CHAPTER

3

Capturing the dynamics of creative daydreaming

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Mind wandering is a peculiar mental state that is at once intimately familiar to us and yet remains somewhat elusive. Although difficult to subsume in a single formal definition (Seli et al., 2018), mind wandering refers a class of interrelated and overlapping phenomena that can be broadly described as "thinking about something other than the here and now." More specific terms are *task-unrelated thought*, when it intersects a concurrent task, or *stimulus-unrelated thought* to denote the disconnect from one's environment, whether or not that includes an explicit task (Schooler et al., 2011; Singer, 1975; Singer & Schonbar, 1961; Smallwood & Schooler, 2006; Teasdale et al., 1995). Another term, *spontaneous cognition*, stresses the *unconstrained* or *unguided* quality that appears to set apart mind wandering from focused thought (Christoff, 2012; Christoff, Irving, Fox, Spreng, & Andrews-Hanna, 2016; Irving & Thompson, 2017). A more general term is daydreaming. Here, we use the terms mind wandering and daydreaming interchangeably. We use more specific term when we want to refer to a specific aspect of mind wandering.

Perhaps the reason why these familiar mental states can seem mysterious to us is that we typically do not notice when our mind starts to wander. We lack meta-awareness—awareness of the contents of our own thoughts (Schooler, Reichele, & Halpern, 2004; Smallwood & Schooler, 2006; Zedelius, Broadway, & Schooler, 2015)—until the moment when we suddenly catch our absent mind or somebody calls it to our attention. At times, it is difficult even then to recall whether we have been daydreaming and what about, much like when waking up from a dream in the night (Seli, Jonker, Cheyne, Cortes, & Smilek, 2015). Another way in which mind wandering remains mysterious is that it is not obvious why we do it, or what, if anything, it is for. Deficits in attention and awareness

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with regard to the present moment are dysfunctional in many ways (Forster & Lavie, 2014, 2016; Barron, Riby, Greer, & Smallwood, 2011; Killingsworth & Gilbert, 2010; Mooneyham & Schooler, 2013; Smallwood, Fishman, & Schooler, 2007; Wammes, Seli, Cheyne, Boucher, & Smilek, 2016; Watkins, 2008), but our tendency to mind wander could also fulfill some function (e.g., Baars, 2010; Smallwood & Andrews-Hanna, 2013; Watkins, 2008). Creativity has often been proposed as such a function (Singer, 1975; Singer & Schonbar, 1961).

Creativity is commonly defined as the generation of novel and useful ideas (Amabile, 1983, 1996; Boden, 1994; Runco, 1988; Sternberg & Lubart, 1999). The aspect of making something *novel* is also essential to artistic expressions of creativity. It seems intuitive that the tendency of our mind to periodically decouple from physical reality could aid the process of generating new ideas that are not "out there" yet or imagining a novel solutions or a piece of art. Supporting this intuition, there is a noteworthy overlap between the neurocognitive processes involved in mind wandering and those involved in idea generation.

Mind wandering is associated with activity in a large neural network called the default network (DN), which includes regions in the medial prefrontal cortex, medial and lateral parietal cortices, and medial temporal regions. The network was termed default because it shows greater activity during undemanding tasks or when at rest, while being suppressed during attention-demanding tasks (Buckner, Andrews-Hanna, & Schacter, 2008; Buckner & Vincent, 2007; Kucyi & Davis, 2014). Thus, it seemed to reflect the default state of the mind, in the absence of cognitive demand. However, besides rest and mind wandering, the DN is also associated with self-referential thinking, remembering the past and imagining the future (Greicius & Menon, 2004; Gusnard, Akbudak, Shulman, & Raichle, 2001; Mason et al., 2007; Spreng, Mar, & Kim, 2009), suggesting that the network is not so much associated with a *passive* mental state as with "internally oriented" cognition (Andrews-Hanna, Smallwood, & Sprenk, 2014; Zabelina & Andrews-Hanna, 2016). This fits with the common experience of mind wandering as involving often very active thinking, planning, and reasoning.

Although mind wandering has been predominantly associated with DN activity, it also involves regions in the executive control network, specifically the dorsal anterior cingulate cortex and the dorsolateral prefrontal cortex, which are typically associated with task-focused attention (e.g., Christoff, Gordon, Smallwood, Smith, & Schooler, 2009; Fox, Spreng, Ellamil, Andrews-Hanna, & Christoff, 2015). This coactivation of both default and executive control network regions could have to do with the inherent conflict that exists between the intention to focus on task-related thought and engaging with task-unrelated daydream contents, or it could be indicative of more controlled regulation of one's thoughts or reflection on daydream contents.

Both the DN and the executive control network have also been implicated in creative idea generation (Beaty, Benedek, Kaufman, & Silvia, 2015; Beaty, Benedek, Silvia, & Schacter, 2016; Beaty, Benedek, et al., 2014, Beaty, Silvia, Nusbaum, Jauk, & Benedek, 2014; Kühn et al., 2014; Mayseless, Eran, & Shamay-Tsoory, 2015). For instance, Mayseless et al. recorded fMRI data while participants generated creative uses for common objects (creative condition) or listed common features of objects (control condition). The creative condition showed increased activity in both DM and executive network regions, a finding that was interpreted as reflecting the interplay of generating ideas while also reflecting on the novelty and relevance of the ideas. In a similar study using the same task setup, Beaty et al. (2015) examined the functional connectivity between core hubs of the different brain networks throughout the creative idea generation process. They found that core hubs of the DN, which were active throughout the task, showed increased connectivity with executive network regions later on in the process. This, likewise, seems to speak more to the temporal dynamic of the creative process, which starts with more unconstrained associative thinking early on and more critical, evaluative processes toward the end.

These studies not only suggest an overlap between the neural activity and cognitive processes underlying mind wandering and creative thinking but also highlight the complex and dynamic nature of our creative thought processes and our spontaneous thoughts. In this chapter, we examine how these dynamics intersect and relate to each other. We begin by examining what happens when our mind is *disengaged* from a problem: How does mind wandering affect processes involved in the generation of new ideas and creative insights? Then, we turn our attention to the question of what a mind that is *disengaged* from the here and now is in fact *engaged* in: Research has shed a light on various different qualities of spontaneous thoughts. Moreover, people differ in the contents that habitually occupy their spontaneous thoughts. We review how these different qualities and contents of mind wandering relate to creativity.

Spontaneous insights from absent minds

Although creative breakthroughs sometimes seem to happen very suddenly, the process that leads to a creative idea or solution unfolds over time and involves many component processes, including the retrieval of associated representations in memory, the suppression of irrelevant or unoriginal information, and the recombination of memory representations into novel ideas (e.g., Beaty, Silvia, Nusbaum, Jauk, & Benedek, 2014; Ellamil, Dobson, Beeman, & Christoff, 2012; Mednik, 1962). The fact that ideas sometimes seem to come out of nowhere, and come to us while we

are busy doing something completely unrelated, suggests that these processes can operate unconsciously while our conscious attention is focused on something else. This possibility has led to the concept of "incubation," the strategy of pausing conscious work on a problem in the hopes that unconscious processes continue to take place and lead to an eventual creative insight (Wallas, 1926). Sometimes, we put our work on a tricky problem on hold because we hit a wall or because other tasks are more pressing, only to find the solution in an unexpected moment of insight. Studies have found evidence that incubation can indeed facilitate creativity, but a robust effect is not always observed: A metaanalysis of the literature found that incubation effects are more likely when the incubation period is filled with a relatively undemanding task (Sio & Ormerod, 2009). Since undemanding tasks are associated with increased mind wandering (Smallwood & Schooler, 2006), could mind wandering play a role in the incubation effect?

Baird et al. (2012) first tested the effect of mind wandering on creative incubation using an unusual uses task. After performing a round of the unusual uses task, participants were interrupted and assigned to one of these conditions: performing an undemanding reaction time task (0-back task), a moderately demanding version of the same task (1-back task), and taking a passive break or no break. Next, participants performed a second round of the unusual uses task in which they generated more creative uses for the same objects as in round 1 (repeated-exposure trials) and for novel objects (new-exposure trials). Participants reported significantly more unique ideas on repeated-exposure trials in the undemanding task condition compared with the other three conditions. Mind wandering rates, assessed retrospectively through questionnaire, were also higher in that condition, supporting the prediction that mind wandering facilitates creative incubation. It is an interesting observation that the nondemanding task improved creative ideation postincubation, whereas the passive break did not. Perhaps, mind-wandering episodes that interject another task, compared with the kinds of thoughts or daydreams one may engage in during a task-free period, are more varied and activate a broader network of memory representations that can be combined with problem-relevant information in a way that leads to relevant insights.

Other studies have studied the effects of mind wandering on insights using compound remote associates (CRA) problems as a measure of creativity. In these problems, participants are given three words (e.g., "board, magic, death") and are asked to find a remotely associated fourth word ("black") that forms a compound word or phrase with each of the other words. What makes these problems interesting is that, sometimes, solutions are found through an analytic search strategy and, other times, a solution comes to mind in a sudden flash of insight. In a set of studies examining the relationship between trait level mind wandering and

creativity, we found that a greater tendency to mind-wander was associated not only with a higher solution rate on CRA problems but also with an increased number of insight solutions (Zedelius & Schooler, 2015). We also showed that frequent daydreamers were more successful at solving these problems when experimentally instructed to "let the answer pop into their mind," rather than apply an analytic search strategy. This is more evidence that mind wandering facilitates unconscious creative processes that lead to creative insights, although these studies did not directly manipulate the opportunity for incubation.

Leszczynski et al. (2017) did conduct a classic incubation experiment using CRA problems. Between two rounds of problem solving, participants performed a sustained attention to response task (SART), in which they responded to frequent nontarget words and withheld responses to infrequent targets (nonwords). This incubation task served to interrupt the problem-solving task. To understand the role of information recombination in the incubation effect, the authors introduced one additional factor, which they varied between studies. In one study, the nontarget words shown in the SART were words from the CRA problems that participants had tried to solve just prior (though never solution words). This was done to activate these memory contents in a context that was likely interspersed with mind-wandering episodes. In a second study, the words were unrelated. Mind wandering during the incubation task was assessed by intermittently interrupting the task with thought probes. Results of the first study showed that more frequent mind wandering during the incubation task was associated with a greater number of previously unsolved problems solved after the task. The effect was absent in the second study. This lends support to the idea that mind wandering may facilitate the incubation effect through a process of recombining problem-related and unrelated memory representations.

A study by Tan, Zhou, Chen, & Luo (2015) examined the role of mind wandering in incubation using an implicit learning task. Participants performed a number reduction task (NRT), in which they were asked to make simple responses to pairs of numbers. Unbeknownst to participants, there was a hidden pattern in the numbers, which, if detected, would allow participants to predict the number that would be shown on each seventh trial. The NRT is not a creativity task per se, but the authors reasoned that spontaneously detecting the hidden pattern (without being explicitly told to look for a pattern) would be similar to the kinds of insights that people can experience when a creative idea or solution unexpectedly comes to them. After performing a first block of the NRT, participants were asked to perform a 1-hour SART during which mind wandering was assessed with thought probes. The probes asked not only to what extent participants' attention was on the task or on unrelated thoughts but also to what extent participants were aware of their focus of

attention. After the incubation period, participants performed a second round of the NRT. Afterward, they were asked if they had detected a hidden pattern in the numbers. Few participants discovered the pattern before the incubation period. Of those who did not, almost half discovered it after the incubation period. (This is despite most participants reporting not consciously having thought about it during the incubation period.) Solvers reported significantly more mind-wandering episodes than nonsolvers and made more errors on the SART—a further indicator of mind wandering. Interestingly, levels of meta-awareness did not predict whether participants detected the rule.

While these studies build on the idea of incubation as a deliberate break in which one steps away from a problem and engages in some other task, Sawyer (2011) speculated that brief periods of mind wandering while working on a problem may function as "mini incubation" periods and promote opportunities for insight in much the same manner. This idea was tested by Hao, Wu, Runco, and Pina (2015). Like Baird, they used the unusual uses task to measure creativity. They did not break up the task with an incubation period but gave participants a generous amount of time (20 min) to come up with ideas for a single object. Mind wandering during the task was assessed with thought probes. The results showed that more frequent mind wandering was associated with generating fewer and less original ideas. Thus, the results do not confirm Sowden's idea of mind wandering as mini incubation and suggest that mind wandering plays a more specific role in the creative process that unfolds after a problem has been interpreted and some initial progress has been made.

In line with this suggestion, it has been proposed that incubation may be especially effective for getting unstuck after having reached an impasse in solving a problem (Segal, 2004). If this is the case, mind wandering should facilitate creative insights particularly in these cases where an impasse has been reached. Evidence that this is indeed the case comes from diary studies examining the spontaneous ideas of elite theoretical physicists and professional creative writers (Gable, Hopper, & Schooler, 2018). The physicists and writers were asked to write daily reports (over a span of 1 [study 2] or 2 [study 1] weeks) in which they recalled their most important creative ideas about ongoing work-related projects (if they had any) and then answered questions about what they were doing and thinking about when an idea occurred to them: Were they actively pursuing the project, working on another project, or doing something unrelated? Were they thinking about the problem or about something unrelated? They were further asked about the state of progress their project was in before they had an idea: Were they making steady progress or had they come to an impasse? Several months later, the participants rated the quality of their reported ideas to indicate which ideas stood the test of time. The results showed that about one in five of the most creative ideas occurred when

participants were engaged in spontaneous task–independent mind wandering (STIM), in this case defined as neither being engaged in work nor actively pursuing the problem. This is not the majority of ideas but a substantial number. More interestingly, STIM-generated ideas were particularly likely to be associated with solutions that involved overcoming an impasse. These findings not only suggest that mind wandering can give rise to creative insights in a real-life context but also lend support to the idea that mind wandering has a specific benefit for getting unstuck when initial attempts to solve a problem have failed.

In sum, the research discussed here suggests that mind wandering plays an important role in facilitating the unconscious mental processes that take place when a problem is set aside and we "incubate" on a problem or an idea. Several observations lend support to the idea that mind wandering during incubation boosts creativity by facilitating the recombination of memory representations: Baird et al. (2012) observed that mind wandering was associated with more creative ideas about *familiar* but not *new* problems. Leszczynski et al. (2017) found that mind wandering increased the likelihood of creative insights when cues related to the problems that were set aside were incidentally presented during the incubation period, but not when these cues were absent. And the studies by Hao et al. (2015) and Gable et al. (2018) suggest that mind wandering benefits creative ideation only after one has made some initial progress on a problem and has reached an impasse. Thus, this research suggests that when trying to come up with a good idea or solve a tricky problem, the creative process is best supported by dynamically switching between devoting focused attention to a problem, setting the problem aside and letting the mind wander, and then returning to the problem later with a fresh mind.

The qualities of productive mind wandering

The research reviewed so far has defined mind wandering simply as thoughts that are *disengaged* from a current problem or task. What we have not asked is: What *is* going on in your mind while you are not thinking about the task or problem at hand? As reviewed earlier, mind wandering engages a wide network of brain areas involved in mental activities such as self-referential thinking, remembering the past, and imagining the future. And phenomenologically, mind wandering can open up a rich and highly engrossing world. It can be pleasant or unpleasant. It can feel effortful or more automatic. Moreover, people differ in the kinds of contents that tend to occupy their spontaneous thoughts. This raises several interesting questions. First, is there something specific about the *qualities* of mind wandering—compared with other types of thinking—that facilitates creativity? Second, how do different *types* or *contents* of mind wandering relate to creativity?

Research suggests that the contents of our spontaneous thoughts are not random. Most of the time, our thoughts tend to get drawn toward current concerns, future plans, and unfulfilled goals (Kane et al., 2007; Klinger & Cox, 1987; Klinger, 2009, 2013; McVay, Kane, & Kwapil, 2009; Smallwood, Nind, & O'Connor, 2009). This suggests that mind wandering may be productive in several ways. First, it can serve a prospective memory function, making sure we do not lose sight of important goals and helping us realize our plans (see Baird, Smallwood, & Schooler, 2011, and Rummel, Smeekens, & Kane, 2017 for evidence that spontaneous thoughts support prospective memory). More interestingly, the goal-directed nature of most mind wandering opens up the possibility that *deliberately* letting the mind wander could be an opportunity to inspire creative ideas. Thinking about a problem in a way that is relatively unconstrained and unguided, yet tends to get drawn toward a goal or plan, could help us think of goal-related contents in new ways. Engaging in such thinking in different, ever-changing environments, could further stimulate creative thinking and allow us to playfully explore ideas and solutions. On a walk or run, for instance, you may think through a complicated work problem more freely than in the familiar confines of your office.[1]

Anecdotal evidence from a qualitative study about the intellectual habits among philosophers, writers, researchers, artists, and business leaders supports this idea (Keinänen, 2016). Based on the observation that a lot of intellectual work seems to happen while one is *literally* wandering, the researchers interviewed the participants about the kind of thinking they engage in while walking. Although the participants reported that they initially started going on regular walks to improve their fitness and recover from injury or for other personal reasons, they noticed after a while that it affected their thinking. "I found out that something interesting was happening in my head. This walking thinking, it is more deep or something," reported one participant. "I found that while walking it is somehow easier to solve problems, your thinking is on the move as well," said another participant. A third participant reported using his walks very deliberately to make progress on work-related problems: "I noticed with my inventions that if you have something you want to solve, just walk, continue and continue. I walk for stimulation, to stimulate thinking. Almost 90% of my inventions, 156 patent cases that are public and 30

[1] Note that this type of deliberate goal-directed mind wandering described here is different from incubation. In incubation, one *sets aside* an unsolved problem and shifts one's attention to some other task—and occasional unrelated thoughts—to allow unconscious creative processes to take place. In the case of deliberate goal-directed mind wandering, one intermittently *disengages* from one's *current* task to bring an unresolved problem to the forefront of one's attention.

which are not public, were created around Sognsvann, walking and thinking." Complementing these qualitative observations, a study by Oppezzo and Schwartz (2014), in which participants were experimentally assigned to conditions involving indoor and outdoor walking and sitting, showed that walking, and particularly walking outside, led to improvements in creative ideation and problem-solving. It is possible that these benefits have to do with the specific combination of walking and thinking. It is also possible that walking is conducive to a kind of productive mind wandering that is unconstrained yet goal-directed and that can be cultivated and used very deliberately.

A recent study by Agnoli, Vanucci, Pelagatti, and Corazza (2018) provides more direct evidence that engaging in *deliberate* mind wandering is associated with creativity. The study investigated the combined contributions of deliberate versus spontaneous mind wandering and mindfulness. Mindfulness is a state of sustained awareness of the present moment. It is sometimes defined in opposition to mind wandering (Mrazek, Smallwood, & Schooler, 2012), but it is also treated as a broader construct that, besides *sustained awareness*, includes a tendency to *observe* and *describe* one's inner experience with a *nonreactive* and *nonjudgmental* attitude. Agnoli et al. assessed these facets of mindfulness and mind wandering through self-reports and measured creativity by asking participants to generate alternative titles for well-known books and movies. The results showed that a greater tendency for deliberate mind wandering predicted greater creativity in the "alternative titles" task, whereas a tendency for greater spontaneous mind wandering predicted lower creativity scores. Moreover, there was an interaction of the *sustained awareness* aspect of mindfulness and deliberate mind wandering, which indicated that sustained awareness was associated with greater creativity, but only for individuals who reported a high tendency for deliberate mind wandering. These findings not only demonstrate the benefit of deliberate mind wandering for creativity but also suggest that cultivating a habit of deliberate mind wandering combined with a mindful awareness of the present moment might be particularly valuable.

A different question is how different styles of mind wandering, defined by thought *contents* or other qualities of thoughts, relate to creativity. The idea that people have different "styles" of mind wandering or daydreaming was first raised by Singer and Antrobus (1963; see also Singer & Schonbar, 1961). They also proposed that there is a productive style of mind wandering, which they termed "positive-constructive daydreaming." This style is characterized by pleasant thoughts, vivid mental images, and thoughts revolving around future plans and creative ideas (in contrast to other styles of mind wandering more preoccupied with negative ruminative thoughts or a general difficulty focusing one's attention). While positive-constructive daydreaming has not been directly linked to

creativity, it has been shown to correlate with openness to experience, a personality trait associated with creativity (Zhiyan & Singer, 1997). However, the fact that the daydreaming style was defined in part by having creative ideas makes it inherently somewhat confounded with creativity. Other potentially confounding factors (e.g., high interpersonal curiosity, low boredom susceptibility) were also contained in the definition and measure of this daydreaming style. Despite these confounds, however, the general idea that individuals could show different tendencies to engage in more or less productive styles of daydreaming is compelling.

Following this tradition, we (Zedelius, Protzko, Broadway, & Schooler, 2018) conducted a series of studies to investigate potentially productive (or unproductive) styles of mind wandering in the context of creativity. Using an initially data-driven approach, we used items from various existing mind-wandering scales and newly generated items and factor—analytically reduced them to a compact scale that can be used to assess different types of daydreams both as trait-like characteristics of an individual (i.e., describing a person's tendency to *habitually* get lost in thoughts unrelated to their current activity or their current environment) and as a temporary state (i.e., describing a particular recent episode of daydreaming/engaging in task- or stimulus-unrelated thoughts). The scale assesses six dimensions of daydreaming: Pleasant daydreaming (i.e., daydreams are pleasant and warm vs. upsetting), meaningful daydreaming (i.e., daydreams revolve around personally meaningful, valuable, or important things), planning (i.e., daydreams revolve around future plans, events, and consequences), sexual daydreaming (i.e., about sexual fantasies or romantic partners), unaware/unintentional daydreaming (i.e., daydreams that occur with little awareness and unintentionally), and bizarre or unusual daydreaming (i.e., daydreams revolve around unusual, bizarre, or fantastical things). While these six dimensions cannot of course comprehensively capture all possible variations of spontaneous thoughts, this focus on the qualities and contents of daydreams is an important step to investigate the relationship between types of daydreaming and creativity.

In a first study using this approach (Zedelius et al., 2018), we assessed trait-level daydreaming among college students and measured creativity in a number of ways: Participants reported on their history of engaging in creative and artistic behaviors (e.g., doing crafts projects, writing poetry or plays), and they performed idea generation and problem-solving tasks and wrote creative short stories based on a writing prompt. The results showed that self-reported creative behavior was predicted by meaningful daydreaming, and the quality of participants' creative writing was by bizarre daydreaming. Performance on the creativity tasks was not predicted by any of the daydreaming styles. These results suggest that personally meaningful daydreaming and more unusual, bizarre

daydreaming are related more to artistic creative expression rather than problem-solving performance. The results further raise a question about the difference between defining daydreaming as a trait that differs between people or a temporary mental state: Are the differences in creativity related to being a meaningful or unusual daydreamer, or does do meaningful or more unusual spontaneous thoughts directly contribute to or motivate creative behavior?

We explored this question in a follow-up experience sampling study with a subset of the same participants. Via smartphones, we probed participants repeatedly throughout the day over a period of 5 days to assess their frequency and qualities of daydreaming. At the end of each day, participants reported how inspired they felt that day and how much they engaged in creative behaviors. By comparing between-participants differences over the time of the study and within-participant fluctuations over each day, we were able to disentangle the contributions of more trait-like differences and state-like fluctuations in mind wandering. The results showed that feelings of inspiration were predicted by trait (but not state) differences in meaningful daydreaming, suggesting that individuals who habitually engage in this type of mind wandering tend to feel more inspired (but having personally meaningful spontaneous thoughts does not necessarily lead to immediate inspiration). Moreover, creative behavior was predicted by trait (nut not state) differences in bizarre mind wandering and by state fluctuations in planning. This suggests that a general tendency to have more unusual or bizarre thoughts is associated with creative behavior but does not immediately inspire creative pursuits. On the other hand, being more of a "planner" generally is not associated with greater creative behavior, but frequent mind wandering about future plans and activities on a given day is associated with more creative behavior that day. This is in line with the idea that mind wandering that revolves around future plans and personal goals is productive for realizing one's goals—including goals for creative pursuits.

While keeping a goal in mind surely helps translate that goal into action, this does not orient a person toward creative pursuits per se. The stereotype of a highly creative person describes a goal orientation that seems to be strongly driven by curiosity—a desire to explore and learn new information, in general, or more specifically directed at particular unsolved problems and unanswered questions. In the words of Kashdan and Silvia (2009), "curiosity motivates people to act and think in new ways and investigate, be immersed, and learn about whatever is the immediate interesting target of their attention." (p. 368). Thus, could productive mind wandering, in the context of creativity, best be descried as mind wandering that is driven by curiosity?

We addressed this question in another experience sampling study, this time examining not only differences between individuals but also between

groups expected to differ in creativity (Zedelius et al., 2018). We recruited a group of 170 professional creative writers and an age-matched control group of 171 adults working in occupations that can be described as white-collar but not necessarily creative. We examined the same six mind wandering dimensions examined before, but in addition, we assessed the tendency for "curious" mind wandering, that is, mind wandering that revolves around unanswered questions, unfinished projects, and unsolved problems. The participants first reported on their trait-level mind wandering habits as well as their proto-professional or professional creative achievements. Then, over the course of a week, participants were probed several times per day via their smartphone and answered questions about the qualities and contents of their daydreams just prior to being probed. At the end of each day, they reported on their creative inspiration and behavior. A group comparison of trait mind wandering showed that the writers differed from the control group only in reporting more bizarre daydreaming. Moreover, among the group of writers, more bizarre daydreaming was associated with greater creative achievements. These results are in line with our previous findings linking this more unusual type of daydreaming to creativity. Next, results from the experience sampling part of the study showed that among both writers and nonwriters, engaging in more curious daydreaming was associated with more creative behavior on the same day. Planning (among nonwriters) also still benefitted creative behavior. Thus, it seems that both goal-directed and curiosity-driven daydreaming can motivate creative pursuits.

Together, the findings reviewed here paint a complex picture that not only highlights the value of daydreaming but also demonstrates that it matters what your "absent" mind is engaged in. There is some evidence to suggest that the goal-directed nature of most much mind wandering can make it productive for keeping personal goals in mind and for realizing these goals, including goals for creative and artistic pursuits. There is also some evidence that deliberately letting the mind wander, or cultivating a deliberate tendency to daydream while being mindfully aware of the present moment benefits creativity. Looking at the contents and qualities of daydreaming that are associated with greater creativity and artistic expression, it is interesting that purely pleasant daydreaming does not seem to be associated with creativity, whereas more personally meaningful daydreaming seems to benefit creativity. Moreover, a tendency for unusual, bizarre daydreams appears to be associated with creativity—perhaps because this type of daydreaming requires more creative thinking to begin with. Furthermore, mind wandering that revolves around future plans or around unresolved problems and unanswered questions seems to be particularly conducive toward creativity, painting the picture of a creative mind that is sometimes absent from the here and now yet driven and highly curious. Note, however, that these findings

rely on correlational evidence. Future research should move toward experimental designs to explore if eliciting these types of mind wandering leads to similar outcomes.

Future directions

The reviewed evidence makes a strong case for the valuable role that mind wandering can play in fostering creativity and more specifically that certain types of mind wandering (e.g., curiosity-driven mind wandering) may be of particular value. At the same time, it raises many important questions for further research.

One critical question is whether there may be other forms of mind wandering content or style that may be particularly associated with creative output. As noted, we initially began our explorations with a data-driven approach examining relatively standard topic elements such as meaning, bizarre content, and so forth. However, we found that when we considered theoretically derived elements, such as mind wandering about curiosity-driven topics, we uncovered these to be relevant. This finding suggests that it would be particularly worthwhile to investigate mind wandering elements that might be expected on theoretical grounds to foster creativity. Some additional elements that seem particularly promising due to their prior association with creativity include playful child-like thinking (Zabelina & Robinson, 2010), perspective shifting (Laukkonen & Tangen, 2017), topic switching (Christoff et al., 2016; Gable et al., 2018), and switching between associative and analytic modes of thinking (Pringle & Sowden, 2017; Pringle, Sowden, & Gabora, 2015).

In trying to address these questions, it is important to note that findings from experience sampling studies or other self-report procedures, while able to distinguish between the contributions of trait- and state-level mind wandering, still rely on correlational evidence. To get a better understanding of the causal role of mind wandering in inspiring creative ideation and behavior, future research should also include experimental interventions in which individuals could, for instance, receive instructions to temporarily induce certain kinds of mind wandering (e.g., see Zabelina & Robinson, 2010) or train individuals to engage in particular daydreaming styles to explore more long-term effects. Potentially, a training course could be developed that would encourage individuals to deliberately engage in potentially constructive (e.g., curious, fantastical, or playful) types of mind wandering, possibly combined with facilitating activities such as walking in nature. Alternatively, certain manipulations could be identified (e.g., exposure to art) that induce mind wandering of the kind that is to be expected to facilitate creativity.

Conclusion

Our tendency to periodically lose the focus on the here and now brings with it the potential to generate and explore novel creative ideas. What is equally important here is our tendency to *disengage* from the present moment as the self-generated thought contents we *engage* with. In the classroom, at work, or during brainstorming sessions, disengagement is typically associated with negative connotations. However, as we have discussed, disengaging from a problem *at the critical moment* when one is stuck is a way to facilitate unconscious processes and can lead to unexpected creative insights. Thus, *strategic* disengagement at these moments is something that should be embraced by educators, employers, and all those who find themselves fixed on a suboptimal solution or at a loss for novel ideas.

Daydreaming can facilitate creativity in other ways. Because our daydreams tend to revolve around personal goals, deliberately taking the time to let the mind wander can be a way to think about a problem in a way that is relatively unconstrained and unguided but nonetheless productive. It can be a way to playfully explore new ideas and solutions in different contexts. Thus, a recommendation would be to build time for deliberate daydreaming—preferably in stimulating environments—into the creative process, especially when faced with a complex problem that takes hours, days, or weeks to explore and work out. We have also brought attention to the styles or contents of daydreaming most conducive to creativity. Although research has often linked a positive mood to creativity, the research on creative daydreaming suggests that engaging in purely pleasant thoughts is not necessarily the most productive kind of daydreaming. Rather, inspiration may come from more unusual or fantastic daydreams and daydreams that explore unanswered questions that evoke curiosity.

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