Chapter 20
Mind Wandering: More than a Bad Habit

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Much of our behaviour is determined by habits, as we can readily observe in our daily repeating routines and struggles with the way we eat, sleep, and manage our time. Aside from habitual behaviour, we are also guided by *mental habits*, habitual patterns in the way we think and feel. When making a mistake, for instance, we may instantaneously jump to negative judgements about ourselves (Verplanken, Friborg, Wang, Trafimow, & Woolf, 2007), or engage in strategies to repair our mood and positive self-image, potentially without even noticing that these mental processes are taking place (Gyurak, Gross, & Etkin, 2011). Such mental habits may be less readily observable, but not necessarily less impactful then habitual behaviour. An important part of our experience that seems to fit the concept of a mental habit is the tenacious tendency for our minds to "wander" away from what we are doing and get drawn towards thoughts unrelated to the here and now. Mind wandering—engaging in stimulus- or task-unrelated thought—occupies roughly half of our waking hours (e.g. Killingsworth & Gilbert, 2010; McVay, Kane, & Kwapil, 2009). Thus, it fits our intuitive idea of habits as something we do frequently. But does mind wandering resemble conventional scientific definitions of habits? Besides something we do frequently, habits are thought of as stimulus–response relationships that unfold in an automatic fashion (Neal, Wood, & Quinn, 2006; Verplanken, 2006; Verplanken & Orbell, 2003). In this chapter, we will examine in what respects mind wandering does and does not fit this definition. Finally, we will discuss how habitual mind wandering, or habitual patterns in our thinking, could be changed.

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Capturing the Wandering Mind: Tools and Types

The broad range of mental events encompassed by the term mind wandering makes it a fuzzy construct. Most generally, mind wandering has been defined as the state that occurs when attention drifts away from the current context and engages in an internal stream of thoughts, ideas, and imagery. This state has historically been referred to by a great number of names, including task-unrelated thought, stimulus-unrelated thought, daydreaming, offline thought, thought intrusions, and spontaneous mental activity (McMillan, Kaufman, & Singer, 2013). Though these terms all share overlapping characteristics, there are nuanced but meaningful differences. Thus, it has been proposed that mind wandering is best conceptualized using a family-resemblances approach, which acknowledges mind wandering as a heterogeneous construct encompassing different definitions with overlapping characteristics (Seli et al., 2018). We will follow this approach here.

Capturing the ceaselessly pulsing contents of the human mind can be a challenging task. The short but rapidly growing history of research in the topic has led to the development of a number of paradigms that differ not only methodologically but also in how mind wandering is conceptualized. Trait measures, which are typically self-report scales, focus on individual differences in how much people *generally* mind wander (e.g. Mrazek, Franklin, Phillips, Baird, & Schooler, 2013) or what they tend to mind wander about most of the time (e.g. Singer & Antrobus, 1970). State measures instead focus on temporary fluctuations in a person's thoughts and attention. An important method for catching such fluctuations is the thought probe method, also called Experience Sampling Methodology (ESM, see Klinger & Cox, 1987 for early work using this approach). This method is typically administered via a computer, smartphone or similar device, and involves periodically interrupting individuals during laboratory tasks or everyday-life activities and asking them whether their thoughts were on task-related or task-unrelated matters. Follow-up questions about what the person was doing, thinking, and feeling when being probed can reveal further information about the qualities of their mind wandering and shed light on repetitive thought patterns (e.g. Kane et al., 2007).

A variation on the thought probe method is the self-caught method, in which individuals report when they themselves notice that their mind has drifted off task (e.g. Schooler, Reichle, & Halpern, 2004; Smallwood & Schooler, 2006). When combined with thought-probes, this approach can distinguish episodes where individuals are aware of the fact that they were mind wandering from episodes where they lacked this awareness before being probed.

Research using these and other measures has revealed important distinctions in the types of mind wandering people experience. One distinguishing factor is intentionality. Oftentimes, people's thoughts unintentionally drift away from the here and now. Other times, people intentionally engage in mental reveries in order to divert their attention from a tedious activity (Giambra, 1995; Seli, Carriere, & Smilek, 2015; Seli, Risko, Smilek, & Schacter, 2016). As we will see, the differentiation between unintentional and intentional mind wandering has implications for

the habitual nature of mind wandering. Another important distinction is that between mind wandering that occurs with or without *meta-awareness*, that is, with or without explicit awareness of the fact that one is mind wandering (i.e. mind wandering episodes people "catch" and those they don't). Results from studies combining probe caught with self-caught measures have shown that participants are meta-aware of their mind wandering only a small portion of the time (Schooler et al., 2004). This distinction also has implications for the habitual character of mind wandering.

Is Mind Wandering a Mental Habit?

When asked to record their daily struggles with bad habits over a period of days, research participants reported struggling with mind wandering and engaging in unwanted thoughts at least from time to time (more often, in fact, than they reported stereotypical habitual behaviours such as smoking and drinking or nail biting, but less often than unhealthy eating, poor sleep, procrastination, and unwanted emotions; Quinn, Pascoe, Wood, & Neal, 2010). This suggests that people think about mind wandering in terms of a habit, a "bad habit" even, at least in some contexts. But does mind wandering fit conventional scientific definitions of habits?

Does Mind Wandering Resemble a Stimulus–Response Relationship?

In the psychological literature, habits are commonly understood as stimulus–response relationships, where the encounter of a particular stimulus triggers an associated response. When it comes to mind wandering, the stimulus part of the relationship is puzzling, since it is by definition unrelated to the here and now. However, it turns out that mind wandering can be triggered by cues—particularly cues that remind us of our current concerns and unresolved goals.

An early study by Antrobus, Singer, & Greenberg in 1966 first explored this idea. The researchers invited college students to come to the lab to perform a vigilance task. While participants waited in a waiting room, the radio was playing in the background. For half the participants, the radio program was interrupted by a fabricated breaking news story. The story reported that an attack by communist China had just escalated the Vietnam War, and announced that the military draft was to be extended to all eligible college graduates. This news obviously would have been highly concerning for the participating students at the time. Participants in the control condition heard a neutral radio broadcast without the fabricated news report. Next, all participants were asked to perform a 50-min long vigilance task. Participants in the experimental condition reported roughly 20% more task-unrelated thoughts compared to the control condition. Thus, the results suggest that mind wandering can be understood as a habitual response to cues that evoke personal concerns.

More recently, researchers have used more inconspicuous methods to find further support for this. For instance, McVay and Kane (2013; see also van Vugt, & Broers, 2016) asked participants to write down their current concerns and later embedded participants' own concern-related words directly into a vigilance task. Using the thought probe method, they found that participants were more likely to report that they were mind wandering during the task when they were probed shortly after seeing concern-related words compared to neutral control words. In another study, Kopp, D'Mello, and Mills (2015) evoked current concerns and goals by asking participants to make a list of all the things they needed to do in the next couple of days (goal condition), or to list the components of a car (control condition). Next, participants did a reading task and reported whenever they noticed a task-unrelated thought enter their mind. Participants who had made the to-do-list reported more mind wandering compared to the control group. These results lend further support to the idea that cues related to personal goals and concerns can trigger mind-wandering in a habitual stimulus–response-like fashion.

Masicampo and Baumeister (2011) provided further evidence that it is specifically *unresolved* goals and concerns that trigger habitual mind wandering. They asked participants to write about personal goals in various states of completion. In one condition (control condition), participants described tasks they had recently completed. In another (unresolved goal condition), they described unfinished tasks that needed to be completed in the next few days. In a third condition (plan condition), participants likewise described unresolved future tasks, but then made a detailed plan for when and how to complete them. Next, all participants were asked to read a short story interspersed with thought probes. Probe-caught mind wandering rates in the unresolved task condition were significantly higher than the plan condition. Moreover, participants in the unresolved task condition later reported more mind wandering compared to the other two conditions. Remarkably, making a plan freed participants from this kind of habitual mind wandering. This not only further supports the notion of mind wandering as a habitual response specifically to *unresolved* goals and concerns and not to already completed goals but also points to a strategy to prevent such habitual mind wandering. By consciously thinking about one's goals and concerns and making plans, the tendency for habitual mind wandering can be reduced, potentially freeing us up for more flexible and less habitual thought.

Mind Wandering and Automaticity

Defining a habit merely as a response to a particular cue overlooks something essential about *how* the behaviour is enacted. This essential characteristic is automaticity (Verplanken, 2006; Verplanken & Orbell, 2003). Upon encountering certain cues or situations, habitual behaviour is enacted more or less "automatically", meaning, with some or all of the four features of automaticity: lack of awareness, mental efficiency, lack of control, and lack of conscious intent (Bargh, 1994). Researchers have come to understand that defining habits in this way offers valuable additional explanatory power over and above frequency, both for predicting future behaviour

and for understanding why habits are useful, but also so hard to break (e.g. Bayer & Campbell, 2012; Schmidt & Retelsdorf, 2016). Can mind wandering be considered a mental habit according to this definition? And are there more or less automatic forms of mind wandering?

Mental Efficiency

The mental efficiency criterion of automaticity speaks to the amount of mental resources (of a very limited kind) needed to perform a behaviour or mental process. With regard to mind wandering, mental efficiency has been the subject of an unresolved debate, at the center of which are two competing hypotheses about whether mind wandering results from a *lack* of executive control (i.e. the *control-failure hypothesis*; McVay & Kane, 2010) or requires executive control (i.e. the *global availability hypothesis*; Smallwood, 2010; Smallwood & Schooler, 2006; Teasdale et al., 1995).

The control-failure hypothesis (McVay & Kane, 2010) is based on the idea that mind wandering represents the "default" state of the mind, resulting from activity in a network of brain regions termed the "default mode network" due to its ceaseless activity during states of sensory deprivation, rest, or passive and undemanding tasks (e.g. Mason et al., 2007; Raichle et al., 2001). According to the control-failure hypothesis, the default network's basic function is to continuously evaluate a person's life goals and any arising discrepancies with these goals. The network is thought to generate stimulus- and task-unrelated (but goal-relevant) thoughts continuously, unintentionally, and in an effortless or "resource-free" (McVay & Kane, 2010, p. 5) manner. (Note that these thoughts need not be conscious, though.) It is only when an external stimulus or task demands our attention that default network activity and hence mind wandering is actively suppressed. Because suppression requires executive control, task-unrelated thoughts automatically come to the forefront of conscious awareness whenever executive control fails or is relaxed, for instance under conditions of low task demands. Thus, according to this account, mind wandering is automatic, and in that sense habitual, even though it is not the kind of habit that has to be learned and become automatized over time.

According to the global access hypothesis, mind wandering requires cognitive resources by virtue of being consciously experienced. This position is built on the global workspace theory of consciousness (Baars, 2005, 2010; Dehaene & Naccache, 2001). The theory posits that, whereas many unconscious cognitive processes can go on in parallel, supported by highly localized brain activity, access to the "global workspace" of consciousness is limited because it requires integrated activity over many cortical areas. This necessarily limits how much information we can be conscious of at a time. Thus, for task-unrelated thoughts to have access to the global workspace of consciousness means that they must compete for the same scarce resource as other—task-relevant—thought processes. According to this account, mind wandering is then not a habit by way of being mentally efficient.

Although the two hypotheses appear conflicting, they may account for different aspects of mind wandering. The control-failure hypothesis speaks more to the onset

of a mind-wandering episode, that is, the switch from stimulus- or task-related thought to mind wandering. It is plausible that cue-elicited switching from task-related thoughts to mind wandering results from a failure to control and explicitly monitor one's current thoughts. This switch could happen quite directly (e.g. Bhangal, Allen, Geisler, & Morsella, 2016; McVay & Kane, 2010; Merrick, Farnia, Jantz, Gazzaley, & Morsella, 2015) and without requiring mental resources. In that sense, it resembles many other habitual responses. The global access hypothesis speaks less to the switch from on- to off-task thought and more to the process of engaging in a train of thought. It is plausible that this indeed relies on limited mental resources, similar to task-related thought. Thus, according to the efficiency criterion of automaticity, the onset of mind wandering may have a habitual character, while pursuing a train of thought is not necessarily habitual.

Lack of Awareness

While it is common to distinguish between conscious (i.e. subjectively experienced) and unconscious processes, another distinction can be made between thoughts and processes that are conscious and those that are accompanied by meta-awareness, explicit awareness of the contents of one's consciousness (e.g. Schooler, 2002). The way mind wandering is conceptualized in the literature is by necessity as a subjective experience. Thus, mind wandering cannot completely lack consciousness, but it can lack meta-awareness. In those cases, a person isn't explicitly aware of the fact that they are mind wandering, and won't "catch" their task-unrelated thoughts, but they can later recall their thoughts when being probed (Schooler, 2002; Schooler et al., 2004, 2011; Smallwood, McSpadden, & Schooler, 2007, 2008; Zedelius, Broadway, & Schooler, 2015).

In the habit literature, this distinction between conscious and meta-aware usually isn't made, and it is unclear whether a behaviour could be considered automatic when it is conscious but lacks meta-awareness. In so far as meta-awareness may be necessary for interrupting a habitual response or initiate flexible, controlled, non-habitual behaviour, there is an argument to be made for defining automaticity more strictly by a lack of meta-awareness. Then, mind wandering could be considered habitual when it lacks meta-awareness, and less habitual when it occurs with meta-awareness.

As pointed out in discussing the efficiency question, it is also relevant here to distinguish between the onset of a mind wandering episode and the process of engaging in a train of thought. It is likely that the origin of a mind-wandering episode, that switch from on-task to off-task, usually occurs entirely unconsciously. Thus, according to the awareness criterion of automaticity, the onset of mind wandering can then be considered a habitual response, while pursuing a train of thought could be more or less habitual, depending on the level of meta-awareness.

If meta-awareness is a determining factor between the distinction between habitual and non-habitual mind wandering, this has implications for ways of to reduce habitual mind wandering. Interestingly, interventions aiming at reducing mind wandering or breaking specific repetitive and habitual patterns of thoughts often center around increasing people's ability to monitor and become meta-aware of their

thoughts soon after they inevitably occur (Fox, Kang, Lifshitz, & Christoff, 2016; Morrison, Goolsarran, Rogers, & Jha, 2014; Mrazek, Phillips, Franklin, Broadway, & Schooler, 2013; Tang & Posner, 2009). This is in line with the idea that the onset of mind wandering tends to be a habitual response to some internal or external cue, but that engaging in task-unrelated thought can have a more or less habitual character, depending on our ability to notice and control it or engage in deliberate daydreaming. Interestingly, there is evidence that mind wandering with meta-awareness is less disruptive to performance than mind wandering without meta-awareness (e.g. Franklin, Broadway, Mrazek, Smallwood, & Schooler, 2013; Schooler, Smallwood, Chrisfoff, Handy, Reichle, & Sayette, 2011). In that sense, detrimental mind wandering can indeed be seen as a "bad habit", but clearly mind wandering can be more than that.

Lack of Conscious Intent

We certainly sometimes mind wander intentionally (e.g. Seli et al., 2015), for instance to cope with boredom or because letting the mind wander where it wants or getting absorbed in an engaging daydream can be pleasant or interesting (Franklin, Mrazek, et al., 2013). More often than not, however, mind wandering occurs unintentionally, despite our best efforts to focus on some other task or activity, and despite its negative consequences for performance and mood (e.g. Killingsworth & Gilbert, 2010; Mooneyham & Schooler, 2013). Thus, according to the intentionality criterion, a large proportion of mind wandering seems to be automatic and habitual. The distinction between intentional and unintentional mind wandering has long been acknowledged (e.g. Giambra, 1978, 1995), but only recently have researchers started to empirically examine the differences between the two. These studies have shown that intentional and unintentional mind wandering are predicted by and themselves predict different factors (e.g. Phillips, Mills, D'Mello, & Risko, 2016; Seli, Risko, Smilek, & Schacter, 2016). For instance, intentional mind wandering is greater during easy compared to difficult tasks—in other words, it happens more often during "opportune" moments, when we have the freedom to drift off into a daydream without substantial costs. In contrast, unintentional mind wandering is greater during difficult than easy tasks (Seli, Risko, & Smilek, 2016). This suggests that intentional mind wandering is more controlled and likely less detrimental to performance. It also suggest that unintentional mind wandering has a more habitual character, although more research is needed to explore whether unintentional mind wandering is more strongly stimulus-driven, that is, more often elicited by cues related to unfulfilled goals and revolving around current concerns and less "freely" moving and unconstrained (see Mills, Raffaelli, Irving, Stan, & Christoff, 2018).

Lack of Control

There is evidence that people can exert *some* control over when they allow their minds to wander. For instance, people mind wander more when task demands are low and divided attention is less detrimental than during difficult tasks that demand

their full attention (e.g. Rummel & Boywitt, 2014; Smallwood, Obonsawin, & Reid, 2003)—although newer evidence suggests that this difference is driven largely by intentional mind wandering (Seli, Risko, & Smilek, 2016), and it is plausible that control requires meta-awareness. Since mind wandering probably often *starts* without awareness, control may largely consist of catching mind-wandering episodes early and deciding to redirect attention back to the task at hand or engaging in more deliberate, controlled, non-habitual mind wandering. Thus, in line with what we have proposed before in our discussions of mental efficiency, awareness, and intentionality, the control criterion of automaticity suggests that mind wandering is more habitual at its onset and can then take on a more or less habitual character.

There is some evidence that people can get better at catching their task-unrelated thoughts when they are motivated to do so. In a study using a "bogus pipeline" procedure, which convinced participants that their attentional states including mind wandering were being covertly monitored through physiological measures, Zedelius et al. (2015) offered participants incentives for catching their task-unrelated thoughts during reading. These incentives indeed increased the number of self-catches, without increasing overall mind wandering. However, the fact that most people still spend a substantial amount of time each day engaged in mind wandering—unintentional mind wandering at that—suggests that they either lack the motivation to control their thoughts, or have very limited control over them.

Interestingly, just like the evidence for the controllability of mind wandering is ambiguous, so are people's beliefs, or "lay theories" about controllability. In a series of studies, Zedelius, Protzko, and Schooler, (in preparation; see also Zedelius & Schooler, 2017) have shown that people differ in whether they believe that mind wandering is mostly controllable or largely outside our control. Moreover, these beliefs predicted how much participants reported to mind wander during day-to-day activities and laboratory tasks. Participants who believed that mind wandering is less controllable tended to mind wander more frequently than those who believed that it is controllable, likely because they aren't as motivated to engage in the futile task of trying to regulate their uncontrollable thoughts. This suggests that interventions that aim to reduce habitual mind wandering by training people to be more aware of their thoughts and control unwanted task-unrelated thoughts should also take into account people's beliefs about the capacity to control their thoughts. This may be a key to encouraging deliberate, non-habitual mind wandering.

Individual Differences in Habitual Mind Wandering and Patterns of Thought

Although a lot of attention has been paid to individual differences in *how much* people mind wander, less is known about individual differences that could explain who is more or less prone to *habitual* mind wandering or who shows more habitual patterns of thinking. Research on this question has mostly examined individual differences in people's proclivity for intentional and unintentional mind wandering.

One study recruited college students who as children had been diagnosed with attention-deficit/hyperactivity disorder (ADHD), a disorder characterized by inattention, impulsivity, and problems with inhibiting distraction. The students, compared to control participants who had never been diagnosed, showed higher rates of unintentional mind wandering, but no increase in intentional mind wandering (Shaw & Giambra, 1993). Moreover, ADHD symptoms among healthy college students have also been found to be uniquely associated with unintentional mind wandering (Seli, Smallwood, Cheyne, & Smilek, 2015). Another study examined how mind wandering related to symptoms of obsessive-compulsive disorder (OCD), a disorder characterized by intrusive thoughts. Among healthy college students, more symptoms of OCD were associated with higher rates of unintentional, but not necessarily intentional mind wandering (Seli, Risko, Purdon, & Smilek, 2017). Thus, this research supports the notion that people differ in the extent to which their mind wandering has a more habitual character, at least with regard to occurring unintentionally.

Other research has looked more specifically at the qualities and recurring contents of people's thoughts. This research suggests that, aside from the question of whether or not mind wandering itself is a habit, there can be habitual, repeating patterns in people's thoughts. A recent study by Kane et al. (2017) has examined how differences in personality (specifically, the "big five" personality traits openness, conscientiousness, extraversion, agreeableness, and neuroticism) relate to differences in mind wandering during laboratory tasks and in everyday life settings. They found that, in everyday life settings, participants scoring higher on the trait neuroticism reported less pleasant and more "racing" thoughts, and their mind wandering centered more often around worries or problems. Participants scoring higher on the trait openness mind wandered more about fantasies. Furthermore, participants scoring high on agreeableness reported more pleasant and less strange thoughts, whereas participants who scored higher in extraversion reported more racing and more strange thoughts during everyday life activities. These findings show that a personality can shape a person's spontaneous thoughts both in content and style. Interestingly, our own recent research has shown that mind wandering that is characterized by strange thoughts and fantasies is associated with greater creativity (Zedelius, Protzko, & Schooler, 2017). Thus, it seems that not only do people differ in their patterns of thinking, but some patterns may be more productive than others (see also Zedelius & Schooler, 2016).

Extreme Mind Wandering Habits

An interesting yet very rare phenomenon at the more extreme end of the spectrum of mind wandering experiences is "maladaptive daydreaming". Maladaptive daydreamers seek refuge in daydreams more than others, in extreme cases so excessively that they spend hours at a time engrossed in elaborate and highly structured daydreams and fantasies, often involving recurring characters and stories that play out over years (Bigelsen & Schupak, 2011; Schupak & Rosenthal, 2009).

Maladaptive daydreaming has a similarly habitual (in the sense of being repetitive and uncontrollable) character as rumination, and can have similarly negative consequences. For some, their daydreaming can take up so much time that it prevents them from doing day-to-day chores and pursuing meaningful life goals and social relationships (Bigelsen & Schupak, 2011; Somer, Lehrfeld, Bigelsen, & Jopp, 2016). At the same time, maladaptive daydreamers, unlike ruminators, often experience their daydreams as highly pleasurable and fulfilling. It is an open question whether maladaptive daydreaming is a habit or a compulsion. Correlations with negative health outcomes and obsessive-compulsive thoughts and behaviours suggest that maladaptive daydreaming has some psychopathological properties (Somer et al., 2016). However, researchers have only just begun studying the phenomenon, and more work needs to be done to understand how this tendency develops and to what extent it may resembles a mental habit or a compulsion.

Conclusion and Future Directions

The goal of this chapter was to answer the question, "Is mind wandering a habit?" As we have seen, to answer this question, it is important to acknowledge that mind wandering is a heterogeneous concept. As we have discussed, there are ways in which mind wandering seems to be automatic, and ways in which it is more deliberate. For instance, a person may lose focus of a task and start to mind wander without noticing, without intending to and without any ability to control their thoughts, but might then become aware of the fact that they have lost track and engage in more deliberate, controlled mind wandering. We have also seen that people differ in their tendency to mind wander habitually (i.e. without meta-awareness and intention), and that people experience different recurrent patterns in their thought contents. Thus, it seems that mind wandering does in some ways resemble the kinds of habits—"bad" habits even—we deal with throughout the day. In other ways, mind wandering is much more than a habit, and can entail intentional reveries and creative thought.

With regard to the habitual character of mind wandering, many unanswered questions remain. For instance, a mind wandering episode can be triggered by a vast and diverse number of external and internal cues that in some way evoke personal goals or concerns. An open question is whether mind wandering can also become linked to a much more specific cue. Could a student who copes with a particularly boring class by retreating into her daydreams learn to associate the unfortunate classroom with habitual mind wandering? Experimentally establishing highly specific mind wandering triggers like these could open up valuable avenues for future research. Another interesting question is how people's patterns of mind wandering can be changed. As we have discussed, initial findings show that meta-awareness may reduce the negative impacts mind wandering can have on performance (Franklin, Broadway, et al., 2013; Schooler et al., 2011). Moreover, research suggests that certain patterns in people's thought contents might be associated with

positive outcomes. A tendency for strange thoughts and fantasies has been associated with greater openness to experiences (Kane et al., 2017) and greater creativity (Zedelius et al., 2017), and intentional mind wandering has been found to be particularly beneficial for creativity (Agnoli, Vanucci, Pelagatti, & Corazza, 2018). Thus, it would be worthy to further examine how these types of mind wandering can be cultivated over time.

We spend much of our life removed from the here and now, our minds wandering or engaged in daydreams. A large number of these thoughts follow habitual patterns. In many situations, this is a good thing. The spontaneous thoughts that intrude our consciousness often revolve around unfulfilled goals and concerns. While distracting in the moment, these thoughts clearly have some personal value and importance for us, helping us work through problems or plans for future events. However, we can get stuck in habitual patterns of repetitive thoughts, negative thoughts, intrusive thoughts, or unproductive fantasies that can keep us from pursuing more important goals. Understanding and then breaking such habitual thought patterns could open the door to an even richer, more interesting internal world in which we explore more novel or unique thoughts and ideas and realize our unfulfilled goals in a more flexible and agentic manner.

Habit Research in Action: How Can We Change Habitual Patterns of Thought?

We all engage in habitual mind wandering, that is, mind wandering episodes triggered by current concerns or goal discrepancies that unfold automatically, without our awareness and intention and with little control. Moreover, we all occasionally experience periods of mind wandering that are negative or unproductive; we obsess, ruminate, or jump to self-critical conclusions (e.g. Verplanken et al., 2007). When such patterns of thought are triggered repeatedly, they can become habitual (Hertel, 2004; Watkins & Nolen-Hoeksema, 2014). At the individual level, this can lead to an increased risk for depression, anxiety, and even difficulties in physical health (Gotlib & Joormann, 2010; Nolen-Hoeksema, 2000; Watkins, 2008 see also Chap. 15 in this volume). At the societal level, entrenched thought patterns can lead to stereotyping and negative behaviour towards outgroups (see Fox et al., 2016). Thus, can we learn to de-automatize habitual patterns of thought and shift to more constructive and unconstrained mind wandering?

The key to changing habitual patterns of thought is to first notice them. Methods from mind wandering research could be used to do just that. An especially promising technique for this purpose is ESM, which allows researchers to capture repetitive patterns in people's thoughts and to reveal those patterns to individuals. The first stage would be to simply remind people multiple times throughout the day to take note of and report their experience (e.g. through a smartphone application). By asking more detailed questions

about what participants are thinking, feeling, and doing at the moment and what the external circumstances are, researchers can identify specific situations in which the individual is most vulnerable to automatic or repetitive, unconstructive thought patterns. These patterns could then be revealed to individuals through feedback at the end of the day or after a longer period of observation. This in itself is a critical step, as research suggests that people can be remarkably unaware of the features or larger patterns in their own inner experience (Fox et al., 2016; Hurlburt, 2011). In a second step, more in-depth procedures can be used to replace or reshape unconstructive habitual thoughts. For instance, guided questions would be used to replace self-critical thoughts with more constructive ones or to break habitual associations between thoughts and emotions. For instance, Kross, Ayduk, and Mischel (2005) found that when individuals are asked to take a distanced perspective on a negative experience and focus on "why" they feel a certain way, rather than "what" they feel, they experience less intense negative emotions.

Another way to change habitual thought patterns that has been proposed by Fox et al. (2016) is through meditation (or similar practices, e.g. hypnosis). A number of studies have shown benefits of mindfulness meditation training for increasing mental control and reducing mind wandering (e.g. Jha et al., 2015; Mrazek, Mooneyham, Mrazek, & Schooler, 2016; Mrazek, Phillips, et al., 2013; Mrazek, Smallwood, & Schooler, 2012; Sedlmeier et al., 2012; Tang & Posner, 2009). Fox et al. (2016) propose that meditation practice may also de-automatize thoughts by breaking learned associations between thoughts in memory and facilitating cognitive-emotional flexibility. This idea is an interesting avenue for future research projects exploring the "middle way" between mind wandering and mindful awareness and attention (Schooler et al., 2014). There is already some evidence that mind wandering can be beneficial for inspiring creative thoughts and ideas (e.g. Baird et al., 2012; Zedelius & Schooler, 2015, 2016). More recent research suggests that this benefit is driven most strongly by intentional mind wandering, and that combined inclinations to frequently intentionally mind wandering while also being able to mindfully focus one's attention on the here and now are most conducive to creativity (Agnoli et al., 2018). Thus, the most constructive and creative types of thinking may indeed arise when we break habitual patterns of thinking and learn to engage in more intentional and controlled yet freely moving and unconstrained (see Mills et al., 2018) mind wandering.

References

Agnoli, S., Vanucci, M., Pelagatti, C., & Corazza, G. E. (2018). Exploring the link between mind wandering, mindfulness, and creativity: A multidimensional approach. *Creativity Research Journal, 30*(1), 41–53.

Antrobus, J. S., Singer, J. L., & Greenberg, S. (1966). Studies in the stream of consciousness: Experimental enhancement and suppression of spontaneous cognitive processes. *Perceptual and Motor Skills, 23*(2), 399–417.

Baars, B. J. (2005). Global workspace theory of consciousness: Toward a cognitive neuroscience of human experience. *Progress in Brain Research, 150*, 45–53.

Baars, B. J. (2010). Spontaneous repetitive thoughts can be adaptive: Postscript on "mind wandering". *Psychological Bulletin, 136*(2), 208–210.

Bargh, J. A. (1994). The four horsemen of automaticity: Awareness, intention, efficiency, and control in social cognition. In R. S. Wyers, Jr., & T. K. Srull (Eds.), *Handbook of social cognition* (2nd ed., pp. 1–40). Hillsdale, NJ: Erlbaum.

Bayer, J. B., & Campbell, S. W. (2012). Texting while driving on automatic: Considering the frequency-independent side of habit. *Computers in Human Behavior, 28*(6), 2083–2090.

Bhangal, S., Allen, A. K., Geisler, M. W., & Morsella, E. (2016). Conscious contents as reflexive processes: Evidence from the habituation of high-level cognitions. *Consciousness and Cognition, 41*, 177–188.

Bigelsen, J., & Schupak, C. (2011). Compulsive fantasy: Proposed evidence of an underreported syndrome through a systematic study of 90 self-identified non-normative fantasizers. *Consciousness and Cognition, 20*(4), 1634–1648.

Dehaene, S., & Naccache, L. (2001). Towards a cognitive neuroscience of consciousness: Basic evidence and a workspace framework. *Cognition, 79*(1–2), 1–37.

Fox, K. C., Kang, Y., Lifshitz, M., & Christoff, K. (2016). Increasing cognitive-emotional flexibility with meditation and hypnosis: The cognitive neuroscience of de-automatization. In A. Raz & M. Lifshitz (Eds.), *Hypnosis and meditation*. New York, NY: Oxford University Press.

Franklin, M. S., Broadway, J. M., Mrazek, M. D., Smallwood, J., & Schooler, J. W. (2013). Window to the wandering mind: Pupillometry of spontaneous thought while reading. *The Quarterly Journal of Experimental Psychology, 66*(12), 2289–2294.

Franklin, M. S., Mrazek, M. D., Anderson, C. L., Smallwood, J., Kingstone, A., & Schooler, J. W. (2013). The silver lining of a mind in the clouds: Interesting musings are associated with positive mood while mind-wandering. *Frontiers in Psychology, 4*, e583. https://doi.org/10.3389/fpsyg.2013.00583

Giambra, L. M. (1978). Adult male daydreaming across the life span: A replication, further analyses, and tentative norms based upon retrospective reports. *International Journal of Aging and Human Development, 1978*(8), 197–228.

Giambra, L. M. (1995). A laboratory method for investigating influences on switching attention to task-unrelated imagery and thought. *Consciousness and Cognition, 4*(1), 1–21.

Gotlib, I. H., & Joormann, J. (2010). Cognition and depression: Current status and future directions. *Annual Review of Clinical Psychology, 6*, 285–312.

Gyurak, A., Gross, J. J., & Etkin, A. (2011). Explicit and implicit emotion regulation: A dual-process framework. *Cognition and Emotion, 25*(3), 400–412.

Hertel, P. T. (2004). Memory for emotional and non-emotional events in depression: A question of habit. In D. Reisberg & P. Hertel (Eds.), *Memory and emotion* (pp. 186–216). New York: Oxford University Press.

Hurlburt, R. T. (2011). *Investigating pristine inner experience: Moments of truth*. New York, NY: Cambridge University Press.

Jha, A. P., Morrison, A. B., Dainer-Best, J., Parker, S., Rostrup, N., & Stanley, E. A. (2015). Minds "at attention": Mindfulness training curbs attentional lapses in military cohorts. *PLoS One, 10*, e0116889. https://doi.org/10.1371/journal.pone.0116889

Kane, M. J., Brown, L. H., McVay, J. C., Silvia, P. J., Myin-Germeys, I., & Kwapil, T. R. (2007). For whom the mind wanders, and when: An experience-sampling study of working memory and executive control in daily life. *Psychological Science, 18*(7), 614–621.

Kane, M. J., Gross, G. M., Chun, C. A., Smeekens, B. A., Meier, M. E., Silvia, P. J., et al. (2017). For whom the mind wanders, and when, varies across laboratory and daily-life settings. *Psychological Science, 28*(9), 1271–1289.

Killingsworth, M. A., & Gilbert, D. T. (2010). A wandering mind is an unhappy mind. *Science, 330*(6006), 932–932.

Klinger, E., & Cox, W. M. (1987). Dimensions of thought flow in everyday life. *Imagination, Cognition and Personality, 7*(2), 105–128.

Kopp, K., D'Mello, S., & Mills, C. (2015). Influencing the occurrence of mind wandering while reading. *Consciousness and Cognition, 34*, 52–62.

Kross, E., Ayduk, O., & Mischel, W. (2005). When asking "why" does not hurt: Distinguishing rumination from reflective processing of negative emotions. *Psychological Science, 16*(9), 709–715.

Masicampo, E. J., & Baumeister, R. F. (2011). Consider it done! Plan making can eliminate the cognitive effects of unfulfilled goals. *Journal of Personality and Social Psychology, 101*(4), 667.

Mason, M. F., Norton, M. I., Van Horn, J. D., Wegner, D. M., Grafton, S. T., & Macrae, C. N. (2007). Wandering minds: The default network and stimulus-independent thought. *Science, 315*(5810), 393–395.

McMillan, R. L., Kaufman, S. B., & Singer, J. L. (2013). Ode to positive constructive daydreaming. *Frontiers in Psychology, 4*, 626. https://doi.org/10.3389/fpsyg.2013.00626

McVay, J. C., & Kane, M. J. (2010). Does mind wandering reflect executive function or executive failure? Comment on Smallwood and Schooler (2006) and Watkins (2008). *Psychological Bulletin, 136*, 188–197.

McVay, J. C., & Kane, M. J. (2013). Dispatching the wandering mind? Toward a laboratory method for cuing "spontaneous" off-task thought. *Frontiers in Psychology, 4*, 570.

McVay, J. C., Kane, M. J., & Kwapil, T. R. (2009). Tracking the train of thought from the laboratory into everyday life: An experience-sampling study of mind wandering across controlled and ecological contexts. *Psychonomic Bulletin & Review, 16*(5), 857–863.

Merrick, C., Farnia, M., Jantz, T. K., Gazzaley, A., & Morsella, E. (2015). External control of the stream of consciousness: Stimulus-based effects on involuntary thought sequences. *Consciousness and Cognition, 33*, 217–225.

Mills, C., Raffaelli, Q., Irving, Z. C., Stan, D., & Christoff, K. (2018). Is an off-task mind a freely-moving mind? Examining the relationship between different dimensions of thought. *Consciousness and Cognition, 58*, 20–33.

Mooneyham, B. W., & Schooler, J. W. (2013). The costs and benefits of mind-wandering: A review. *Canadian Journal of Experimental Psychology/Revue canadienne de psychologie expérimentale, 67*(1), 11.

Morrison, A. B., Goolsarran, M., Rogers, S. L., & Jha, A. P. (2014). Taming a wandering attention: Short-form mindfulness training in student cohorts. *Frontiers in Human Neuroscience, 7*, 897.

Mrazek, M. D., Franklin, M. S., Phillips, D., Baird, B., & Schooler, J. (2013). Mindfulness training improves working memory and GRE performance while reducing mind-wandering. *Psychological Science, 24*, 776–781.

Mrazek, M. D., Mooneyham, B. W., Mrazek, K. L., & Schooler, J. W. (2016). Pushing the limits: Cognitive, affective, and neural plasticity revealed by an intensive multifaceted intervention. *Frontiers in Human Neuroscience, 10*, e117. https://doi.org/10.3389/fnhum.2016.00117

Mrazek, M. D., Phillips, D. T., Franklin, M. S., Broadway, J. M., & Schooler, J. W. (2013). Young and restless: Validation of the Mind-Wandering Questionnaire (MWQ) reveals disruptive impact of mind-wandering for youth. *Frontiers in Psychology, 4*, 560.

Mrazek, M. D., Smallwood, J., & Schooler, J. W. (2012). Mindfulness and mind-wandering: Finding convergence through opposing constructs. *Emotion, 12*(3), 442.

Neal, D. T., Wood, W., & Quinn, J. M. (2006). Habits: A repeat performance. *Current Directions in Psychological Science, 15*, 198–202.
Nolen-Hoeksema, S. (2000). The role of rumination in depressive disorders and mixed anxiety/depressive symptoms. Journal of Abnormal Psychology, 109(3), 504.
Phillips, N. E., Mills, C., D'Mello, S., & Risko, E. F. (2016). On the influence of re-reading on mind wandering. *The Quarterly Journal of Experimental Psychology, 69*(12), 2338–2357.
Quinn, J. M., Pascoe, A., Wood, W., & Neal, D. T. (2010). Can't control yourself? Monitor those bad habits. *Personality and Social Psychology Bulletin, 36*(4), 499–511.
Raichle, M. E., MacLeod, A. M., Snyder, A. Z., Powers, W. J., Gusnard, D. A., & Shulman, G. L. (2001). A default mode of brain function. *Proceedings of the National Academy of Sciences, 98*(2), 676–682.
Rummel, J., & Boywitt, C. D. (2014). Controlling the stream of thought: Working memory capacity predicts adjustment of mind-wandering to situational demands. *Psychonomic Bulletin & Review, 21*(5), 1309–1315.
Schmidt, F. T., & Retelsdorf, J. (2016). A new measure of reading habit: Going beyond behavioral frequency. *Frontiers in Psychology, 7*, 1364.
Schooler, J. W. (2002). Re-representing consciousness: Dissociations between experience and meta-consciousness. *Trends in Cognitive Sciences, 6*(8), 339–344.
Schooler, J. W., Mrazek, M. D., Franklin, M. S., Baird, B., Mooneyham, B. W., Zedelius, C., & Broadway, J. M. (2014). The middle way: Finding the balance between mindfulness and mind-wandering. In *Psychology of learning and motivation* (Vol. 60, pp. 1–33). Academic.
Schooler, J. W., Reichle, E., & Halpern, D. (2004). Zoning out while reading: Evidence for dissociations between experience and metaconsciousness. In D. T. Levin (Ed.), *Thinking and seeing: Visual metacognition in adults and children*. Cambridge, MA: MIT Press.
Schooler, J. W., Smallwood, J., Christoff, K., Handy, T. C., Reichle, E. D., & Sayette, M. A. (2011). Meta-awareness, perceptual decoupling and the wandering mind. *Trends in Cognitive Sciences, 15*(7), 319–326.
Schupak, C., & Rosenthal, J. (2009). Excessive daydreaming: A case history and discussion of mind wandering and high fantasy proneness. *Consciousness and Cognition, 18*, 290–292.
Sedlmeier, P., Eberth, J., Schwarz, M., Zimmermann, D., Haarig, F., Jaeger, S., et al. (2012). The psychological effects of meditation: A meta-analysis. *Psychological Bulletin, 138*(6), 1139–1171.
Seli, P., Carriere, J. S., & Smilek, D. (2015). Not all mind wandering is created equal: Dissociating deliberate from spontaneous mind wandering. *Psychological Research, 79*(5), 750–758.
Seli, P., Kane, M., Smallwood, J., Schacter, D. L., Maillet, D., Schooler, J., & Smilek, D. (2018). Mind-wandering as a natural kind: A family-resemblances view. *Trends in Cognitive Sciences, 22*(6), 479–490.
Seli, P., Risko, E. F., Purdon, C., & Smilek, D. (2017). Intrusive thoughts: Linking spontaneous mind wandering and OCD symptomatology. *Psychological Research, 81*(2), 392–398.
Seli, P., Risko, E. F., & Smilek, D. (2016). On the necessity of distinguishing between unintentional and intentional mind wandering. *Psychological Science, 27*(5), 685–691.
Seli, P., Risko, E. F., Smilek, D., & Schacter, D. L. (2016). Mind-wandering with and without intention. *Trends in Cognitive Sciences, 20*(8), 605–617.
Seli, P., Smallwood, J., Cheyne, J. A., & Smilek, D. (2015). On the relation of mind wandering and ADHD symptomatology. *Psychonomic Bulletin & Review, 22*(3), 629–636.
Shaw, G. A., & Giambra, L. (1993). Task-unrelated thoughts of college students diagnosed as hyperactive in childhood. *Developmental Neuropsychology, 9*(1), 17–30.
Singer, J. L., & Antrobus, J. S. (1970). *Imaginal processes inventory*. Princeton NJ: Educational Testing Service.
Smallwood, J. (2010). Why the global availability of mind wandering necessitates resource competition: Reply to McVay and Kane (2010).

Smallwood, J., McSpadden, M., & Schooler, J. W. (2007). The lights are on but no one's home: Meta-awareness and the decoupling of attention when the mind wanders. *Psychonomic Bulletin & Review, 14*(3), 527–533.

Smallwood, J., McSpadden, M., & Schooler, J. W. (2008). When attention matters: The curious incident of the wandering mind. *Memory and Cognition, 36*(6), 1144–1150.

Smallwood, J., Obonsawin, M., & Reid, H. (2003). The effects of block duration and task demands on the experience of task unrelated thought. *Imagination, Cognition and Personality, 22*, 13–31.

Smallwood, J., & Schooler, J. W. (2006). The restless mind. *Psychological Bulletin, 132*, 946–958.

Somer, E., Lehrfeld, J., Bigelsen, J., & Jopp, D. S. (2016). Development and validation of the Maladaptive Daydreaming Scale (MDS). *Consciousness and Cognition, 39*, 77–91.

Tang, Y. Y., & Posner, M. I. (2009). Attention training and attention state training. *Trends in Cognitive Sciences, 13*(5), 222–227.

Teasdale, J. D., Dritschel, B. H., Taylor, M. J., Proctor, L., Lloyd, C. A., Nimmo-Smith, I., et al. (1995). Stimulus-independent thought depends on central executive resources. *Memory & Cognition, 23*(5), 551–559.

van Vugt, M. K., & Broers, N. (2016). Self-reported stickiness of mind-wandering affects task performance. *Frontiers in Psychology, 7*, Article 732.

Verplanken, B. (2006). Beyond frequency: Habit as mental construct. *British Journal of Social Psychology, 45*(3), 639–656.

Verplanken, B., Friborg, O., Wang, C. E., Trafimow, D., & Woolf, K. (2007). Mental habits: Metacognitive reflection on negative self-thinking. *Journal of Personality and Social Psychology, 92*(3), 526.

Verplanken, B., & Orbell, S. (2003). Reflections on past behavior: A self-report index of habit strength. *Journal of Applied Social Psychology, 33*(6), 1313–1330.

Watkins, E. R. (2008). Constructive and unconstructive repetitive thought. *Psychological Bulletin, 134*(2), 163.

Watkins, E.R., & Nolen-Hoeksema, S. (2014). A habit-goal framework of depressive rumination. Journal of Abnormal Psychology, 123, 24–34.

Zedelius, C. M., Broadway, J. M., & Schooler, J. W. (2015). Motivating meta-awareness of mind wandering: A way to catch the mind in flight? *Consciousness and Cognition, 36*, 44–53.

Zedelius, C. M., Protzko, J., & Schooler, J. W. (2017). *Exploring the relationship between distinct styles of daydreaming and creativity*. Poster presented at the Society for the Neuroscience of Creativity conference, San Francisco, CA.

Zedelius, C. M., & Schooler, J. W. (2015). Mind wandering "Ahas" versus mindful reasoning: Alternative routes to creative solutions. *Frontiers in Psychology, 6*, 834.

Zedelius, C. M., & Schooler, J. W. (2016). The richness of inner experience: Relating styles of daydreaming to creative processes. *Frontiers in Psychology, 6*, 2063.

Zedelius, C. M., & Schooler, J. W. (2017). What are people's lay theories about mind wandering and how do those beliefs affect them? In C. M. Zedelius, B. C. N. Müller, & J. W. Schooler (Eds.), *The Science of Lay Theories: How beliefs shape our cognition, behavior, and health* (pp. 71–93). New York, NY: Springer.