoughts is so vast and has only been very selectively studied, we must beware of generalizing from limited samples to the entire stream of thought.

Baars and Franklin (2003) maintained that conscious contents are essential for accessing and controlling working memory, which can be viewed as the broad cognitive domain in which one can mobilize novel cognitive resources for some 10 to 30 s. Conscious thoughts also interact with an even larger domain of unconscious long-term memories, semantics, and automatic mental routines.

Smallwood and Schooler (2006) addressed mind-wandering in the context of executive attention, which is clearly life relevant. Effortful attention correlates with the Five Factor component of Conscientiousness as well as with persistence in problem-solving, general intelligence, and activation of the anterior cingulate and dorsolateral prefrontal cortex (Duncan & Owen, 2000). Executive attention is obviously vital under many circumstances. Nonetheless, a hunter-gatherer who successfully directs attention to arbitrary events only to lose track of spontaneous, emotionally relevant thoughts is not likely to make the best choices. Conscious capacity is notoriously limited, and humans need to strike a dynamic balance between spontaneous and effortful objects of attention.

Like the play of children, the contents of reported thoughts may not reveal their relevance explicitly because much spontaneous thought is guided by implicit motivation (Devos & Banaji, 2003). Major life tasks like grammar learning are implicit, as are many varieties of problem solving, social cognition, emotional coping, and intuitive judgments. Such processes are not accurately reportable or controllable. Yet such seemingly random thoughts are not necessarily mind-wandering. They may be more relevant than a button-pressing task.

It is useful to remember that experimental subjects who are college students are in the midst of major life changes and that they may well be riding an emotional rollercoaster that experimenters simply do not know about. Under those conditions it is difficult to maintain that beep detection is or even should be the most relevant task in their lives, even during an experiment.

Teachers and professors spend much of their lives drawing the attention of distractible students to their favorite topics, whether it be medieval scholasticism, eye-blink conditioning, or the rules of French grammar. Perhaps our classroom values are spilling over into the research domain; our emphasis on executive control of attention may, in fact, include a bit of academic imperialism. Fortunately, such biases should be open to correction.

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