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**Phenomenological properties of mind-wandering and daydreams: an historical
overview and functional correlates**

David Stawarczyk^{1,2}

¹ Department of Psychology, Psychology and Neuroscience of Cognition Research Unit,
University of Liège, Belgium

² Fund for Scientific Research FNRS, Belgium

Correspondence should be addressed to David Stawarczyk, Department of Psychology,
University of Liège, Quartier Agora, place des Orateurs 1, 4000 Liège 1. Tel: +3243665979,
Fax: +3243662808, E-mail: d.stawarczyk@ulg.ac.be

ABSTRACT

Mind-wandering and daydreams (i.e., spontaneous thoughts that are both task-unrelated and decoupled from current sensory perceptions) have recently become the object of increased interest in cognitive psychology and neuroscience. To date, however, there have been relatively few attempts at investigating the form and content of these thoughts, and what individuals are exactly thinking about when they daydream or their minds wander from the here and now. In this chapter, I will first provide an historical overview of the studies that investigated the phenomenological properties of mind-wandering and daydreams. In a second section, I will review the current state of research examining how specific phenomenological features of these thoughts are related to beneficial and deleterious aspects of cognitive and affective functioning. I will conclude by discussing possible avenues for future investigations, such as how the content and context of occurrence of mind-wandering and daydreams might interact to determine their functional outcomes.

Keywords: mind-wandering, daydreams, phenomenology, future thinking, personal goals, self-report questionnaires, experience sampling method.

Although the beginning of experimental research on mind-wandering and daydreaming can be traced back to the spreading of cognitive psychology during the early sixties (for seminal works on this topic, see Antrobus, Singer, & Greenberg, 1966; Singer, 1966; Singer & McCraven, 1961), there has been a surprisingly low number of studies investigating the phenomenological features and content of these particular kinds of spontaneous cognition. One of the first things that one may indeed reasonably wonder when hearing for the first time of mind-wandering or daydreams is: “what are people thinking about when their minds drift away from the here and now and engage in spontaneous cognitions?” Are people thinking of dreamlike and chimeric contents, as illustrated with the common idiomatic expression “building castles in Spain,” or are their thoughts more closely related to their everyday activities and to the achievement of short-term personal goals? From there, one may also wonder whether there is some kind of regularity between individuals in the content of mind-wandering and daydreams. For instance, do people tend to think of similar topics when their minds wander or has each individual his own pattern of thoughts during this type of spontaneous cognition? Finally, a last important question might be how the phenomenological features of mind-wandering and daydreaming are related to other variables outside the domain of spontaneous thought. In other words, can the form and content of daydreams and mind-wandering episodes predict the degree to which these thoughts are associated with functional or deleterious aspects of individuals’ daily cognitive functioning?

The aim of the present chapter will be to discuss and answer the above mentioned questions in two different sections. In the first section I will focus on the phenomenological structure of mind-wandering and daydreams. I will do so by providing a historical perspective of the studies that investigated the form and content of these two kinds of spontaneous cognition. I will begin by reviewing the early questionnaire studies that assessed the features of daydreams and then the more recent experience sampling research on mind-wandering. In the second section, I will center my attention on the few studies that examined how some

phenomenological features of mind-wandering and daydreams are related to beneficial and deleterious aspects of cognitive and affective functioning outside their direct impact on task performance. Finally, I will conclude this chapter by a brief summary of the current state of research on the phenomenology of mind-wandering and daydreams and the possible avenues that could be interesting to investigate for future research.

1. Phenomenological structure of mind-wandering and daydreams

In the general population, there is a common lay-belief that daydreams and mind-wandering episodes are mostly fleeting thoughts about random topics with no particular personal meaning. For instance, many influential thinkers throughout history such as Plato, Blaise Pascal, and Sigmund Freud have argued that daydreams and other kinds of spontaneous thoughts are mostly fanciful and departed from reality, and therefore should be disregarded in favor of more deliberate and controlled forms of cognition (Klinger, 1990). Can mind-wandering and daydreams truly be considered as pointless or futile thoughts, however? On the one hand, if these two forms of spontaneous cognition represent nothing more than “psychological noise” that disturbs individuals from their current task at hand then no consistent phenomenological structure should emerge from the investigation of the content and form of these thoughts. On the other hand, if mind-wandering and daydreams are the product of a well-defined cognitive and neural system and if this particular kind of thoughts plays a role in several important aspects of our daily cognitive functioning, such as planning (e.g., Baird, Smallwood, & Schooler, 2011; Stawarczyk, Majerus, Maj, Van der Linden, & D'Argembeau, 2011), the generation of creative ideas (e.g., Baird et al., 2012), prospective memory (e.g., Mason & Reinholtz, 2015), or the regulation of mood and emotions (e.g., Engert, Smallwood, & Singer, 2014; Mar, Mason, & Litvack, 2012; Ruby, Smallwood, Engen, & Singer, 2013), then it is likely that these two types of spontaneous cognition might represent a more phenomenologically structured phenomenon than what might be initially assumed.

1.1. Questionnaire studies on the features of daydreams

One of the first published studies that examined the regularities that exist across individuals in the content of spontaneous thoughts was conducted by Singer and McCraven (1961). In this study, the authors asked a large sample of 240 college students to rate the frequency with which they experience in their everyday life a list of 93 specific examples of potential daydreams. Their main finding was that the most frequently endorsed instances of daydreams were those related to future practical concerns during social situations (e.g., thinking about works that need to be done in the following weeks) rather than those related to fanciful or wish-fulfilling ideation (e.g., thinking about inheriting an important sum of money). Although a limitation of this study is that the authors solely computed frequency estimates and did not use more advanced statistical techniques such as factor analyses to obtain their results, this research can still be considered as a pivotal study in the domain of spontaneous thought because it was one of the first to suggest that daydreams may possess common phenomenological features across individuals, including a future temporal orientation and a relationship with short-term personal concerns in interpersonal situations.

Capitalizing on these results, the authors then created a more exhaustive questionnaire, the Imaginal Process Inventory (IPI; Singer & Antrobus, 1970), designed to assess the general dimensions of private mental experiences in daily life rather than specifically the features daydreams and spontaneous thoughts. This 344-item questionnaire comprises 28 subscales that investigate various factors related to the individual's inner mental life, such as night dreaming, distractibility, need for external stimulations, or boredom tendency, in addition to daydreaming-related dimensions such as the frequency of these thoughts, their temporal orientation, their visual and auditory nature, or the positive and negative emotional reactions that individuals experience to their occurrence. Across different studies, the authors computed several factor analyses on the scale scores of the IPI and consistently found three second-order factors (e.g., Huba, Segal, & Singer, 1977; Singer & Antrobus, 1972; Starker, 1973, 1974),

leading them to develop a short 45-item version of the IPI, the Short Imaginal Process Inventory, specifically designed to assess these three general dimensions of inner mental life (SIPI; Huba, Aneshensel, & Singer, 1981; Huba, Singer, Aneshensel, & Antrobus, 1982). Interestingly, the first of these factors was named 'Positive-Constructive Daydreaming' and is characterized by vivid daydreams oriented towards the future and problem solving and more generally with attitudes consisting in an acceptance and positive reactions to daydreams. The second factor was 'Guilty-Dysphoric Daydreams' and mainly consists of hostile, fearful, and guilty daydreams associated with stressful and negative emotional reactions. Finally, the last factor was termed 'Poor Attentional Control' and reflects a general tendency towards boredom and distractibility associated with fleeting thoughts. Although the IPI and SIPI departed from the specific investigation of the content and features of spontaneous thoughts, their factorial structure nonetheless replicated the initial finding by Singer and McCraven (1961) that an important qualitative feature of daydreaming might be a future temporal orientation associated with problem solving processes.

One of the most extensive investigations of the phenomenological features of daydreams with the IPI was conducted by Leonard Giambra with the aim of clarifying the changes that occur in daydreaming and inner mental life across the life-span (Giambra, 1999a, 1999b, 2000). For approximately 25 years starting in the early seventies, Giambra administered the full IPI to a large sample of more than 3,000 participants before examining and contrasting how scores on various groups of subscales vary with age. A first set of investigations focused on daydreaming frequency and the three different subscales assessing the present, past, and future temporal orientation of daydreams (Giambra, 1999b). Results of these analyses firstly revealed the now well accepted finding that the tendency to experience daydreams generally decreases with increasing age (for a recent review on this topic, see Maillet & Schacter, 2015). Giambra further showed that future-oriented daydreams were generally more prominent across age groups than past and present daydreams but that this effect decreased with aging. More

precisely, the future orientation was significantly greater than the past and present orientations from the youngest age group (17-24 years); but by 45-54 years and 65-74 years, the differences for present and past, respectively, had become non-significant. It is only in the oldest age group (75-84 years) that scores for past and present daydreams became higher than those for future daydreams. This first set of results suggests that daydreaming is mostly future-oriented and that the predominance of this temporal orientation remains relatively stable with increasing age, except for the oldest groups of individuals.

Giambra also examined whether daydreams tend to occur more consistently in the form of visual than auditory imagery (i.e., imagining sounds other than one's own voice such as tunes or voices of acquaintances). He found that scores on the visual imagery subscale were consistently higher than those for auditory imagery across all age groups and that both forms of imagery generally declined with increasing age. In accordance with the finding that the vividness of daydreams might be lower in older adults, he also found in a second set of results that scores on the absorption in daydreams and hallucinatory-vividness of daydreams subscales strongly decreased with age (Giambra, 1999a). Finally, in a third set of analyses (Giambra, 2000), he showed that scores on the problem solving subscale of daydreams were generally much higher than on other subscales assessing the content of daydreams including hostile, fear of failure, heroic, sexual, guilt, bizarre-improbable, and achievement-oriented daydreams. Furthermore, scores on the problem solving subscale remained relatively stable across age groups whereas scores for most of the other content subscales showed moderate to high decline with aging. Overall, these results confirm those of Singer and McCraven (1961) and the studies that investigated the factorial structure of the IPI/SIPI by showing the importance of future-oriented and problem solving daydreams.

Unfortunately, following the creation of the IPI and SIPI, no clear and elaborated attempts were made to further develop retrospective tools designed to assess the occurrence and characteristics of spontaneous thoughts in daily life and, at present, these two

questionnaires are still the only self-rating scales available to assess the general features of daydreams, mind-wandering, and inner mental life of healthy individuals. Several questionnaires have recently been created to retrospectively assess the features of inner thoughts occurring during functional magnetic resonance imaging, and more particularly following resting state periods (e.g., Delamillieure et al., 2010; Diaz et al., 2014; Diaz et al., 2013; Gorgolewski et al., 2014), however the use of these scales is still in its infancy and further studies are still required to clearly assess their validity and factorial structure. Be that as it may, the initial attempts to determine the phenomenological structure of daydreaming with the use of retrospective self-rating scales such as the IPI and SIPI still remain significant today because they revealed the important findings that (1) daydreams and more generally spontaneous thoughts might be reducible to a limited number of important dimensions that are common across individuals and (2) the fancifulness/wish-fulfilling aspects of spontaneous thoughts might not be as preponderant as argued by early influential thinkers.

1.2. Early experience sampling studies of mind-wandering and thought content

Surprisingly, following the preliminary investigations with retrospective questionnaires of everyday life experiences, very few studies attempted to further examine in detail the content and phenomenological features of mind-wandering and daydreams for several decades. Although the IPI and SIPI provided some important findings, their main limitation is that they completely rely on long-term memory processes from daily life experiences and it has been questioned whether individuals are truly able to give an accurate evaluation of their spontaneous thought patterns over such extended time periods (Singer, 1993, 2003). To address this concern, researchers gradually started to rely more and more on online experience sampling of mind-wandering during laboratory tasks with methods such as thought-probes to minimize dependency on memory processes. This methodological switch in the study of spontaneous thoughts was, however, also accompanied by an impoverishment of the phenomenological dimensions of mind-wandering investigated. Until recently most of the

studies that used online experience sampling indeed solely focused on the mere presence of spontaneous thoughts with thought-probes consisting in dichotomous questions simply asking whether individuals were mind-wandering or not during the task just prior to their appearance. The aims of these studies also departed from the idea of describing the general phenomenological structure of spontaneous thoughts and their main focus was rather to investigate how contextual factors such as task demands and complexity can influence either the frequency of mind-wandering episodes or the extent to which these episodes negatively impact task performance (for reviews on this topic, see Randall, Oswald, & Beier, 2014; Smallwood, Fishman, & Schooler, 2007; Smallwood & Schooler, 2006).

Some early studies using thought-probes nonetheless attempted to investigate spontaneous thoughts beyond their mere presence or absence, but in these cases the authors did not examine in depth the content and form of mind-wandering episodes and mostly focused on a single phenomenological dimension of these thoughts, such as their representational format (e.g., inner speech versus visual imagery; Antrobus, Singer, Goldstein, & Fortgang, 1970; Antrobus et al., 1966), the intentionality of their occurrence (Forster & Lavie, 2009; Giambra, 1995), or their structuration in complex sequences of thoughts (Stuyven & Van der Goten, 1995; Teasdale, Proctor, Lloyd, & Baddeley, 1993). Although these studies greatly advanced the understanding of some important aspects of mind-wandering, such as how these thoughts might depend on the same cognitive resources as those required for task performance (e.g., Smallwood, 2013; Thomson, Besner, & Smilek, 2015), for most of this time no clear advances were made to answer the important question of what individuals are actually thinking about when their minds wander from the here and now.

A notable exception to the general decrease of interest of early experience sampling studies in thought content is the research conducted by Klinger and Cox (1987), who examined the dimensions of thought flow in everyday life. These authors asked their participants to report the content of their latest thoughts (i.e., not only spontaneous but all kinds of thoughts)

when randomly probed with a beeper in their daily life and to rate them on a wide variety of phenomenological dimensions including, among others, vividness, fancifulness, improbability, controllability, or deliberateness. During a mean of four days and a half, 29 participants reported and rated a total of 1,425 thoughts. These thoughts were then submitted to a within-individuals factor analysis to assess how their phenomenological features related to each other when mean inter-individual differences on each dimension were controlled for. The detailed results of this study are reported elsewhere (e.g., Klinger, 1990, 2009), but one of the most interesting findings was that the dimensions related to the (1) fancifulness of the thoughts and (2) directedness/deliberateness loaded on orthogonal factors. These results indicate that the spontaneous nature of the thoughts is unrelated to the degree to which their content departs from reality. These findings thus argue against the proposal that daydreams and mind-wandering are mostly chimerical wish-fulfilling ideations by demonstrating that the approximately 10% of thoughts rated as mostly fanciful in this study are evenly distributed between spontaneous and directed thoughts.

1.3. The prospective bias of mind-wandering

Although the study by Klinger and Cox (1987) reported some interesting findings on the relationship between the phenomenological dimensions of thought flow, it did not offer detailed answers to the question of what people are exactly thinking about when they experience spontaneous cognitions. It is only in recent years that researchers have started to investigate more exhaustively the form and content of mind-wandering with online experience sampling procedures. A first important step in this direction was made by Smallwood, Nind, and O'Connor (2009), who asked their participants about the precise temporal orientation of their mind-wandering episodes during attentional and reading tasks. Their main finding was that mind-wandering sampled during task performance is characterized by a prospective bias (i.e., that in most circumstances mind-wandering is temporally oriented towards the future more often than the past; see Table 1) and that this bias can be reduced with increasing task

demands during attentional tasks, or greater interest and more prior experience with the topic of the text during reading tasks. These findings can be directly related to the above mentioned questionnaire studies which showed that future-orientation is an important dimension of daydreams and are consistent with the idea that the content of mind-wandering episodes and daydreams might possess common properties across individuals.

A direct follow up of the study by Smallwood et al. (2009) was made in our lab with the aim of getting a more complete view of what characterizes the prospective bias of mind-wandering (Stawarczyk et al., 2011). More specifically, we asked participants to write a short description of each mind-wandering episode that they reported to thought-probes during a laboratory attentional task, the Sustained Attention to Response Task (SART; Robertson, Manly, Andrade, Baddeley, & Yiend, 1997). At the end of this task, our participants were further requested to rate each of their reported thoughts on a variant of the Memory Characteristics Questionnaire adapted for mind-wandering studies (a questionnaire the original purpose of which is to investigate the phenomenological properties of episodic memories; Johnson, Foley, Suengas, & Raye, 1988). Importantly, besides temporal orientation, we also asked our participants to determine the possible functions of their mind-wandering episodes and how distant from the here and now were the events referred to in their thoughts. Our findings replicated the prospective bias of mind-wandering by showing that approximately half of reported episodes were directed towards the future, with the other half being evenly distributed between past, present and atemporal episodes (see Table 1). Furthermore, our findings also revealed that most mind-wandering episodes were given personal goal-oriented functions such as planning (35%), decision making (8%), and the appraisal of events (10%) in comparison to having no function (29%) or non-personal goal-oriented function such as self-entertainment (7%) or trying to maintain arousal (8%). Finally, we also found that most future-oriented episodes were about upcoming events within a short temporal distance from the present moment, with 79% of these thoughts being about events happening later in the same

day or in the next seven days. Together, these results confirm the prospective bias of mind-wandering and further indicate that these thoughts are mostly directed towards planning and preparing for upcoming events in the near future.

[Insert Table 1 near here]

Following the studies by Smallwood et al. (2009) and Stawarczyk et al. (2011), there has been an exponential number of studies further assessing the prospective bias of mind-wandering (see Table 1 for a detailed list of the recent studies that investigated the temporal orientations of mind-wandering episodes). For instance Baird et al. (2011), also demonstrated that most mind-wandering episodes are future-oriented and further showed that these future episodes are specifically characterized by a combination of goal- and self-directed contents compared to past, present, and atemporal episodes, suggesting that the content of future-oriented mind-wandering mainly consists in autobiographical planning. Smallwood et al. (2011) also demonstrated the importance of self-related processes during future-oriented mind-wandering by showing that the prospective bias of these thoughts could be increased by asking participants to reflect on their own personality traits before the experience sampling period. Jackson, Weinstein, and Balota (2013) showed that the prospective bias of mind-wandering sampled during task performance is still present in older adults, although reduced when allowing participants to report atemporal episodes. Ye, Song, Zhang, and Wang (2014) demonstrated that future-oriented episodes are already the most prevalent kind of mind-wandering in 10 year old Chinese children. Iijima and Tanno (2012) showed that the prospective bias of mind-wandering is also present in Japanese participants and replicated the finding that this bias is reduced with increasing task difficulty. Finally, several studies demonstrated that the prospective bias of mind-wandering is not limited to laboratory tasks and

that most mind-wandering episodes sampled in daily life are also future and goal-oriented (e.g., Berthie et al., 2015; Poerio, Totterdell, & Miles, 2013; Song & Wang, 2012).

Not all studies consistently showed the prospective bias of mind-wandering, however. For instance, and in contrast to a later study (Andrews-Hanna, Reidler, Huang, & Buckner, 2010), two early studies that retrospectively assessed the content of thoughts directly after functional magnetic resonance imaging did not find a clear prevalence of future-oriented mind-wandering episodes compared to past episodes (Fransson, 2006; Mason et al., 2007a, 2007b). Miles, Karpinska, Lumsden, and Macrae (2010) found that a retrospective rather than a prospective bias of mind-wandering could be induced when performing a vigilance task involving backward rather than forward illusions of self-motion. Contrary to most other studies, McVay and colleagues (McVay & Kane, 2012; McVay, Unsworth, McMillan, & Kane, 2013) found the presence of a prospective bias of mind-wandering during reading tasks but not during a less demanding attentional go/no-go task. On the basis of a retrospective evaluation of daily life thoughts, Christian, Miles, Parkinson, and Macrae (2013) found that the prospective bias of mind-wandering is more prominent in participants from Eastern Asian than Western cultures. Finally, Plimpton, Patel, and Kvavilashvili (2015) included irrelevant cue words during a vigilance task and found a retrospective rather than prospective bias to mind-wandering. Although these studies indicate that further investigations remain to be done to clearly determine the circumstances that influence our mind's tendency to wander towards the future, they nonetheless represent a minority of the literature. To date the vast majority of experience sampling research converges on the finding that, whenever individuals experience mind-wandering, there is a higher probability that the focus of their thoughts will be directed at planning and preparing for upcoming events rather than remembering past memories.

1.4. Mind-wandering and personal goals

In parallel to the studies on temporal orientation, a more indirect yet complementary way in which the prospective bias of mind-wandering has been investigated is by examining

the relationship between these thoughts and personal-goals/future-related concerns. In an initial study involving American college students, Antrobus et al. (1966) played a fake alarming radio broadcast about the entry of the Chinese Communists into the war in Vietnam going on at this time and found that participants who heard the broadcast reported more mind-wandering during a subsequent vigilance task in comparison to a control group who solely heard tape-recorded music before the task. A qualitative analysis of the content of thoughts reported by the participants in the experimental group showed that many mind-wandering episodes were directed at dealing with the induced concerns, consisting for instance in reflections about how a possible draft in the U.S. army would affect their personal future. The authors interpreted these findings in the sense that an important function of spontaneous thoughts might be to help individuals to adjust their conceptual model of the future when presented with contradicting information that forces them to revise their system of relationship with the environment.

A few years later, Klinger (1978) used a different approach and asked his participants to describe their personal goals in a first experimental session. In a second session, he asked the same participants to perform a dichotic listening task where two different sections of the same narrative were played in each ear for 15 minutes. Crucially, at different time intervals, the two narrations were modified to include either words belonging to the participants' own personal goal or to the personal goals of another participant. A few seconds following these modified sections, the narrations were interrupted by thought-probes and the author found that participants (1) spent more time listening to the narration modified to include segments related to their personal goals and (2) had thoughts related to their own personal goals more frequently than to the other participants' goals. Klinger interpreted these findings in favor of his Current Concerns Theory which proposes that individuals are constantly involved in a myriad of personal goals (or current concerns) throughout their daily life. Cues related to these goals either in the external world or coming from the individuals' own thoughts would be particularly effective in capturing attention and, in a situation where no behavioral actions can

be performed to advance towards the achievement of the cued personal goals (for instance because of being already engaged in another task), the typical response of most individuals would be to engage in thoughts related to the management of these goals (for more detailed discussions of the Current Concern Theory, see Klinger, 1971, 1996, 1999, 2009; 2013, and also Klinger et al., this volume). Klinger later extended these findings by showing with retrospective self-rating questionnaires that the current concerns rated as being most important or as requiring actions in the impending future were the most likely to influence the content of thoughts in daily life (Klinger, Barta, & Maxeiner, 1980). Similarly, Gold and Reilly (1985) asked their participants to describe in a diary the content of daydreams experienced in their daily life and found that approximately 65% of the reported thoughts were about the five most important current concerns that the participants listed in an earlier session.

Following these initial studies several research teams have attempted to prime personal goals or future-related concerns to influence the content and/or frequency of mind-wandering. For instance, in our above mentioned study (Stawarczyk et al., 2011) we further asked half of our participants to write a one page essay on their most important personal goal or to perform a control spatial navigation task before performing the SART with thought-probes. We found that participants who previously reflected on their personal goal subsequently reported more temporally and functionally future-oriented mind-wandering episodes than participants in the control condition. These findings were recently replicated by Kopp, D'Mello, and Mills (2015) who showed that participants asked to make a “to do list” of their current personal goals subsequently reported more mind-wandering during a reading task than control participants asked to make a list of the features that define a car. In the same vein, Masicampo and Baumeister (2011) found that writing about two unfulfilled personal goals resulted in more mind-wandering directed towards these goals in a subsequent reading task but that this effect could be reduced by asking participants to detail precise ways to reach these goals rather than simply describing them as well as their personal importance. Using a procedure slightly similar

to the one used by Klinger (1978), McVay and Kane (2013) inserted words related to participants' personal goals in a modified version of the SART with thought-probes and showed that responses to the probes preceded by words cuing the participants' personal goals were more likely to consist in mind-wandering reports than responses to the probes preceded by words related to the goals of other participants. Finally, in another study performed in our lab (Stawarczyk, Majerus, & D'Argembeau, 2013) we told our participant a cover story falsely informing them that they would perform either a stressful task (to do a videotaped speech about one's physical appearance) or a neutral task (to do a simple visual planning task) following the SART with thought-probes. We found that more than 25% of reported mind-wandering episodes in the experimental group were described as attempts to prepare for the supposedly subsequent task versus only 2% in the control group. Furthermore, participants who reported a higher increase in negative affect after being told about the stressful speech also reported a higher frequency of mind-wandering during the SART, suggesting that emotions might play an important role in the association between personal goals and spontaneous thoughts.

Although the above mentioned studies suggest that personal goals and mind-wandering episodes are strongly coupled, results of the studies that simply asked individuals to rate on Likert scales the extent to which their mind-wandering episodes are related to personal goals without using any form of goal-priming procedures only found moderate associations between these two variables. For instance, in another study where we asked our participants to rate the content of each of their mind-wandering episodes during the SART with thought-probes (Stawarczyk, Cassol, & D'Argembeau, 2013), we found that the mean score for the item asking about the strength of the relationship between mind-wandering and personal goals was slightly below the mid-point of the scale (i.e., mildly related to personal goals). Similar findings were reported for the retrospective evaluation of daily life thoughts (Andrews-Hanna et al., 2013) and for the online experience sampling of mind-wandering in everyday life (McVay, Kane, &

Kwapil, 2009; Poerio et al., 2013) who also found mean self-rating scores reflecting only moderate relationships with personal goals.

A potential explanation for the lower than expected association between mind-wandering episodes and personal goals outside goal-priming and cuing procedures can be related to the results of Klinger et al. (1980) who found that not only highly valuable personal goals but also those for which actions have to be carried out in the close future are the most likely to influence thought content. It could therefore be that, in experience sampling studies, most mind-wandering episodes relates to personal goals that are of moderate importance but for which individuals will need to take actions in the near future. Although this proposal remains to be specifically investigated, it is supported by two preliminary lines of evidence: first, by the findings that most future-oriented mind-wandering episodes are related to events supposed to happen in the next few days rather than the far future (e.g., Andrews-Hanna et al., 2013; Andrews-Hanna et al., 2010; Stawarczyk, Cassol, et al., 2013; Stawarczyk et al., 2011); second, by the results that mind-wandering episodes related to the future not only have higher ratings regarding their relationships with personal goals than those being attributed other temporal orientations but, additionally, that episodes about events happening in the far future (i.e., in more than one week) are also more strongly associated with personal goals than those happening in the near future (Stawarczyk, Cassol, et al., 2013). Together these results suggest that there could be a valuation trade-off between importance and imminence to determine the topic of future-related spontaneous thoughts, potentially explaining why most self-ratings of mind-wandering episodes reflect that these thoughts are about short-term and mildly important concerns rather than more meaningful (but often long-term) personal goals.

In summary, investigations on the relationships between personal goals and mind-wandering nicely complement the research on temporal orientation by showing that induced future-related concerns are likely to influence the frequency and content of spontaneous thoughts. Notably, several studies have shown that a significant part of mind-wandering

episodes reported during tasks following goal-priming procedures are directly aimed at dealing with the cued personal goals. Research that investigated the degree to which “naturally” occurring mind-wandering episodes (i.e., without prior cuing of future-related concerns) are related to personal goals in laboratory and daily life settings revealed slightly less convincing findings, however. Self-ratings of such episodes showed only a moderate association with personal goals. The precise reasons why some spontaneous thoughts are more likely to be related to low than highly relevant personal goals and concerns still remains to be investigated and I have proposed that the imminent requirement of behavioral actions might moderate the influence of importance on the probability of personal goals to influence thought content.

1.5. Other phenomenological features of mind-wandering

Temporal orientation and relationships with personal goals are currently the two most investigated phenomenological properties of mind-wandering and daydreams. To date, the other features that characterize the form and content of these two kinds of spontaneous thought have received much less attention from the scientific community and are also generally associated with more mixed findings. In the following subsections I will summarize the findings related to the most widely investigated phenomenological properties of mind-wandering outside temporal orientation and goal-relatedness, namely (1) representational format, (2) emotional valence, (3) realism and specificity, (4) unintentionality, (5) sequential vs fragmented form, (6) repetitiveness, (7) visual perspective, and (8) self and social aspects.

First, regarding representational format, there is evidence that mind-wandering is generally as likely to be in the form of visual images as inner speech (e.g., Diaz et al., 2014; Song & Wang, 2012; Stawarczyk, Cassol, et al., 2013; Stawarczyk et al., 2011) with other modalities (e.g., auditory, tactile, gustatory, etc.) representing a much smaller proportion of this kind of spontaneous thought (Christian et al., 2013; Klinger & Cox, 1987). Regarding the relationships between inner speech and visual imagery, we found in one of our studies that these two representational formats are strongly negatively correlated at the within-individual

level (coefficient of $-.55$; Stawarczyk, Cassol, et al., 2013), suggesting that a particular mind-wandering episode is less likely to involve inner speech if it strongly consists of visual imagery. Not all results are consistent with this finding, however. Klinger and Cox (1987), for instance, found in their within-individuals factorial analyses that inner speech was unrelated to visual imagery and that the auditory modality (i.e., mentally imagining sounds other than one's own voice) loaded on factor independent from visual modality. It could be that differences in the kinds of thoughts sampled in these studies—exclusively mind-wandering for Stawarczyk, Cassol, et al. (2013) versus all kinds of thoughts for Klinger and Cox (1987)—are the cause of these discrepant findings. On the other hand, at the between-individuals level, results of our study revealed that these two representational formats were much less negatively correlated (coefficient of $-.22$), suggesting that individuals are generally not characterized by a style of mind-wandering consistently occurring mostly in either visual or verbal forms (Stawarczyk, Cassol, et al., 2013). Intriguingly, in an early paper, Antrobus et al. (1970) reported that performing a visual task strongly interfered with visual imagery during mind-wandering whereas auditory tasks rather interfered with auditory imagery. These results have not yet been replicated, however, and future studies should investigate more precisely (1) the factors that influence verbal versus visual imagery during spontaneous thoughts as well as (2) the precise relationships that exist between these two kinds of representational formats.

A second important dimension regards the emotionality of mind-wandering episodes. Findings here are generally consistent within the literature and most studies have shown that, when people engage in spontaneous cognitions, it is mostly to think about slightly pleasant topics. For instance, we found in our studies that approximately 42% of reported mind-wandering episodes were associated with positive affect whereas only 19% were related to negative affect (Stawarczyk, Cassol, et al., 2013; Stawarczyk et al., 2011). Similar ratings were found for the daily life sampling of mind-wandering with proportions of 42.5% of pleasant versus 26.5% of unpleasant mind-wandering episodes (Killingsworth & Gilbert, 2010). Other

studies that rated on Likert scales the affective valence of spontaneous thoughts from daily life (e.g., Andrews-Hanna et al., 2013; Song & Wang, 2012) or occurring during laboratory sessions (Ruby, Smallwood, Engen, et al., 2013; Tusche, Smallwood, Bernhardt, & Singer, 2014) also consistently found that, on average, these thoughts are mildly positive (for a recent discussion on this topic, see Fox, Thompson, Andrews-Hanna, & Christoff, 2014).

Third, in line with the findings that most mind-wandering episodes are about autobiographical planning for events in the near future, we found in our studies that most reported episodes are rated as (1) having highly realistic content (between 85-90% of episodes), (2) being related to specific events or actions (approximately 75% of reported thoughts), and (3) that these two dimensions are strongly positively correlated at the within-individuals level (coefficient of .52), suggesting that the specific events imagined by our participants are nearly always very realistic (Stawarczyk, Cassol, et al., 2013; Stawarczyk et al., 2011). In the same vein, Andrews-Hanna et al. (2013) found that 77% of daily life thoughts retrospectively assessed by their participants were related to specific events. Klinger and Cox (1987) found in their study that approximately 90% of reported thoughts involved none to low level of either physical impossibility, inappropriate actions, or reality distortions. Less consistent with these previous findings, two other studies that sampled mind-wandering in daily life found that these thoughts involve on average moderate amount of fantasy (Kane et al., 2007; McVay et al., 2009). These later results should be considered carefully, however, because the wording of the item used in these two studies to assess fancifulness (i.e., “I was daydreaming of fantasizing about something”) makes it somewhat difficult to clearly determine whether the thoughts scored high on this dimension truly departed from real world events. Nevertheless, we can overall conclude from the current state of research that mind-wandering is generally about precise, concrete, and highly realistic events.

A fourth important phenomenological dimension is the unintentionality of mind-wandering. Most studies generally consider that, when people mind-wander, it is mostly in an

unintended manner. However, it is also possible that some individuals could deliberately engage in thoughts unrelated to the task at hand (for a recent discussion on this topic, see Seli, Wammes, Risko, & Smilek, 2016). In our studies, we found that deliberate mind-wandering episodes occur much less frequently than unintentional episodes during the SART, with approximately 10% of mind-wandering being rated as intentional (Stawarczyk, Cassol, et al., 2013; Stawarczyk et al., 2011). Forster and Lavie (2009) found similar results and reported that 13.9% of responses to thought-probes in their experiment involved deliberate mind-wandering versus 38.3% for unintentional mind-wandering during a visual search task. More recently, Seli et al. (2016) found that 9% of probe responses were deliberate mind-wandering episodes versus 24% of unintentional episodes while memorizing a videotaped lecture. Not all studies are consistent with these results, however. Giambra (1995), for instance, reported in several experiments using low demand vigilance tasks that deliberate mind-wandering episodes outnumbered unintentional episodes. Seli and colleagues also recently created a 4-item self-rating scale designed to assess the frequency of deliberate and unintentional mind-wandering in daily life (e.g., Carriere, Seli, & Smilek, 2013; Seli, Carriere, & Smilek, 2015; Seli, Smallwood, Cheyne, & Smilek, 2015) and found roughly similar ratings for these two kinds of thoughts across studies. Finally, studies that used experience sampling methods in everyday life revealed that, when asked whether they allowed their minds to wander on purpose, individuals generally report that their mind-wandering episodes consisted of a mixture of unintentional and deliberate thoughts (Kane et al., 2007; McVay et al., 2009). In sum, although research generally considers mind-wandering episodes as reflecting unintentional thoughts, several studies suggest that a non-negligible proportion of these episodes nonetheless consist of deliberate disengagements from the current task at hand.

A fifth phenomenological feature of mind-wandering is the degree to which this kind of spontaneous cognition consists of structured sequences of thoughts (e.g., as in reasoning, argumentation, etc.) versus disjointed segments of thoughts with no particular continuity. In

their investigation of thought flow in daily life, Klinger and Cox (1987) found that thoughts were mostly coherent, although approximately 20% of them involved a moderate to high level of disconnected segments. Teasdale et al. (1993) found in a laboratory session that sequential mind-wandering was nearly four times more prevalent than fragmented thoughts during periods of rest. However, these differences became non-significant when their participants performed more demanding working memory tasks, with the frequency of sequential mind-wandering episodes decreasing to the same level as fragmented episodes (the rate of which did not change across conditions). The authors interpreted these results in the sense that sequential thoughts might be more resource consuming than fragmented ones. Two years later, Stuyven and Van der Gooten (1995) replicated these findings and additionally found that, in comparison to rest, the frequency of sequential mind-wandering was less affected by a finger tapping than a random letter generation task. In the studies performed in our lab, we found that approximately 25% of reported mind-wandering episodes during the SART were rated as highly structured sequences of thoughts (Stawarczyk, Cassol, et al., 2013; Stawarczyk et al., 2011). Although requiring further investigations, these results suggest (1) that mind-wandering involves both sequential and fragmented segments of thoughts and (2) that the respective proportions of these two kinds of spontaneous cognition might depend on task difficulty.

Another important dimension of mind-wandering is whether this phenomenon is mainly composed of repetitive thoughts that chronically reappear throughout daily life or rather consists of more varied topics that continuously change over time (Watkins, 2008, 2010). When asked to rate whether the content of each of their reported mind-wandering episodes reoccurs repetitively in daily life, we found in our studies that participants gave average scores close to the anchor point “sometimes” of the scale, suggesting that some but not all spontaneous thoughts possess repetitive content (Stawarczyk, Cassol, et al., 2013; Stawarczyk et al., 2011). More interestingly, we also found that scores regarding the repetitiveness of reported thoughts correlated highly with both the personal importance and goal-relatedness of

these thoughts (coefficients higher than .50 at the within-individuals level and higher than .70 at the between-individuals level), suggesting that the more a mind-wandering episode is related to important personal goals, the more it is likely to occur repetitively in daily life. Andrews-Hanna et al. (2013) later confirmed these findings by showing that repetitiveness is part of a general “personal relevance” dimension of thoughts, along with other variables related to the importance of thought content (e.g., goal-directedness, centrality to self-identity, self-relevance, etc.). Together, these findings are consistent with the Current Concerns Theory (Klinger, 1971, 1996, 1999, 2009, 2013) and its proposal that the most important personal goals are more likely to influence the content of thoughts occurring in everyday life.

A much less examined dimension is the visual perspective adopted while mind-wandering (i.e., first- versus third-person perspective). Andrews-Hanna et al. (2013) found that 64.3% of thoughts in their study were rated as having a first-person point of view, 18.7% as having a different perspective, and 17% did not have any particular visual perspective. In another study, Christian et al. (2013) replicated the finding of a prevalence of the first-person perspective in participants from Western cultures (60.4%), whereas participants from Eastern Asian cultures reported a bias toward the third-person perspective in their mind-wandering episodes (59.5%). Female participants also showed a preference for first- (59.9%) over third-person imagery whereas no preference was found in male participants. Interestingly, Eastern Asian participants and males also reported less vivid mental imagery during mind-wandering than Westerners and females. The authors did not assess whether this difference was attributable to visual perspective, however. Generally, more studies should be conducted to determine whether differences in visual perspective during mind-wandering are associated with other phenomenological variables such as emotional intensity, self-relatedness, temporal distance, or coherence, similar to findings on episodic memories (e.g., Sutin & Robins, 2008; Sutin & Robins, 2010).

Finally, a last important dimension regards the social aspects of mind-wandering content. As discussed above, Singer and McCraven (1961) found in their seminal study that the most frequently endorsed instances of daydreams were related to interpersonal situations. In an online questionnaire study involving a vast number of participants ($N = 17,556$), Mar et al. (2012) found that 73.2% of respondents reported always or at least frequently daydreaming about other people whereas only .8% reported that their daydreams never had social contents. Using online experience sampling of mind-wandering in daily life, Song and Wang (2012) found that the proportion of mind-wandering episodes focusing on people (70.95%) was significantly higher than the proportion of episodes focusing on objects (29.05%). In their study about daily life thinking, Andrews-Hanna et al. (2013) found that the thoughts reported by their participants were highly self-relevant (see also Baird et al., 2011; Smallwood et al., 2011) but only moderately involved other people. Similar findings were reported by Ruby, Smallwood, Engen, et al. (2013) who showed that mind-wandering episodes are generally more self- than other-related. Interestingly, these authors computed several principal component analyses on the dimensions of mind-wandering and consistently found that self-related episodes tend to be more future-oriented whereas past episodes tend to more consistently involve thoughts about other people (Engert et al., 2014; Ruby, Smallwood, Engen, et al., 2013; Ruby, Smallwood, Sackur, & Singer, 2013). Although these findings remain to be replicated by other research teams, studies on the social aspects of mind-wandering generally converge towards the finding that, if most mind-wandering episodes are about oneself, they also quite frequently involve other people.

In summary, we have shown in this subsection that, apart from temporal orientation and goal-relatedness, mind-wandering episodes (1) occur most generally under the form of visual imagery or inner speech; (2) that they are mostly about pleasant rather than unpleasant topics, resulting in a slightly positive emotional bias; (3) that they are in most cases about highly realistic and specific events; (4) that they can either occur unintentionally or in a more

deliberate way; (5) that they can take the form of both sequential or fragmented segments of thoughts and that increasing task demands may particularly reduce the frequency of sequential mind-wandering; (6) that they do not necessarily consist of repetitive thoughts, although episodes focusing on more important and self-relevant topics tend to reappear more consistently in daily life; (7) that they mainly involve a first- rather than third-person visual perspective although culture and gender may influence this effect; and finally (8) that they nearly always involve self-related contents but also frequently focus on other people and social situations.

2. How the phenomenology of mind-wandering and daydreams is related to daily life functioning

In the previous section, I have shown that, far from being wish-fulfilling ideations or random representations of fanciful topics, daydreams and mind-wandering episodes generally show consistent phenomenological properties across individuals. Studies that examined the content of these two kinds of thought have more specifically revealed that their main features are a future temporal orientation associated with autobiographical planning processes related to specific events. A question that naturally follows from these findings is: “Do future- and goal-oriented mind-wandering episodes have concrete beneficial impacts on daily life functioning in comparison to other kinds of episodes?” One may indeed wonder whether using mind-wandering and daydreams in a constructive way to plan and prepare for future events may effectively be associated with a better daily cognitive and affective functioning. To date, studies assessing this particular question are relatively scarce and their results often show mixed findings, however. In the present section I will first review questionnaire studies that retrospectively assessed the general features of daydreams and then the results of research that focused on more specific instances of mind-wandering during laboratory tasks and daily life.

Regarding the retrospective evaluations of daydreams in daily life, questionnaire studies using the IPI (Singer & Antrobus, 1970) or SIPI (Huba et al., 1982) have generally shown that

high scores on the Positive-Constructive Daydreams dimension are associated with beneficial correlates (or at least the absence of negative correlates) whereas the opposite is commonly found for the Guilty-Dysphoric Daydreams and Poor Attentional Control dimensions (e.g., Finnbogadottir & Berntsen, 2013; Giambra & Traynor, 1978; Klinger, Henning, & Janssen, 2009; Wilson et al., 2014). For instance, Zhiyan and Singer (1997) administered the SIPI to their participants as well as two other questionnaires assessing (1) the tendency to experience positive and negative affect in daily life and (2) the Big Five Personality Traits. They found that Positive-Constructive Daydreams correlated positively with openness to experience, conscientiousness, and positive affect. On the other hand, Guilty-Dysphoric Daydreams and Poor Attentional Control were both related to higher neuroticism and negative affect in daily life. In addition, Poor Attentional Control was also negatively correlated with conscientiousness and experience of positive affect in daily life. These results suggest that the tendency to experience and enjoy vivid future-oriented daydreams associated with problem solving processes is related to positive emotional outcomes in everyday life and personality traits reflecting higher intellectual curiosity and self-discipline.

In a more recent study, (Marcusson-Clavertz, Cardena, & Terhune, 2016) used experience sampling of mind-wandering in daily life and further asked their participants to complete the SIPI, a working memory task, and the Stroop task in a laboratory session. The aim of these authors was to examine how individual differences on the SIPI dimensions modulate the relationships between daily life mind-wandering and cognitive task performance. They found that, for participants with high levels of Guilty-Dysphoric Daydreams, mind-wandering frequency was negatively correlated with working memory capacity whereas the opposite was found for participants scoring low on this dimension. Next, as concerns Positive-Constructive Daydreams, results showed that mind-wandering frequency is related to poor inhibition abilities during the Stroop task but only for participants with below average scores on this particular dimension. Together these results suggest that the relationship between

cognitive abilities and mind-wandering is moderated by thought content: the more an individual has a tendency to experience high positive-constructive or low guilty-dysphoric daydreams, the less his/her mind-wandering episodes are likely to be related to poor inhibition abilities and low working memory capacity, respectively.

An issue with the IPI/SIPI dimensions is that they represent a combination of different facets, some of which are not directly representative of spontaneous thought features per se (e.g., positive and negative attitudes towards daydreams) and it may be questionable whether similar positive correlates would emerge for experience sampled mind-wandering episodes, and more specifically those whose content reflects autobiographical planning processes. Preliminary result in this regards came from the study of Baird et al. (2011), who found that the tendency of their participants to reports future-oriented mind-wandering during low-demand task performance was associated with higher working memory capacity. In accordance with the SIPI findings, these results suggest that the tendency to experience constructive spontaneous thoughts is associated with better cognitive functioning. Other findings regarding the specificity of prospective mind-wandering came from a study of ours where we examined how future- and goal-oriented mind-wandering (1) differ from other kinds of episodes along several phenomenological dimensions and (2) whether these differences are consistent with the supposed role of these episodes in planning and preparing for future events (Stawarczyk, Cassol, et al., 2013). Our main findings were that future/goal-oriented episodes generally focused on more personally important, concrete, and specific events, and that these episodes were also more deliberate and structured in sequential thoughts than other episodes (i.e., past, present, and atemporal mind-wandering). In accordance with our hypotheses, these results indicated that prospective mind-wandering possesses features making it from more likely than other forms of mind-wandering to beneficially influence future behaviors.

More concrete evidence in favor of the beneficial outcomes of prospective mind-wandering were recently found by Mason and Reinholtz (2015). In this study the authors asked

their participants to perform specific actions in their daily life (i.e., to send an e-mail or text message to the experimenter at a specific time and date without using external memory aids). The two authors then examined whether self-reported mind-wandering episodes specifically related to these future tasks (and occurring outside the enactment window) would predict the probability of the participants subsequently remembering to perform the requested actions. Across five experiments, the results generally showed that participants who reported more intention-related mind-wandering episodes were indeed more likely to send the e-mail or text message at the right moment. These findings are particularly important because they are currently the only firm evidence indicating that future-oriented mind-wandering about a planned action can increase the probability of carrying out this action and, more generally, that spontaneous thoughts can effectively reinforce goal pursuit by fulfilling a self-reminding function.

In addition to its goal-reminding utility, there is also some recent evidence from experience sampling studies on the possible emotion regulation function of future-oriented mind-wandering. For instance, Ruby, Smallwood, Engen, et al. (2013) investigated whether the socio-temporal content of mind-wandering episodes can predict changes in mood states during a laboratory attentional task. Using time lag analyses, they found that (1) reports of mind-wandering episodes related to the past and other people when interrupted by a thought-probe predicted lower mood at the next thought-probe and (2) this finding remained significant even if the emotional valence of the initially reported thought was positive. In contrast, mind-wandering episodes focusing on the future and the self were associated with better mood state at the next probe, even if the content of these initial episodes was negatively emotionally toned. Consistent with these findings, Engert et al. (2014) exposed their participants to a stress induction procedure before assessing their levels of stress hormones and asking them to perform an attentional task with thought-probes. These authors found that the content of mind-wandering episodes reported by their participants generally moderated the levels of alpha-

amylase and cortisol in saliva samples following the stressor. More specifically, (1) thinking about future- and self-related topics was associated with lower levels of cortisol and alpha-amylase, whereas (2) thinking about the past and other people was associated with a higher alpha amylase peak following the stress induction and (3) negatively toned thoughts were associated with higher levels of cortisol. Together, the results of these studies suggest that future-oriented mind-wandering has beneficial effects on mood independently of its emotional valence and is also associated with reduced biological marker responses to stressors.

Not all findings are consistent with beneficial correlates of future-oriented mind-wandering, however. For instance, McVay et al. (2013) assessed mind-wandering during more demanding tasks than Baird et al. (2011) and did not replicate the finding that future-oriented mind-wandering is associated with a better working memory capacity. In another study, Ruby, Smallwood, Sackur, et al. (2013) found no association between the future/self and past/other content of mind-wandering episodes and performance in a social problem solving task. In their daily life investigation on the affective consequences of mind-wandering, Poerio et al. (2013) found that future-oriented episodes had no effect on feelings of sadness and anxiety 15 minutes after the initial thought report. In addition, their findings revealed that it was the affective valence of the thoughts that was congruently predictive of subsequent mood states rather than their temporal orientation. Similarly, Andrews-Hanna et al. (2013) found for their retrospective assessment of daily life thoughts that temporal orientation was unrelated to the experience of depression and negative affect in their participants. Again, it was instead the affective valence of the thoughts (and to a lower extent the tendency to rate the content of thoughts as more personally significant) that was predictive of lower emotional well-being. Finally, in the study where we induced a stressful concern in our participants before the SART with thought-probes (Stawarczyk, Majerus, et al., 2013), we found that the number of future-oriented mind-wandering episodes aiming at dealing with the induced concern was associated with a maintenance rather than a decrease of negative affect during the SART. It could be that, in this

particular study, the experience of repetitive future thoughts about the induced concern was indicative of unsuccessful rather than successful attempts to deal with this particular concern. Nevertheless, these results indicate that further studies should be conducted to clearly determine the affective and cognitive correlates of prospective mind-wandering.

Finally, aside from autobiographical planning processes, some studies have found that other features related to the content of mind-wandering and daydreams can also influence the affective correlates of these thoughts. For instance, Franklin et al. (2013) used experience sampling in daily life and found that the presence of mind-wandering was generally associated with lower mood than moments where individuals reported being focused on their current task (see also Killingsworth & Gilbert, 2010). Importantly, however, a more detailed examination of mind-wandering content showed that episodes rated as high for either interest or usefulness were associated with better mood than moments where individuals were focused on-task. In another study, Mar et al. (2012) found with retrospective reports that, whereas the frequency of daydreaming about people in daily life was positively correlated with loneliness, it was only daydreams about people for whom the participants could not be close (i.e., strangers, fictional characters, or past/potential romantic partner) that explained this relationship. Daydreaming about family members and close friends was not associated with loneliness and was instead related to an increased perception of social support and greater life satisfaction. These results suggest that phenomenological dimensions other than temporal orientation and emotional valence are important to take into account when examining the affective correlates of mind-wandering, daydreams, and more generally spontaneous thought.

In summary, we have shown in this section that evidence suggesting that some forms of mind-wandering may have more beneficial outcomes than others is currently very scarce. Evidence from questionnaire studies suggests that either a high score on the positive-constructive or low score on the guilty-dysphoric dimensions of daydreams are associated with better emotional and cognitive functioning. However, the extent to which these effects are due

to daydreams per se and not to other variables associated with these two general dimensions of inner mental life (e.g., acceptance and emotional reactions to spontaneous thoughts) remains unknown. With regards to experience sampled mind-wandering, apart from a single recent study by Mason and Reinholtz (2015) there is no really direct evidence that future- and goal-oriented mind-wandering can concretely facilitate the achievement of personal goals. There are some indications that future-oriented mind-wandering is associated with beneficial effects on mood states and biological reaction to stressors, but these findings need to be replicated. Some other studies have found, for instance, that it is the affective valence of thought content rather than its temporal orientation that is predictive of mood states and emotional well-being. Finally, it seems that other variables such as the social proximity of imagined individuals and the subjective interest and usefulness of thought content also influence the affective correlates of spontaneous thoughts.

3. Conclusions and future directions

In this chapter I attempted to answer the two important questions of (1) what are people thinking about when they daydream and their minds wander from the here and now and (2) whether the form and content of these two kinds of thoughts can influence their correlates outside the domain of spontaneous cognition. First, regarding form and content of mind-wandering and daydreams, early questionnaire studies are generally consistent in finding that, rather than being fanciful ideations, important phenomenological dimensions of daydreams are a future temporal orientation associated with problem solving processes. These findings were later confirmed by experience sampling research during daily life and laboratory tasks that demonstrated a prospective bias of mind-wandering associated with autobiographical planning processes. Several studies have also shown that cuing and inducing future-related concerns can strongly influence the content and frequency of mind-wandering, suggesting that these thoughts are closely related to the processing of personal goals. Finally, other phenomenological features of mind-wandering have been much less investigated and the most

consistent findings are that these thoughts are (1) mostly about oneself and events happening in the near rather than distant future, (2) generally occur under the form of a visual image or inner speech, (3) focus on specific and highly realistic events, and (4) show a slight positive emotional bias. Second, regarding the questions of whether the content of mind-wandering and daydreams can moderate the beneficial or deleterious correlates of these thoughts, there is currently little direct evidence that future-oriented mind-wandering can concretely facilitate the achievement of personal goals or intended actions. Some questionnaire and experience sampling studies have found that future-oriented/constructive daydreams and mind-wandering are associated with beneficial affective and cognitive correlates, but these findings have not been consistently replicated across research groups.

One possible way to explain the contrast between research that consistently showed the importance of prospective thoughts to daydreaming and mind-wandering and, on the other hand, the inconclusive results of the studies that assessed how this kind of thought may beneficially impact daily life, could be related to the lack of investigation of the context in which these spontaneous thoughts occurs. Based on the findings that mind-wandering is generally more frequent and also has a lower negative impact on performance during low demand and easy tasks, Smallwood and Andrews-Hanna (2013) recently proposed that it is crucially important to take into account the context of mind-wandering episodes, in addition to their content, to clearly determine their beneficial outcomes. To date, however, very few studies have assessed whether and how the phenomenological properties of mind-wandering are influenced by the context in which it occurs, and even fewer have attempted to determine how this modulating effect of context on content may moderate the relationships between mind-wandering and its possible outcomes (but see Ruby, Smallwood, Sackur, et al., 2013). Interestingly, some evidence suggests that the association between mind-wandering and higher ability to delay future gratification (Smallwood, Ruby, & Singer, 2013) and generate creative ideas (Baird et al., 2012) is stronger for mind-wandering occurring during low than high

demand tasks. Furthermore, we have seen in this chapter that mind-wandering seems to be more consistently future-oriented and structured in complex sequences of thoughts during low than high resource consuming tasks. An interesting avenue for future studies in the growing field focusing on the phenomenological properties of spontaneous thoughts might therefore be to examine whether the beneficial correlates previously found for mind-wandering episodes during low demanding tasks can be explained by the higher occurrence of future-oriented and complex episodes in this particular context.

To conclude, it is important to remember that the study of the phenomenological properties of spontaneous thoughts is still in its infancy, being less than one decade old for the precise investigation of daydreaming and mind-wandering content with thought-probes. I nonetheless believe that a major next step in the study of this particular kind of cognition, and for which we hope that this book will represent a strong anchor point, will be to develop an integrative theoretical model of spontaneous thoughts. I think that it will be crucial for this model to include the various dimensions reflecting the phenomenological features of thoughts and a key component of this theoretical framework will require more precisely investigating how different kinds of daydreams and mind-wandering episodes can concretely influence our daily cognitive and affective functioning, be it deleteriously or beneficially.

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Table 1. Temporal orientation of mind-wandering and daydreams

N°	Study	Prospective Bias	Future	Past	Present	Atemporal	Task	Assessment Method	Participants
1.	(Fransson, 2006)	NO	31 (28)	32 (28)	/	/	Rest during fMRI	Retrospective rating on an analog scale	12 (within-subjects design)
		NO	5 (15)	1 (3)	/	/	WM during fMRI		
2.	(Mason et al., 2007a, 2007b)	NO	26%	23%	/	10%	Rest during fMRI	Retrospective interview	19
3a.	(Smallwood et al., 2009) Study 1	YES	.33 (.02)	.23 (.02)	/	/	Rest, CRT, and WM	Thought-probes	76 (within-subjects design)
3b.	(Smallwood et al., 2009) Study 2	YES	.27 (.03)	.20 (.03)	/	/	WM	Thought-probes	77 (within-subjects design)
		NO	.10 (.01)	.09 (.02)	/	/	Reading		
4.	(Miles et al., 2010)	YES	63.4%	36.6%	/	/	Vigilance (forward vection)	Retrospective rating on an analog scale	25 (between-subjects design)
		NO	40.03%	59.07%	/	/	Vigilance (backward vection)		
5.	(Andrews-Hanna et al., 2010)	YES	28.7%	19.2%	/	15%	Rest during fMRI	Retrospective questionnaire	139
6.	(Stawarczyk et al., 2011)	YES	59%	14%	17%	11%	SART preceded by personal goal priming	Thought-probes & retrospective questionnaire	46 (between-subjects design)
		YES	41%	25%	19%	15%	SART preceded by mental navigation		
7.	(Baird et al., 2011)	YES	48%	12%	28%	11%	CRT	Thought-probes	47
8.	(Smallwood et al., 2011) Study 1	YES	.32 (.03)	.20 (.02)	/	/	CRT and WM preceded by self-reflection tasks	Thought-probes	68 (mixed design)
9.	(Smallwood & O'Connor, 2011) Study 2	YES	1.7 (.15)	.92 (.23)	/	1.58	CRT preceded by mood induction procedures	Thought-probes	82 (between-subjects design)
10.	(Iijima & Tanno, 2012)	YES	.33 (.03)	.23 (.03)	/	/	Zero-back WM	Thought-probes	31 (within-subjects design)
		NO	.20 (.03)	.30 (.05)	/	/	One-back WM		
		NO	.09 (.03)	.11 (.03)	/	/	Two-back WM		
11.	(Mar et al., 2012) Study 2	YES	41.3%	28.8%	/	/	Daily life	Retrospective evaluation (proportion of participants responding “always” or “frequently” when asked if their daydreams are about the past of the future)	17,556
12.	(McVay & Kane, 2012)	YES	.26 (.27)	.10 (.18)	/	/	Reading	Thought-probes	242
		YES	.33 (.36)	.17 (.29)	/	/	Reading		
		YES	.22 (.23)	.11 (.17)	/	/	Stroop		
		NO	.18 (.25)	.17 (.26)	/	/	SART		

13.	(Song & Wang, 2012)	YES	40.53%	21.53%	15.92%	22.02%	Daily life	Thought-probes	165
14.	(Andrews-Hanna et al., 2013)	YES	59.8 % (25.4)	40.2% (25.4)	/	/	Daily life	Retrospective rating of self-generated thoughts about specific events	76
15.	(Christian et al., 2013)	NO	5.04 (2.24)		/	/	Daily life	Retrospective ratings on a continuous scale ranging from 1 (always past) to 10 (always future)	200 participants from Western countries
		YES	5.85 (2.57)		/	/			200 participants from Eastern Asian countries
16	(Diaz et al., 2013)	NO	2.72	2.14	3.43	/	Rest	Retrospective rating on three continuous scales ranging from 1 (completely disagree) to 5 (completely agree)	1355
17a.	(Jackson et al., 2013) Study 1	YES	3.33 (1.34)	2.82 (1.32)	/	/	SART	Self-caught reports	89 (between-subjects design)
		NO	1.36 (2.13)	2 (1.23)	/	3 (1.23)			57 older adults (between-subjects design)
		YES	1.72 (1.08)	.83 (.53)	/	/	SART	Self-caught reports	82 (between-subjects design)
		NO	1.03 (1.34)	.93 (1.32)	/	1.03 (.07)			74 older adults (between-subjects design)
18b.	(Jackson et al., 2013) Study 2	YES	2.72 (.78)	1.38 (.22)	/	/	SART	Thought-probes	82 (between-subjects design)
		NO	2.59 (.92)	1.07 (.56)	/	1.9 (.55)			74 older adults (between-subjects design)
		YES	1.83 (.39)	.67 (.82)	/	/	SART	Thought-probes	24 young adults
		NO	1.68 (.78)	.34 (.22)	/	2.66 (.84)			17 aged adults
19.	(Mevel et al., 2013)	YES	3.7 (2.7)	3.2 (2.9)	/	/	Rest during fMRI	Retrospective evaluation of the number of past and future thoughts	24 young adults
		YES	2.8 (2.2)	2.1 (3)	/	/			22 middle-aged adults
		NO	2.6 (2.6)	2.8 (2.2)	/	/			17 aged adults
20.	(Poerio et al., 2013)	YES	3.40 (.24)		/	/	Daily life	Thought-probes & continuous scale ranging from 1 (distant past) to 5 (distant future)	24
21.	(Ruby, Smallwood, Sackur, et al., 2013)	YES	4.45 (.19)	2.72 (.14)	/	/	CRT	Thought probes & two independent scales	84 (within-subjects design)

		YES	4 (.23)	2.74 (.13)	/	/	WM	ranging from 1 to 9 to asses past & future orientation	
22.	(Ruby, Smallwood, Engen, et al., 2013)	YES	3.38 (.12)	2.26 (.08)	/	/	CRT	Thought probes & two independent scales ranging from 1 to 9 to asses past & future orientation	
23.	(Stawarczyk, Majerus, et al., 2013)	YES	59%	10%	20%	9%	SART preceded by stressful concern priming	Thought-probes & retrospective questionnaire	32 (between-subject design)
		YES	52%	32%	10%	6%	SART preceded by neutral concern priming		
24.	(Stawarczyk, Cassol, et al., 2013)	YES	43%	26%	15%	16%	SART	Thought-probes & retrospective questionnaire	67
25.	(Diaz et al., 2014)	NO	2.62	2.44	3.74	/	Rest	Retrospective rating on three continuous scales ranging from 1 (completely disagree) to 5 (completely agree)	562
26.	(Engert et al., 2014)	YES	4.2 (2.7)	3.5 (2.5)	/	/	CRT and WM preceded by a stress induction procedure	Thought probes & two independent scales ranging from 1 to 9 to asses past & future orientation	99 (within-subject design)
		YES	4.4 (2.8)	3 (2.3)	/	/	CRT and WM preceded by rest		
27.	(Unsworth & McMillan, 2014)	NO	.22 (.30)	.22 (.32)	/	/	Reading	Thought-Probes	150
28.	(Ye et al., 2014) Study 2	YES	.25 (.02)	.14 (.02)	/	/	CRT	Thought-probes	71 children (within-subject design)
		YES	26 (.03)	11. (02)	/	/	WM		
29.	(Berthie et al., 2015)	YES	50%	10.5%	39.5%	/	Daily life (driving)	Retrospective questionnaire about the participants' most recent driving trip	109
30.	(Plimpton et al., 2015)	NO	25%	46%	29%		Vigilance with cue words	Thought-probes	17 dysphoric individuals
		NO	28%	41%	31%	19 non-dysphoric individuals			
31.	(Marcusson-Clavertz et al., 2016)	YES	4.05 (2.91)	2.23 (2.32)	2.31 (2.10)		SART	Thought-probes	111

Note: This table comprises all studies that investigated the temporal orientation of mind-wandering and daydreams with tools other than the Imaginal Process Inventory (IPI) or Short Imaginal Process Inventory (SIPI). Every study listed in this table was performed on healthy young adult participants except when stated otherwise in the Participants column. CRT = Choice Reaction Time; fMRI = functional magnetic resonance imaging; SART = Sustained Attention To response Task; WM = working memory.