

Chapter 1

Introduction. The Lines, Circles and Zigzag on Mind-Wandering



Nadia Dario and Luca Tateo 

“New Perspective on Mind Wandering in Education” presents a body of studies and research that deal with mind-wandering and shows the points of convergence and divergence among them, suggesting which are the conjunctions with learning in educational settings.

Generally, we can define *mind wandering* (MW) as a conscious experience where the mind wanders away at different levels of disconnection from here and now towards inner musings (Kane et al., 2007; Killingsworth & Gilbert, 2010), but the discussion on its definition is recursively considered by our authors.¹

Mind-wandering is a complex phenomenon that deals with dimensions of mental activity such as intentionality, attention, motivation, emotion and performance, which are part of the educational domain. MW represents a dilemmatic object in pedagogical and psychological research, because it remains split between positive and negative implications. Just to give an example, in cognitive sciences, mind-wandering correlates with cognitive control. On the one hand, it is a failure to constrain thinking to task-relevant material; on the other hand, this failure in control facilitates the expression of self-generated mental contents.

¹An interesting analysis on this aspect in cognitive, clinical psychology and neuroscience is offered by Pelagatti et al. (2020). However, in the chapter, the more common definition in literature is reported: Mind-wandering is a “shift in the focus of attention away from the here and now towards one’s private thoughts and feelings”. This shifting away is generally spontaneous, although there is evidence that it may also occur intentionally (Seli et al., 2016).

N. Dario (✉)
CNRS, Ecole Normale Supérieure de Lyon, Université Lyon 2, Lyon, France
e-mail: nadia.dario@ens-lyon.fr

L. Tateo
University of Oslo, Oslo, Norway

“New Perspective on Mind Wandering in Education” aims at providing a landscape view of the phenomenon, from different perspectives and interpretations, without imposing a single viewpoint. In particular, the book deals with some of prototypical dimensions and instances of mind-wandering that have an impact in the educational field (O’Neill et al., 2021, p. 2599):

- (a) *Task-relatedness* that captures the extent to which one’s thoughts pertain to a primary task or to a task-unrelated content. Barron et al. (2011) and Smallwood and Schooler (2006) suggest that more highly prototypical instances of MW tend to include thoughts that are unrelated to a focal task (i.e. TUTs), as opposed to task-focused thoughts.
- (b) *Intentionality and consciousness* (i.e. whether thought is deliberately or spontaneously engaged²).
- (c) *Thought constraint* that distinguishes between thoughts that are constrained and unconstrained by attention where MW is associated with a greater degree of *freely moving thought (FMT)*.

Thus, the text is fully inserted into the debate about MW’s dimensions and their relatedness or dissociation (O’Neill et al., 2021). The book deals with the relationship between the main domains of attention, memory, perception and performance (Callard et al., 2013), but also considers intentionality, temporality, motivation, emotion, creativity and acquisition of new knowledge.

Finally, it discusses the methodological issues concerning the idiographic and nomothetic approaches in the MW research. The former concentrate on the uniqueness, specificity and unrepeatability of the individual (*idios*) and try to govern it and to bring it back to general laws (generalists). The latter adopt a mesurative approach and try to find stable and recursive laws (experimentalists).

Therefore, the book intends to overcome the limits set by generalists and experimentalists, whereas the former criticise the latter for its neopositivist paradigm. The experimentalist paradigm claims instead that the scientific nature of knowledge is linked to the use of quantitative methodologies that provide measurable results. However, neopositivism cannot be dismissed by just an a-historical and obsolete criticism. Scholars in this volume are aware that thinking is marked by self-awareness and external reality. The problem is instead a poor conceptualisation of both consciousness, environment and their relationship. The latter becomes complex, consisting of elements that interact in a non-linear manner so that even though thought can no longer be considered such, it must still be able to deconstruct and restructure consolidated schemes, and follow inaccessible roads by making

²Seli et al. (2016) claim: “Voluntary shifts of attention to TUTs would seem to involve higher orders of control in information processing or be motivationally determined and to be benign because of their controlled nature. However, involuntary shifts of attention from the task at hand to TUTs would seem to involve lower orders of control in information processing and not [be] motivationally determined; in addition, involuntary shifts may be less benign because they are uncontrolled” (p. 606).

connections that have never been practised before, getting rid of any rigidity. Hence, thought places MW among its postulates.

Our prologue represents MW as a mind's journey in time, space and knowledge. As in a "loose string of creative thought", this book moves along imaginary "lines" and "circles" of scientific knowledge.³ In the first section, represented as "lines", the authors show their perspectives on the issues of attention (selective and sustained), the influence of age, embodiment, consciousness and experience related to MW. Each time the authors expand the planes creating new lines of inquiry.

In the second section, these "lines" become "circles" of knowledge on methodology (tasks and measurement), intervention (auditory beat stimulation and mindfulness practices) and creativity, in which there are always profitable, decisive and retroactive exchanges between information that each group or author activates. In this manner, we recreate a dance of interacting parts: scrolling through the different contributions, one can grasp the rhythm of convergences and interconnections that animates them.

In the last part "zigzag", we discuss the absence of a unified theoretical perspective, in the pedagogical field, based on a generative-systemic approach, attentive both to the developing processes of emergence and the interactions between parts.

The book prologue (Warren, 2022) frames the question of the conceptual and operational definition of MW, named in different ways: spontaneous thought, stream of consciousness, daydreaming, stimulus-independent thought, task unrelated thought, etc. *Which one best suits mind-wandering?*

Starting from this question, Warren (2022) considers the debate on its definition in cognitive science.⁴ She reports the first use of the term "mind-wandering" as a synonym of stream of consciousness (Pope, 1978) and stimulus-independent

³Reconsidering Giunta (2014)'s idea on flexibility as lines and circles.

⁴Here, we find two main approaches: dynamic and family resemblance. The former propose that mind-wandering is a member of a family of spontaneous-thought phenomena that must be studied to understand how its states, arise or change over time, **distinguishing it** from, for example, rumination (see Christoff et al. 2016, 2018), and linking mind-wandering with two concepts: variability and constraints. "Some studies have started investigating this dynamic dimension of MW, introducing measure of the degree of freedom of movement in thought (i.e., level of constraints on thought as it unfolds over time) (Smith et al., 2018) and examining its relationship with the other, content-based dimensions, as task-unrelatedness and stimulus-independence Mills et al. (2018) (Pelagatti et al., 2020, p. 3). The issue of the dynamic of MW is also addressed, in a more temporal-based perspective, in the process-occurrence framework, proposed by Smallwood. According to this proposal, any comprehensive account of Mw is expected to explain when and why MW occurs, that is which processes and events control and prompt the initial occurrence of MW (onset) and how MW unfolds over time, that is which processes sustain MW over time (maintenance). In order to understand how the mind wanders, we need to identify and distinguish between the onset (the so-called process of ignition) and maintenance" (Pelagatti, p. 2).

The Family Resemble Approach doesn't accept a definition because "no single definition can capture all the facets and subtleties of mind-wandering, and neither logic nor empiricism can select among them. Thus, they propose defining mind-wandering as a multidimensional and **fuzzy construct**, encompassing a family of experiences with common and unique features" (Seli et al. 2018a, b).

thought, reminding the reader how much of the literature on the subject stems from Antrobus (1968). Warren (2022) seems to criticise the position that departs from the theory of information processing, where MW is considered a process that hinders and reduces the capacity of perception, processing and retention of the main stimulus. Our author, like William James (1890), prefers to stress the dynamic nature of MW: “To James, a perching represented a mental state including contents such as imaginings, worries and inner speech, whereas a flight represented the ‘movement’ from one mental state to another” (Christoff et al., 2016, p. 1), and associates it with mental travel (Corballis, 2015) and spontaneous thought. In this chapter, the reader can perceive the human uniqueness where MW is involved in “autobiographical memory retrieval, envisioning the future, and conceiving the perspectives of others” (Corballis, 2015). Hence, the importance of “episodic simulation” appears in relationship with creative processes, so the person is able to remember events and experiences and to imagine novel scenarios and situations. Warren believes that the universe of humans is full of stories, not of atoms, and MW is fundamental for storytelling and creativity where generation of ideas would be more highly spontaneous. However, Warren (2022) offers to the attentive reader some elements for a pedagogical reflection: she structures the chapter on the idea of spontaneity and creativity (Warren, 2018). Creative thinking is composed of a spontaneous part, linked to MW, and a critical one. The educator’s purpose is to make sure that the creative process is not subjected to critical scrutiny before making room for MW. She underlines how the role of the adult must be to accompany the child in this part of the creative process, which is an expansive phase, without forgetting the critical aspect we were talking about. In this, she demonstrates how the educator’s and teacher’s job is to *take care* of children’s ideas, thoughts and processes as if they were treasures.

The Lines

In the first part of the volume, there are trajectories of knowledge development on MW, the “lines”, which are sometimes tangent to the “circles”. That is, they have points that touch upon the chapters in the second section (Fig. 1.1).

Pepin and Lafont (“How and Why our Mind Wanders?”) start analysing the concept of “attention”, one of the most misleading and misused terms in cognitive science. From our authors’ peculiar perspective, the chapter offers an overview on attention and MW. It introduces the topic showing how theories of attention evolved from the early sequential models of information processing (Antrobus, 1968) to more flexible and interactive models with parallel streams specialising in different forms of perceptual analysis, interactive cycles of processing and re-entry of earlier levels and cognitive neuroscience approaches (Treisman, 2009; Driver, 2001). The authors’ theoretical reconstruction shows how avantguard or “embryonal ideas” on attention were already in the air even before cognitive neuroscience developed them.



Fig. 1.1 Holly BF Warren (2022), private collection, Milan, Italy

Initially, the authors describe how humans utilise selective attention to improve their confidence level in confusing situations, such as the so-called “cocktail party effect”.⁵ With Broadbent’s (1958) “early filtering theory”,⁶ where the brain temporarily retains information about all stimuli but the information fades, unless attention is turned quickly to a particular memory trace, Pepin and Lafont want to stress the shift in attention research towards the interaction between psychology and neuroscience:

The attempt to link physiology and psychology can be disastrous when it is premature. [...] But it would be equally disastrous to go on forever treating the brain as an abstract and ideal construct having no biological reality. (Broadbent, 1958, p. 447)

The “filtering theory” is used to introduce Kahneman’s (1973) model of a limited pool of resources or “effort” to produce explanations that relate not only to psychological but also to neural processes.

⁵The “cocktail party effect” describes the brain’s ability to focus on only one auditory stimulus while filtering out a range of other stimuli. For instance, a partygoer can focus on a single conversation in a noisy room.

⁶As referred by Pepin and Lafont, we use the term early theory because others changed it. Consider Treisman’s “attenuation” modification of Broadbent’s theory where he proposed that the filter merely attenuated the input rather than totally eliminating (Park & Lee, 2000).

The two authors are closely interconnected. Broadbent's theory is based on the computer metaphor of the mind. It is one of the first theoretical accounts to relate psychological phenomena to information processing concepts from mathematics and computer science. The computer metaphor stresses the analogy between the human attentional limits and the limits of central processing units in computers. In accordance with this view, Kahneman (1973) showed that a secondary task was impaired when combined with a primary task because resources were limited and these two tasks were unlikely to share the same brain networks:

According to the Kahneman's model, the performance obtained following the success of a cognitive task depends on three factors: the amount of cognitive resources required to complete the task, the amount of available resources and the way resources are distributed (Kahneman, 1973). The amount of resources required to complete a task generates a cognitive load which varies with the type and the difficulty of the task. (Pepin & Lafont, 2022, p.)

Another element in Kahneman's model was the effort connected with attention. To illustrate this point, he gave an example taken from the school setting: "the school-boy who pays attention is not merely wide awake, activated by his teacher's voice. He is performing work, expending his limited resources, and the more attention he pays, the harder he works. The example suggests that the intensive aspect of attention corresponds to effort rather than to mere wakefulness" (Bruya & Tang, 2018, p. 4).

Pepin and Lafont's (2022) exploration continues with the description of brain networks necessary for human attentional capacity: ventral attentional network (VAN), dorsal attentional network (DAN) and default mode network (DMN). In particular, they emphasise the role of these networks related to the occurrence of mind-wandering in individuals:

Default mode network is not only activated during the vagrancy of thought (Stawarczyk et al., 2011) or when we think of something that is of personal importance (Gusnard et al., 2001), but its activation is found to be anti-correlated with that of the brain regions recruited during external sensory processing (e.g., primary visual and auditory cortex as emphasised by Smallwood et al., 2008). Thus, when we think about something else, the activity decreases in regions of the occipital cortex involved in perceptual processing (Gorgolewski et al., 2014). This means that we cannot process information from the outside world and stay focused on our thoughts at the same time. This may seem obvious to anyone who has experienced mind-wandering. However, this is a neurological proof of how our attention works and it sustains models of attention. (Kahneman, 1973; Wickens, 2002; Pepin & Lafont, 2022; p.)

Pepin and Lafont (2022) describe how the sophisticated dynamical patterns of activity emerge spontaneously across cortical and subcortical structures, but in particular, they stress that there is a different neural activation when a subject is engaged in some task, in the presence of external stimuli (task-evoked) and when the brain is at rest and external stimuli are weak or absent (mind-wandering).

By considering MW a first shift of attention from the outside world to personal thoughts and the maintenance of attention on the train of thought to protect the internal experience also known as perceptual decoupling (brain at rest), the authors wonder about MW costs and benefits in light of its positive or negative aspects in

relation to its emotional contents (positive or negative), to the activity to be carried out and to the context.

In the conclusion, the four main themes on mind-wandering emerge: temporality and emotion, intentionality and consciousness. All topics are connected with the educational setting, but we believe that this first chapter helps the reader to reflect on other aspects of the learning process. Pepin and Lafont (2022) suggest the idea of limits. Man has limits. Mind-wandering makes us human because we cannot control everything and we are governed by the laws of salience by which we are oriented/orient ourselves towards what we perceive as most motivating, interesting and useful at that given moment. In the final analysis, what is the purpose of education? To disclose the human in us, isn't it?

After all, in every historical period, man has discovered his limits but also his great potentialities: let's consider for a moment the role of passions in the Middle Ages. They had to be repressed because they had a negative connotation. In modern times, we have rediscovered their relevant role in learning processes and, more generally, in education.

In the second chapter of Vannucci, Pelagatti and Marchetti, the narrative focuses on the description of the most important studies on mind-wandering in adolescence, an age scarcely investigated by literature on mind-wandering.

According to the authors:

the multiple emotional, social and cognitive changes characteristics of the life phase of adolescence makes young people vulnerable to psychological distress and mental health problems (such as depression, see Marchetti et al., 2016) but the association between MW and both negative affect and psychological distress in adolescents may have important implications, not only at a theoretical level, but also for designing intervention to promote psychological well-being. (See Smallwood & Andrew-Hanna, 2013; Vannucci et al., 2022, p.)

By considering adolescence a “critical period for protracted maturation of the frontal lobes and brain maturational changes that continue into early adulthood to play a crucial role in attentional mechanisms, especially in sustained attention and executive functioning”, Vannucci et al. (2022) present the state of art on the topic and on cognitive attentional control in adolescence.

The relevance and pervasiveness of attentional problems are a major concern in educational contexts (for a review, see Polderman et al. (2010)) and psychopathology. In these particular fields the paper reconsiders in-depth Vannucci et al.'s (2020) elaborations that examined the association between trait levels of mind-wandering in daily life (deliberate and spontaneous mind-wandering) and depressive symptomatology, considering the differences in relation to age- and personal-oriented approach. The chapter maintains a strict distinction between deliberate and spontaneous mind-wandering (Seli et al., 2016) and underlines the importance of motivational dispositions in students. This confirms Klinger's current-concern hypothesis (Klinger, 1971, 2013; Klinger et al., 1973) where mental life is attracted to personal concerns, and, especially when the external world is relatively uninteresting and the circumstances are unfavourable for goal-directed behaviour, the mind turns inwards and starts wandering and the thoughts reflect the goal pursuit or associated contents.

Vannucci et al. (2022) conclude their chapter by suggesting the necessity to give a clear operational definition and to “capture the complexity of mind-wandering” through a multidimensional approach in particular if we consider how the contents and the context in which mind-wandering emerges are determinant for its relation to other cognitive variables (including pupil size) (Pelagatti et al., 2020; Konishi et al., 2017; Binda & Murray, 2015). This chapter is especially interesting because it introduces the reader to the methodological questions of the next section: the circles. It is a kind of tangent to the circle on the theme of the task; it strikes us for the attention given to the issue of well-being in adolescence and in school.

Starting from the idea of MW as a process observable in behaviour, a third chapter entitled “Mind and Body: The Manifestation of Mind-Wandering in Bodily Behaviourism” stresses the impact of MW on the perception-action cycle (Fuster, 2002, 2004):

Perception of external stimuli is attenuated during mind wandering and, therefore, predictions and actions become more inaccurate or less efficient. In addition, mind wandering affects the body in other ways: one’s posture might change, and the change in mental state might be reflected in facial features. Interestingly, there are also specific non-instrumental behaviors, such as fidgeting, that are associated with mind-wandering, suggesting that mind-wandering not only changes how the body interacts with the environment but also that mind-wandering is (at least to some extent) embodied. (Dias da Silva et al., 2022a, p.)

The chapter draws attention to instrumental and non-instrumental behaviours often forgotten in the educational field. On the contrary, it could be useful for teachers to be provided with tools (observations of instrumental and non-instrumental behaviours) to detect when mind-wandering takes place in the context of perception and action. The authors discuss its disruptive manifestation in bodily behaviours associated with intentional and attentive actions, linking MW with non-instrumental bodily behaviours. The findings suggested that there is a degree of decoupling perception of the external environment and bodily actions during MW. In the chapter, two experimental conditions are reported, *mind-wandering during a forced-choice reaching task and a tracking task*, where the movements of the hand appear to be more erratic and less variable hand movements with a reduced efficiency on the task. The same is indicated for eye movement and voice pitch. However, the chapter is also focused on non-instrumental behaviours such as fidgeting and facial features, the embodied manifestations of MW. Furthermore, this information can be of interest in the studies on intelligent tutoring systems.

At this point, the reader finds the idea of MW manifested in an exploratory off-task state, embodied in fidgeting, doodling and humming, serving to determine the next attentional state. The chapter closes with a brief analysis of a computational model of mind-wandering to be necessarily integrated with bodily behaviours. They wrote:

In general, the computational models of mind wandering focus on simulated behaviour in terms of the trade-off between accuracy and speed. As we have seen throughout the course of this chapter, our behaviors while performing a task can be more complex than reaction times and accuracy alone in that mind-wandering is associated not only to a change in mag-

nitude or the variability of any one type of bodily behavior, but rather to a systematic co-variation of bodily behaviors. (D’Mello et al., 2012; Dias da Silva et al., 2022b, p.)

Re-Organizing One’s World. The Gestalt Psychological Multiple-Field Approach to “Mind-Wandering” closes the section on the lines and offers a new approach on mind-wandering as a reorganisation of the total phenomenal field of perception and experience. The author discusses the “conditions, implication and potential applications of Gestalt psychological multiple-field approach”.

In particular, it offers a new vision of consciousness, a description of the mind-wandering phenomenon (*where it primarily consisted of one phenomenal world, divided into one phenomenal ego and its phenomenal environment, now a second world separates itself from this one world, which is also divided into a phenomenal ego and a corresponding phenomenal environment. This second world is embedded in the first and is more or less closely interrelated with it. This is what happens in the mental processes that are conceptualised, with positive or even negative connotations, under such diverse terms as mind-wandering, daydreaming, imagining, fantasy travel, attention deficit disorder, dissociation and so on*) and the main features on the Gestalt theoretical approach to “mind-wandering”.

Starting from the MW state, the in-depth analysis of the author on the ideas of consciousness, total field, experience and applications in the therapeutic field makes any editor’s explanation reductive. It seems more appropriate to write, as if this were the leaflet of a drug: “We recommend reading it”.

The Circles

In this section, we find the following topics collected in three circles: the task and the measurement of mind-wandering (first circle), the intervention on forms of maladaptive mind-wandering (second circle) and creativity (third circle). The knowledge that develops therefore seems to return to itself, reflexively. In particular, the second and third circle attempt to find a point of convergence, describing how cognitive, socio-relational and socio-affective dimensions are integrated during the learning processes (Fig. 1.2).

In the chapter “Extended Minds and Tools for Mind Wandering”, Gozli (2022) points to the lack of an analysis of the representation of the task (Metzinger, 2017) in experimental studies used to analyse and describe mind-wandering. A Autobiographical and literary examples (on writing and painting) are used to introduce how the methods of experimental psychology and cognitive neuroscience could be viewed as media of thought and communication. In particular, the methods for the study of mind-wandering are themselves cognitive tools that limit the way researchers think about MW. According to Gozli, perceptual decoupling is an example of an idea on MW that results from a bias built into methods of research. Generally, the role of experimental tasks as the engine of data production in mind-wandering studies has resulted in the recognition that research participants might



Fig. 1.2 Holly BF Warren (2022), private collection, Milan, Italy

occasionally disengage from tasks (Callard et al., 2012; Gozli, 2019). This has resulted in the emergence of research on MW which begins by considering MW a deviation from task performance and sustaining the perceptual decoupling (Callard et al., 2012, 2013; see also Christoff et al. 2018). This is the task-switching approach. Alternatively, Gozli (2022) proposes a style-based approach where mind-wandering is a style of engagement in another type of task (e.g. daydreaming). Gozli’s questions can go beyond whether participants are disengaged, and address how they are actually engaged. We can ask how they might be observing, imagining or thinking differently in the same situation (Tateo, 2020).

In summary, in accordance with Vannucci et al. (2022), Gozli (2022) questions the main theories on spontaneous cognition (such as the inhibition and reduced cognitive resources theories of ageing) showing how task difficulty, consciousness, task interest and amount of current concerns may contribute to MW heterogeneity. Furthermore, Gozli suggests a style-based approach showing how this leads to a different interpretation of the phenomenon. It means to consider the possibility of a *hierarchical goal representation* (multiple-goal representation in Metzinger’s idea) but also to distinguish between persistence and flexibility, developed by the researchers. Gozli’s chapter creates a bridge with Dias, Postma and Faber’s chapter: “Windows to the Mind: Neurophysiological Indicators of Mind Wandering Across Tasks”. Gozli’s analysis on tasks and the stress on the discrepancies observed across studies in addition to or in interaction with task demands reflect on neurophysiological indicators of mind-wandering across tasks (Dias et al., 2022b). They highlight subjective and objective measures of mind-wandering, revealing how the former (questionnaire, online self-reports, offline self-reports⁷) can be limited. For instance, they can have a low ecological validity and disrupt the natural flow of a task or

⁷The subjective self-reports are critically dependent on meta-awareness.

process. Triangulation of self-reports with behavioural and neurophysiological measures (e.g. eye tracking and EEG) can provide a more comprehensive research method of MW analysis. However, what strikes the reader is the sluice where Dias, Postma and Faber suggest applying research on MW in the context of intelligent tutoring systems to generate predictive models by means of machine learning (i.e. online lecture).

Surely, from the pedagogical point of view and from the research methodologies in the educational field, this chapter and the following ones refer to a need to identify methods and knowledge capable of interacting profitably with educational practices, and, in particular, they seem to remind us how too often a line of research in education is terminated with a change of fashion, or a change of paradigm, not because the problem has been solved (Hargreaves, 2007). However, the orientation towards triangulation and mixed methods shows how we cannot only anchor ourselves on the concept of effectiveness in schooling but we must always define “for what”. In short, it is necessary to remember that at school there isn’t only learning but also other dimensions such as autonomy, self-esteem, and well-being to which this second circle seems to refer (Olson, 2004; Chatterji, 2004).

The second circle is about intervention in educational settings. The first chapter of this section is “Non-invasive Brain Stimulation for the Modulation of Mind-Wandering”. Here, we find a well-argued discussion on current direct stimulation techniques on mind-wandering and the description of non-invasive brain stimulation methods, in particular a novel neuromodulatory approach, *auditory beat stimulation (ABS)*, to modulate mind-wandering and meta-awareness. The authors start with a short introduction on non-invasive brain stimulation techniques (magnetic and electrical ones) to treat auditory beat stimulation, a promising new method to safely and reversibly modulate cognitive processes. The method consists of applying two types of auditory beats: binaural and monaural. It has a relevant impact in individuals that exhibit a greater tendency to mind-wander.

Ergas’ (2022) position on MW – an autonomous dimension of mind in which we do not control neither our actions nor our mental experiences – argues that we are hardly conscious agents. He suggests solving this problem through contemplative practices. According to Ergas, the agency of an individual has a fulcrum in attention, not in thinking. MW represents a case of hypo-agency and disintegration that is pervasive in our life (it takes the mind away from being fully invested in the present moment of embodied existence). MW is a state of mind of which we are *not* the agents. The fact that this phenomenon is so pervasive shows that students are not the integrated beings that school curricula speak of:

Looking at students from an external gaze as integrated subjects does not grant us with enough understanding of agency. Inner experiences in which we supposedly will do one thing and do another, suggest first, that it might be more helpful not to think of students as integrated beings and acknowledge them as complex and disintegrated subjects. Second, it suggests that if education does assume agency and aspires to cultivate it, it needs to delve more deeply into the moment-to-moment processes concerned with agency that are associated with the depth of these inner complexities, so that it can indeed cultivate such agency if this is possible. (Ergas, 2022, p.)

Through the words of James (1995) and Holt (1995), Ergas shows us how difficult it is to talk about full agency and MW helps us to see it as a conundrum. Attention and agency are two faces of the same coin. All the curricula that think of the student as an integrated subject make no sense, but those that think of him as a human being, in need of being aware of what is happening in his own mind, make perfect sense.

Ergas' series of examples and suggestions on contemplative practices (i.e. an experiment on a form of mindfulness practice), used by the author with his students to enhance their attentional faculty, make the chapter even more interesting and rich in ideas for practitioners. He emphasises how essential it is to strengthen our attentional faculty to develop agency, and for this reason, contemplative techniques come to our rescue, to sustain the focus of attention on particular objects.

The contemplative practises are then perfectly described in Lars Didriksen's chapter, "A Contemplative Perspective on Mind-Wandering", where they are used to alleviate some negative effects of mind-wandering in health and educational settings. In the "Introduction", Didriksen (2022) retraces the main features of maladaptive mind-wandering: rumination, worry, anxiety and self-referential processing not only in clinical but also in daily activities. Starting from dissatisfaction (*Duhkha-samudaya*) and suffering and basing them on the idea of attachment (to the experiences that we don't want to end), Didriksen indicates contemplative practice as a means of stopping them. The mental creation of preconceptions limits our responses, and, on the contrary, zen meditation and mindfulness could promote the *shoshin* or a beginner's open mind. Didriksen's main idea is an inner transformation based on awareness and attention and a regulation of mind-wandering, "Paying attention in a particular way: on purpose, at the present moment, and nonjudgmentally" (Kabat-Zinn, 2013; Rogers et al., 2018; Xu et al., 2014).

Thus, he describes two distinct clinical programs: mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT). In the section "Biomarkers", he also offers a psychophysiological analysis that confirms how these practices modify our mental processes. The two programs, in particular, teach how meta-awareness helps the practitioner catch signs of changes to reach a mental and physical well-being in time. They reduce past- and future-oriented thoughts and reoriented attention to the present moment, the here and now moment.

A new perspective on the contemplative practices, expressed in the two previous chapters, is offered in "Mind Wandering and Emotional Processing in Nondirective Meditation". Here, the contemplative practices are used to facilitate MW and default network activity that implicate emotional processing. The reason for this contro-intuitive position at this point of our book introduction is "If mind-wandering were only negative, how would it have survived millions of years of evolution and have still been such a widespread trait in human beings?" Thus, in the chapter, Halvor Eifring (2022) looks "at one specific function of mind-wandering which is more rarely discussed in the research literature, but which turns out to be quite important: **emotional processing**". In fact, Xu et al. (2014) demonstrate, through fMRI, how non-directive meditation facilitates MW and activates the default mode network and other brain areas associated with memory retrieval and emotional processing (based on information and therapeutic processing of emotions). He wrote:

One important feature of nondirective meditation is the *relaxed use of attention* involved in the free mental attitude, as implied by its effortless nature, its open and wide-angled nature, and its acceptance of digressions. This mode of attention facilitates an increased amount of *mind wandering*. This, in turn, creates opportunities for the retrieval of *episodic memories* that have been suppressed or relegated to the periphery of consciousness. Since these memories are often emotionally charged, their retrieval implies the resurfacing and *processing of emotions* that have not in the past been processed in a fully satisfactory way. (Eifring, 2022, p.)

This chapter is a sort of bridge with the last circle on creativity.

In fact, Böttger and Költzsch (2022) in “The Secret Powers of a Wandering Mind. Underestimated Potential of a Resting State Network for Language Acquisition” move to other topics: personal development, creativity and acquisition of new knowledge. Thus, the third circle on the positive side of mind-wandering takes shape. The two authors treat the connectivity between the emotion network, the salience network and the default mode network, indicating the functional importance of resting states of the brain (see Raichle et al. 2001). According to them, when the three brain networks are coordinated and co-regulated, humans can operate well in the world and take advantage of learning opportunities due to the fact that they contribute to social, emotional and cognitive functioning. In particular, the perspective and predictive brain, DMN, generally connected with mind-wandering, is able “to facilitate flexible self-relevant mental explorations – simulations – that provide a means to anticipate and evaluate upcoming events before they happen”, so that the disengagement from current situations allows us to deal with imminent problems of the future, developing greater personal relevance and intrinsic motivation regarding the situations. According to Pezzulo et al. (2021), this has two imperatives: maximising the accuracy of mental explorations (to fit data) and minimising the complexity of reality (to avoid overfitting). In brief, mind-wandering increases accuracy and favours the reduction of complexity.

Furthermore, the chapter is inserted in this section because it considers mind-wandering a self-referential thought with similarities with the creative process. In this respect, the incubation stage is of significance: creative ideas are incubated, while the subjects are engaged in completely different tasks. This has an implication for foreign language production when the student constructs hypotheses about rules of the use of it, constantly tested and modified:

Considering cognitive activities connected to the activation of the DMN, e.g. introspective or self-referential thought, emotional processing (Broyd et al., 2009), spontaneous cognition, or predicting possible actions (Raichle & Snyder, 2007), there is a link between these implicit processes and language acquisition related processes such as self-correcting and self-reflecting, unconsciously planning of the speech action, expressing personality through certain choice of words and expressions, or decision making how to say what to whom. (Böttger & Költzsch, 2022, p.)

The suggestion offered at the end for optimising the learning environment indicates how a concrete comprehension of mind-wandering is necessary to overcome the long-standing belief in Western culture that links attention to effort in an all-or-none manner. On the contrary, attention is graded in nature (Shad et al., 2012), and

optimal learning environments include sustained attention, flexible planning, exploration and discovery, followed by self-monitoring and meaning-making processes.

Developing and expanding the positive and creative side of mind-wandering, González, García-Huidobro and Fossa in the chapter “Is a Wandering Mind an Unhappy Mind? The Affective Qualities of Creativity, Volition and Resistance” are interested in proposing the unexplored position on mind-wandering. With the intention of generating an integrative framework of consciousness, the authors introduce the concept of mind-wandering as an affective expression, which extends to the processes of creativity, volition and resistance as inter-functional connections of thought (see also Fossa et al. 2019).

Mind-wandering is a complex cognitive-affective phenomenon in constant relationship to other functions of the psyche: volition, imagination, thought, language and memory. What is generally considered a task-unrelated thought is seen as a process by which attention is oriented internally through a neural mechanism of suppression that inhibits the focus on external information (Villena-González, 2019), it is linked to an individual’s motivations (Smallwood & Schooler, 2015), along with the person’s present concerns and goals (Vannucci & Agnoli, 2019). These considerations are also facilitated by the introduction of the developmental psychology concept of the continuum in thought. As also expressed in Fossa (2017, Fossa et al. 2019), this opens the doors to a new approach towards the topic in terms of inner speech, problem-solving and creativity:

the expressive dimension of inner speech is a manifestation of the deeper states of consciousness, that is the expressiveness of the volitional sphere- motivation that resonates in our interior in the form of condensed experiences of images, thought and affections. (Fossa, 2017, p. 325)

In the “era of mind-wandering”, the authors criticised the traditional notion of mind-wandering as a task-unrelated thought preferring the unguided thought, due to the severe limitations of this approach: scarce consideration of the dynamics in MW episodes and other intermediate forms of it, absence of explanation on how its content can be related to a main task and excessive emphasis placed on the connection between a shift in attention and mental wandering (i.e. there could be a simple switch between tasks). The advantage of their new approach is that it captures the dynamics of mental wandering and permits the establishment of a clear difference between it and other kinds of task-unrelated thoughts.

González et al. (2022) recognise two typical and contrasting variations of mind-wandering: spontaneous and deliberate. The first one is caused by a failure in the executive control of the attentional focus, and due to its non-intentional characteristics, appears suddenly in somewhat unsuitable situations. The intentional or deliberate mind-wandering refers to cases in which the focus of attention intentionally drifts away from the ongoing task towards internal thoughts. This refers to a process that happens under the individual’s control (Vannucci & Agnoli, 2019) and that enables a certain kind of guidance in the content of thoughts, unlike unintentional mind-wandering. Spontaneous mind-wandering, in fact, generates costs – ADHD, OCD, self-reported anxiety, the tendency to act impulsively, distraction and other

attentional difficulties – while intentional mind-wandering is often associated with benefits due to the individual’s capacity to control its occurrence: it has been shown to improve the ability to describe internal experiences, which in turn is a predictor of creative achievement (Villena-González, 2019; Agnoli et al., 2018). MW in this sense is useful to regulate the content of thought itself and the occurrence of mind-wandering in regard to the context (Villena-González, 2019). In relation to the above, “neurocognitive research has clearly shown that MW is far more than a failure to constrain attention to perception, but it is instead a remarkable mental activity, which entails complex higher-order functional and neural mechanisms” (Vannucci & Agnoli, 2019, p. 247). Thus, mind-wandering does not entail negative costs, and the authors insert a question on how exactly affective experience reflects on mind-wandering and vice versa. The answer is in the literature overview, showing the relevance of emotions in MW and, according to our chapter authors, in Vygotsky’s perspective that advocates the existence of a volitional-affective tendency behind every thought (Vygotsky, 1934). In this manner, it is offered critical features of spontaneous thought and a more comprehensive and accurate conceptualisation of mind-wandering. Outside the homologated voluntary and non-voluntary kinds of cognition (Fossa et al., 2018), in this chapter, we discover the actuality of Vygotsky on this specific issue and two levels of volitive thought/action where spontaneous and deliberate thoughts represent the extremes of a continuum. Recapitulating Vygotsky’s work, the chapter suggests that deliberate action or thought is not a single instance of volitive exercise, but the culmination of the process of volition to a higher-order or degree (Vygotsky, 1934). There is a continuum between the two polarities, spontaneous and deliberate, and we could also describe intermediate types of mental activities (Andrews-Hanna et al., 2017; Fossa et al., 2018). Furthermore, creativity becomes the expression of multiple inter-functional forms and takes place in a continuum between controlled and non-controlled forms of thinking. At this point, the chapter suggests another interesting aspect that could be explored in future research: the idea of mind-wandering as resistance to the psychological status quo. Thus, MW is a game, a resting state, a self-contemplation strategy, or a preparation or mental “rehearsal” that transgresses the temporal barrier into the future, as expressed by Böttger and Költzsch (2022).

Looking for a Structure That Connects: The Zigzag

In this book, we have seen “lines” of research and “circles” on specific themes (attention, age, disability, task and methodology, intervention methodologies and creativity). We have tried in the dislocation of the chapters to go beyond a summative reading of information and contextual relationships, but our interpretative choice has nothing to do with the truth. Bateson writes (Fig. 1.3):

Let us say that truth would mean a precise correspondence between our description and what we describe and between our total network of abstractions and deductions and some total understanding of the outside world. Truth in this sense is not obtainable. And even if



Fig. 1.3 Holly BF Warren (2022), private collection, Milan, Italy

we ignore the barriers of coding, the circumstance that our description will be in the words of figure or picture but what we describe is going to be in flesh and blood and action- even disregarding that hurdle of translation, we shall never be able to claim final knowledge of anything whatsoever. (Bateson, 1979, 27)

To wade so far, the conditions have not been created for a full understanding of this phenomenon, mind-wandering, but rather we have offered the reader “ways of perceiving” the phenomenon according to the different specific domains of knowledge. In this sense, the book allows us to reason about the fact that science “doesn’t probes but explores” and almost always creates a difference that disturbs the quiet state of the system. This is the feeling that pervades the reader of the text and that could

disturb him because difference has always been an element of disturbance, so much so that often when the difference becomes uncomfortable for a pre-existing system of knowledge, a defence system intervenes that eliminates dissonances, creating a paradigm (a higher unity is sought that gives coherence to differences and contradictions). We will need a dialogical approach towards differences that recognises as constitutive elements of complexity in order to move forwards. We looked for a “structure that connects”, paying attention to a generative epistemology that would build a zigzag dialectical scale of the knowledge processes that emerged: we tried to bring out the differences in the explanations of the phenomenon, to highlight the circularities, the hybridisations and mixtures between different disciplinary areas (domains) (Giunta, 2014). Something very clear has emerged: excluding the few studies on learning mainly related to reading-writing and purely of a psychological nature, there is a lack of pedagogical attention to mind-wandering in a systemic sense.⁸ Obviously, we will not be able to fill a gap in the knowledge with a single book. However, we hope this may open a new avenue about mind-wandering research in education.

References

- Agnoli, S., Vannucci, 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.
- Andrews-Hanna, J., Irving, Z., Fox, K., Spreng, N., & Christoff, K. (2017). The neuroscience of spontaneous thought: An evolving, interdisciplinary field. In K. C. R. Fox & K. Christoff (Eds.), *The Oxford handbook of spontaneous thought*. Oxford University Press.
- Antrobus, J. (1968). Information theory and stimulus dependent thought. *British Journal of Psychology*, 59(4), 423–430. <https://doi.org/10.1111/j.2044-8295.1968.tb01157.x>
- Barron, E., Riby, L. M., Greer, J., & Smallwood, J. (2011). Absorbed in thought: The effect of mind wandering on the processing of relevant and irrelevant events. *Psychological Science*, 22, 596–601.
- Bateson, G. (1979). *Mind and nature: A necessary unity* (Vol. 255). Bantam Books.
- Binda, P., & Murray, S. O. (2015). Spatial attention increases the pupillary response to light changes. *Journal of Vision*, 15(2), 1–1.
- Böttger, H., & Költzsch, D. (2022). The Secret Powers of a Wandering Mind. Underestimated Potential of a Resting State Network for Language Acquisition. In N. Dario & L. Tateo (Eds.), *New perspectives on mind-wandering*. Springer.
- Broadbent, D. E. (1958). Perception and communication. Pergamon Press.
- Broyd, S. J., Demanuele, C., Debener, S., Helps, S. K., James, C. J., & Sonuga-Barke, E. J. S. (2009). Default-mode brain dysfunction in mental disorders: A systematic review. *Neuroscience & Biobehavioral Reviews*, 33(3), 279–296. <https://doi.org/10.1016/j.neubiorev.2008.09.002>

⁸What happens when dealing with educational action? Let’s take some trivial examples: what if the lesson is organised in a receptive manner? What happens if it is carried out in other ways (behavioural, guided discovery, simulative, collaborative, exploratory, metacognitive-regulatory)? Obviously to answer these questions, we need to focus on the contextual organisation of the component systems (e.g. metabolic, psychological-emotional, cognitive, social system) connected with mind-wandering and not on the components per se.

- Bruya, B., & Tang, Y. Y. (2018). Is attention really effort? Revisiting Daniel Kahneman's influential 1973 book attention and effort. *Frontiers in Psychology*, *9*, 1133.
- Callard, F., Smallwood, J., & Margulies, D. S. (2012). Default positions: How neuroscience's historical legacy has hampered investigation of the resting mind. *Frontiers in Psychology*, *3*, 321.
- Callard, F., Smallwood, J., Golchert, J., & Margulies, D. S. (2013). The era of the wandering mind? Twenty-first century research on self-generated mental activity. *Frontiers in Psychology*, *4*, 891.
- Chatterji, M. (2004). Evidence on "what works": An argument for extended-term mixed-method (ETMM) evaluation designs. *Educational Researcher*, *33*(9), 3–13.
- Christoff, K., Irving, Z. C., Fox, K. C., Spreng, R. N., & Andrews-Hanna, J. R. (2016). Mind-wandering as spontaneous thought: A dynamic framework. *Nature Reviews Neuroscience*, *17*(11), 718–731.
- Christoff, K., Mills, C., Andrews-Hanna, J. R., Irving, Z. C., Thompson, E., Fox, K. C., & Kam, J. W. (2018). Mind-wandering as a scientific concept: Cutting through the definitional haze. *Trends in Cognitive Sciences*, *22*(11), 957–959.
- Corballis, M. C. (2015). *The wandering mind: What the brain does when you're not looking*. University of Chicago Press.
- Dias da Silva, M. R., Faber, M., Branco, D., & Postma, M. (2022a). Mind and body: The manifestation of mind-wandering in bodily behaviours. In N. Dario & L. Tateo (Eds.), *New perspectives on mind-wandering*. Springer.
- D'Mello, S., Dale, R., & Graesser, A. (2012). Disequilibrium in the mind, disharmony in the body. *Cognition and Emotion*, *26*(2), 362–374. <https://doi.org/10.1080/02699931.2011.575767>
- Dias da Silva, M. R., Postma, M., & Faber, M. (2022b). Windows to the mind: Neurophysiological indicators of mind wandering across tasks. In N. Dario & L. Tateo (Eds.), *New perspectives on mind-wandering*. Springer.
- Didriksen, L. S. (2022). A contemplative perspective on mind wandering. In N. Dario & L. Tateo (Eds.), *New perspectives on mind-wandering*. Springer.
- Driver, J. (2001). A selective review of selective attention research from the past century. *British Journal of Psychology*, *92*(1), 53–78.
- Eifring, H. (2022). Mind-wandering and emotional processing in nondirective meditation. In N. Dario & L. Tateo (Eds.), *New perspectives on mind-wandering*. (pp. 201–210). Springer.
- Ergas, O. (2022). Education in agency, mind wandering, and the contemplative mind. In N. Dario & L. Tateo (Eds.), *New perspectives on mind-wandering*. Springer.
- Fossa, P. (2017). The expressive dimension of inner speech. *Psicologia USP*, *28*, 318–326.
- Fossa, P., Awad, N., Ramos, F., Molina, Y., De la Puerta, S. & Cornejo, C. (2018). Control del pensamiento, esfuerzo cognitivo y lenguaje fisionómico orgánico: Tres manifestaciones expresivas del lenguaje interior en la experiencia humana. *Universitas Psychologica*, *17*(4), 1–15. <https://doi.org/10.11144/Javeriana.upsy17-4.cpec>
- Fossa, P., Gonzalez, N., & Di Montezemolo, F. C. (2019). From inner speech to mind-wandering: Developing a comprehensive model of inner mental activity trajectories. *Integrative Psychological and Behavioral Science*, *53*(2), 298–322.
- Fuster, J. M. (2002). Physiology of executive functions: The perception-action cycle. In *Principles of frontal lobe function*. Oxford University Press.
- Fuster, J. M. (2004). Upper processing stages of the perception action cycle. *Trends in Cognitive Sciences*, *8*(4), 143–145. <https://doi.org/10.1016/j.tics.2004.02.004>
- Giunta, I. (2014). *Flessibilita. Un modello sistemico di approccio al tema della flessibilita*. Pensa MultiMedia.
- González, N., García-Huidobro, C., & Fossa, P. (2022). Is a wandering mind an unhappy mind? The affective qualities of creativity, volition and resistance. In N. Dario & L. Tateo (Eds.), *New perspectives on mind-wandering*. Springer.
- Gorgolewski, K. J., Lurie, D., Urchs, S., Kipping, J. A., Craddock, R. C., Milham, M. P., ... & Smallwood, J. (2014). A correspondence between individual differences in the brain's intrinsic functional architecture and the content and form of self-generated thoughts. *PLoS one*, *9*(5), e97176.

- Gozli, D. G. (2017). Behaviour versus performance: The veiled commitment of experimental psychology. *Theory & Psychology*, 27(6), 741–758.
- Gozli, D. (2019). *Experimental psychology and human agency*. Springer.
- Gozli, D. G. (2022). Extended minds and tools for mind wandering. In N. Dario & L. Tateo (Eds.), *New perspectives on mind-wandering*. Springer.
- Gusnard, D., Akbudak, E., Shulman, G., & Raichle, M. (2001). Medial prefrontal cortex and self-referential mental activity: relation to a default mode of brain function. *Proceedings of the National Academy of Sciences*, 98(7), 4259–4264
- Hargreaves, A. (2007). Sustainable leadership and development in education: Creating the future, conserving the past. *European Journal of Education*, 42(2), 223–233.
- Holt, J. (1995). *How children fail*. Perseus books.
- James, W. (1890). *The principles of psychology*. Harvard University Press.
- James, W. (1995). The principles of psychology: in two volumes. Vol. 1:...(Facsim. of ed. New York, Henry Holt, 1890).
- Kabat-Zinn, J. (2013). Full catastrophe living, revised edition: how to cope with stress, pain and illness using mindfulness meditation. Hachette UK.
- Kahneman, D. (1973). *Attention and effort* (Vol. 1063). Prentice-Hall.
- 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.
- Killingsworth, M. A., & Gilbert, D. T. (2010). A wandering mind is an unhappy mind. *Science*, 330(6006), 932–932.
- Klinger, E. (1971). *Structure and functions of fantasy*. Wiley.
- Klinger, E. (2013). Goal commitments and the content of thoughts and dreams: Basic principles. *Frontiers in Psychology*, 4, 415. <https://doi.org/10.3389/fpsyg.2013.00415>
- Klinger, E., Gregoire, K. C., & Barta, S. G. (1973). Physiological correlates of mental activity: Eye movements, alpha, and heart rate during imagining, suppression, concentration, search, and choice. *Psychophysiology*, 10(5), 471–477. <https://doi.org/10.1111/j.1469-8986.1973.tb00534.x>
- Konishi, M., Brown, K., Battaglini, L., & Smallwood, J. (2017). When attention wanders: Pupillometric signatures of fluctuations in external attention. *Cognition*, 168, 16–26.
- Marchetti, I., Koster, E. H. W., Klinger, E., & Alloy, L. B. (2016). Spontaneous thought and vulnerability to mood disorders: The dark side of the wandering mind. *Clinical Psychological Science*, 4(5), 835–857. <https://doi.org/10.1177/2167702615622383>
- Metzinger, T. (2017). The Problem of Mental Action - Predictive Control without Sensory Sheets. In T. Metzinger & W. Wiese (Eds.). *Philosophy and Predictive Processing* (pp. 1–26), Frankfurt am Main: MIND Group. <https://doi.org/10.15502/9783958573208>
- Mills, C., Raffalli, 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. <https://doi.org/10.1016/j.concog.2017.10.003>. PMID: 29107470.
- O’Neill, K., Smith, A. P., Smilek, D., & Seli, P. (2021). Dissociating the freely-moving thought dimension of mind-wandering from the intentionality and task-unrelated thought dimensions. *Psychological Research*, 85(7), 2599–2609.
- Olson, D. R. (2004). The triumph of hope over experience in the search for “what works”: A response to Slavin. *Educational Researcher*, 33(1), 24–26.
- Park, K. Y., & Lee, S. Y. (2000). Out-of-vocabulary rejection based on selective attention model. *Neural Processing Letters*, 12(1), 41–48.
- Pelagatti, C., Binda, P., & Vannucci, M. (2020). A closer look at the timecourse of mind wandering: Pupillary responses and behaviour. *PLoS One*, 15(4), e0226792. <https://doi.org/10.1371/journal.pone.0226792>
- Pepin, G., & Lafont, A. (2022). How and why our mind wanders? In N. Dario & L. Tateo (Eds.), *New perspectives on mind-wandering*. Springer.

- Pezzulo, G., Zorzi, M., & Corbetta, M. (2021). The secret life of predictive brains: what's spontaneous activity for? *Trends in Cognitive Sciences*, 25(9), 730–743.
- Polderman, T. J., Boomsma, D. I., Bartels, M., Verhulst, F. C., & Huizink, A. C. (2010). A systematic review of prospective studies on attention problems and academic achievement. *Acta Psychiatrica Scandinavica*, 122(4), 271–284. <https://doi.org/10.1111/j.1600-0447.2010.01568.x>
- Pope, K. S., & Singer, J. L. E. (1978). *The stream of consciousness: Scientific investigations into the flow of human experience*. New York: Plenum.
- Raichle, M. E., & Snyder, A. Z. (2007). A default mode of brain function: A brief history of an evolving idea. *NeuroImage*, 37(4), 1083–1090. <https://doi.org/10.1016/j.neuroimage.2007.02.041>
- 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.
- Rogers, S. L. O., McAilley, C. L., & Jha, A. P. (2018). Mindfulness training for judges: Mind wandering and the development of cognitive resilience. *Court Review*, 54.
- Seli, P., Risko, E., Smilek, D., & Schacter, L. (2016). Mind-wandering with and without intention. *Trends in Cognitive Sciences*, 20(8). <https://doi.org/10.1016/j.tics.2016.05.010>
- Seli, P., Kane, M. J., Smallwood, J., Schacter, D. L., Maillet, D., Schooler, J. W., et al. (2018a). Mind-wandering as a natural kind: A family-resemblances view. *Trends in Cognitive Sciences*, 22(6), 479–490.
- Seli, P., Kane, M. J., Metzinger, T., Smallwood, J., Schacter, D. L., Maillet, D., et al. (2018b). The family-resemblances framework for mind-wandering remains well clad. *Trends in Cognitive Sciences*, 22(11), 959–961.
- Shad, M. U., Keshavan, M. S., Steinberg, J. L., Mihalakos, P., Thomas, B. P., Motes, M. A., Soares, J. C., & Tamminga, C. A. (2012). Neurobiology of self-awareness in schizophrenia: An fMRI study. *Schizophrenia Research*, 138(2–3), 113–119.
- Smallwood, J., & Schooler, J. W. (2006). The restless mind. *Psychological Bulletin*, 132, 946–958.
- Smallwood, J., & Andrews-Hanna, J. (2013). Not all minds that wander are lost: The importance of a balanced perspective on the mind-wandering state. *Frontiers in Psychology*, 4, 441. <https://doi.org/10.3389/fpsyg.2013.00441>
- Smallwood, J., & Schooler, J. (2015). The science of mind wandering: Empirically navigating the stream of consciousness. *Annual Review of Psychology*, 66, 487–518.
- Smallwood, J., Beach, E., Schooler, J. W., & Handy, T. C. (2008). Going AWOL in the brain: mind wandering reduces cortical analysis of external events. *Journal of Cognitive Neuroscience*, 20(3), 458–469.
- Smith, G. K., Mills, C., Paxton, A., & Christoff, K. (2018). Mind-wandering rates fluctuate across the day: Evidence from an experience-sampling study. *Cognitive Research: Principles and Implications*, 3(1). <https://doi.org/10.1186/s41235-018-0141-4>
- Stawarczyk, D., Majerus, S., Maquet, P., & D'Argembeau, A. (2011). Neural correlates of ongoing conscious experience: Both task-unrelatedness and stimulus-independence are related to default network activity. *PLOS ONE*, 6(2), e16997.
- Tateo, L. (2020). *A theory of imagining, knowing, and understanding*. Springer.
- Treisman, A. (2009). Attention: Theoretical and psychological perspectives. In M. S. Gazzaniga, E. Bizzi, L. M. Chalupa, S. T. Grafton, T. F. Heatherton, C. Koch, J. E. LeDoux, S. J. Luck, G. R. Mangun, J. A. Movshon, H. Neville, E. A. Phelps, P. Rakic, D. L. Schacter, M. Sur, & B. A. Wandell (Eds.), *The cognitive neurosciences* (pp. 189–204). Massachusetts Institute of Technology.
- Vannucci, M., & Agnoli, S. (2019). Thought dynamics: Which role for mind wandering in creativity. In R. Beghetto & G. E. Corazza (Eds.), *Dynamic perspectives on creativity* (pp. 245–260). Springer.
- Vannucci, M., Chiorri, C., Nocentini, A., & Menesini, E. (2020). Distinguishing spontaneous from deliberate mind wandering in adolescents: The role of attentional control and depressive symptoms. *British Journal of Developmental Psychology*, 38, 434–441.

- Vannucci, M., Pelagatti, C., & Marchetti, I. (2022). Mind wandering in adolescents: Evidence, challenges and future directions. In N. Dario & L. Tateo (Eds.), *New perspectives on mind-wandering*. Springer.
- Villena-González, M. (2019). Huellas de una mente errante: un terreno fértil para el florecimiento de la creatividad. In R. Videla (Ed.), *Pasos para una ecología cognitiva de la educación* (pp. 59–72). Editorial Universidad de la Serena.
- Vygotsky, L. (1934). *Pensamiento y Lenguaje*. En *Obras Escogidas II*. Machado Libros.
- Warren, H. (2018, August 8). *The wandering mind. Loose strings of creative thought. The mind's journey in time, space and knowledge*. <https://hbfwarren.com/the-wandering-mind-loose-strings-of-creative-thought-the-minds-journey-in-time-space-and-knowledge/>
- Warren, H. (2022). The wandering mind. Loose strings of creative thought. The mind's journey in time, space and knowledge. In N. Dario & L. Tateo (Eds.), *New perspectives on mind-wandering*. Springer.
- Wickens, C. (2002). Multiple resources and performance prediction. *Theoretical issues in ergonomics science*, 3(2), 159–177.
- Xu, J., Vik, A., Groote, I. R., Lagopoulos, J., Holen, A., Ellingsen, Ø., Håberg, A. K., & Davanger, S. (2014). Nondirective meditation activates default mode network and areas associated with memory retrieval and emotional processing. *Frontiers in Human Neuroscience*, 8(86), 1–10.