Consciousness and Cognition 55 (2017) 223–231

Contents lists available at ScienceDirect

Consciousness and Cognition

journal homepage: www.elsevier.com/locate/concog

Thoughts and sensations, twin galaxies of the inner space: The propensity to mind-wander relates to spontaneous sensations arising on the hands

George A. Michael[a,b,*], Isabelle Tapiero[a,b], Germán Gálvez-García[b,c], Laurence Jacquot[d]

[a] Université de Lyon, Lyon, France
[b] Université Lyon 2, Institut de Psychologie, Laboratoire EMC (EA 3082), Lyon, France
[c] Department of Psychology, Universidad de la Frontera, Chile
[d] Laboratoire de Neurosciences Intégratives et Cliniques (EA 481), Université de Franche-Comté, Besançon, France

ARTICLE INFO

Keywords:
Spontaneous sensations
Mind-wandering
Body awareness
Self-awareness
Consciousness

ABSTRACT

Sensations and thoughts have been described as potentially related to self-awareness. We therefore asked whether sensations that arise in the absence of external triggers, i.e., spontaneous sensations (SPS), which were shown to relate to interoception and perception of the self, vary as a function of the individual propensity to generate spontaneous thoughts, i.e., mind-wandering. The Mind Wandering Questionnaire (MWQ) was used as a specific tool to assess the frequency and propensity to mind-wander several weeks before completing an SPS task. Correlational analyses between the MWQ score and SPS showed that greater propensity to mind-wander coincided with widespread perception of SPS, while lesser propensity to mind-wander coincided with more spatially restricted perception of SPS. The results are interpreted in light of the role of spontaneous thoughts and sensations in self-awareness. The potential psychological processes and the way they might regulate the relation between mind-wandering and the perception of SPS are discussed.

1. Introduction

Recognizing oneself as an individual entity separate from the environment and other individuals requires focusing attention on one's own subjective experience and being aware of one's own self-concept. This is self-awareness (Morin, 2006). Being self-aware is, therefore, having access to one's own thoughts, autobiographical memories, and bodily sensations.

Spontaneous thoughts may potentially contribute to self-awareness (Buckner, Andrews-Hanna, & Schacter, 2008; Ingvar, 1979; Mason et al., 2007). They are defined as mental states arising freely due to loose engagement on a task or another mental state (Christoff, Irving, Fox, Spreng, & Andrews-Hanna, 2016). Mind-wandering is considered to be a category of internal activity and consists in a spontaneous and dynamic drift of attention away from its current focus to internal mental content generated by the individual (Christoff et al., 2016; Smallwood & Schooler, 2015). It has been considered as a psychological baseline that emerges when the brain is otherwise unoccupied (Mason et al., 2007). Some authors pose that mind-wandering ensues when conscious supervision of a task is ceased, whether or not we want it to be (Braboszcz & Delorme, 2010), and a global reduction of sensory input lets the mind

* Corresponding author at: Université Lyon 2, Département de Sciences Cognitives, Psychologie Cognitive & Neuropsychologie, Laboratoire d'Étude des Mécanismes Cognitifs, 5, Avenue Pierre Mendès-France, 69676 Bron Cedex, France.
E-mail address: George.Michael@univ-lyon2.fr (G.A. Michael).

http://dx.doi.org/10.1016/j.concog.2017.08.007
Received 10 March 2017; Received in revised form 18 August 2017; Accepted 18 August 2017
Available online 11 September 2017

become occupied with its own consciousness (Ingvar, 1979). Its effects are not found only in tasks that engage higher-order processes, like those involved in reading and discourse comprehension, but they are also found at multiple levels of perceptual and sensorimotor processing (Carriere, Seli, & Smilek, 2013; Kam & Handy, 2013; Kam et al., 2011; Smallwood, 2011). For instance, changes in response variability and in response accuracy in motor tracking tasks during episodes of mind-wandering (Kam et al., 2012) suggest decrements in response stability and constancy, and increased fidgeting during such episodes intimates decreased control over motor activity. Mind-wandering trims down processing of incoming information at early perceptual levels and across multiple sensory modalities and, as a consequence, low-level decoupling cascades through the cognitive system causing decoupling at higher levels (Smallwood, 2011). Such global and seemingly amodal effects are consistent with and reinforce the hypothesis that mind-wandering may play a role in self-awareness (Giambra, 1995), since they suggest that attention turns towards inner cognitive activity.

Consistent with this idea is the fact that heightened activity in the brain's default mode network (DMN), which plays a role in self-referential thought (e.g., Fingelkurts & Fingelkurts, 2011; Northoff et al., 2006) and autobiographical memory retrieval (Svoboda, McKinnon, & Levine, 2006), has been observed during episodes of mind-wandering (Christoff, Gordon, Smallwood, Smith, & Schooler, 2009; Christoff et al., 2016; Kirschner, Kam, Handy, & Ward, 2012; Mason et al., 2007; O'Callaghan et al., 2015; Raichle, 2015; Smallwood, 2013). Despite the regular occurrence of mind-wandering, for as much as 30–50% of our waking life, not all minds wander to the same degree. The propensity to mind-wander appears to be a stable individual cognitive characteristic. Some people mind-wander more often than others (Mrazek, Phillips, Franklin, Broadway, & Schooler, 2013), whether mind-wandering can be related to the current task or not (Carriere et al., 2013; Christoff et al., 2016; Stawarczyk, Majerus, Maquet, & D'Argembeau, 2011).

However, self-awareness may relate not only to thoughts like those occurring during mind-wandering. Other kinds of activity also seem to contribute towards self-awareness, such as those related to the interoceptive system (Cameron, 2002). This background of bodily sensations maintains the integrity of the body (Craig, 2009) and is partly responsible for how the self is perceived (Kinsbourne, 1998). When this system is damaged, it causes the body image to slip out from consciousness (Kinsbourne, 1998; Wolpert, Goodbody, & Husain, 1998). This system includes, among others, the systems responsible for perception of visceral activity (Herbert, Muth, Pollatos, & Herbert, 2012; Schandry, 1981) and perception of sensations arising on the body without any external triggers (spontaneous sensations or SPS; Michael, Naveteur, Dupuy, & Jacquot, 2015). Attention to such sensations enables the image of the body to be maintained in consciousness (Michael & Naveteur, 2011). As regards SPS, these are normal spontaneous phenomena that are experienced by nearly everyone, which possess their own spatial, qualitative, and quantitative properties (Michael & Naveteur, 2011; Naveteur, Honoré, & Michael, 2005). It has been reported that diverting attention away from these sensations may cause their perception to fade (Michael & Naveteur, 2011; Michael et al., 2012). By contrast, abnormally heightened attention (i.e., hypervigilance) produces excessive increases in the perception of their frequency and intensity (Borg, Carrier-Emond, Colson, Laurent, & Michael, 2015). One of their characteristics is that they are better perceived when at rest (Beaudoin & Michael, 2014), that is, when attention is free to turn inwards and when the conditions are met for spontaneous thoughts to be born. Thus, having access to one's own bodily sensations provides access to self-awareness. Finally, imaging techniques have shown that part of the DMN is active during perception of SPS (Bauer, Díaz, Concha, & Barrios, 2014), suggesting that those functional specificities of the brain that are related to mind-wandering are also related to the perception of SPS, at least partly.

All the abovementioned findings suggest that spontaneous cognition is a shared human experience that probably relates to self-awareness, and some people are more inclined to this than others. Then again, this leads to a strange question: If self-awareness were related to spontaneous sensations, feelings, or thoughts, then what would self-awareness of people who have increased and more frequent spontaneous cognitive activity look like? The answer could be even more strange, since it might be expected that the more a person is prone to spontaneous thoughts, the bigger his/her self-awareness would be because of a tendency to turn attention towards the inner world. The present study aimed at investigating this hypothesis through exploring the potential links between the propensity to mind-wander and the perception of SPS. We therefore used a questionnaire as a specific tool to assess the frequency and propensity to mind-wander followed, several weeks later, by the completion of a task assessing the perception of SPS (Michael & Naveteur, 2011). A direct hypothesis is that if both the propensity to mind-wander and SPS are linked to self-awareness (Buckner et al., 2008; Michael et al., 2012, 2015), then being more prone to mind-wander would coincide with increased perceived frequency and intensity of SPS.

2. Material and methods

2.1. Participants

The study was conducted in accordance with the Helsinki Declaration. All participants were students at the University of Franche-Comté (east of France) participating in neuroscience programs. Participants were excluded if they self-reported a history of neurological or psychiatric disorders or had taken any psychoactive substances in the three months preceding the test session. This information was gathered during the first steps of the experimental procedure, where participants were required to complete a questionnaire containing questions on their sociodemographic and health characteristics. Items included age, gender, use of psychotropic medication (and if so, the reason why; antidepressants, anxiolytics, neuroleptics, anticonvulsants, hypnotics, tranquilizers etc.), and regular use of other psychoactive substances (alcohol, marijuana, etc.). In addition, participants were free to report any other information they considered to be important for the study. Provided a power of 90% to detect the most prominent characteristic of SPS, which is the proximo-distal gradient in frequency (average effect size based on 4 published experiments from two studies $\eta^2 = 0.44$; Beaudoin & Michael, 2014; Michael et al., 2012), the sample size needed is 24. On the basis of the above-mentioned criteria, 29 participants (22 female) with a mean age of 21.8 ± 2.6 (age range: 20–33) were included in the study. None of them