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When the mind wanders: Age-related differences between young and older adults

Michela Zavagnin *, Erika Borella *, Rossana De Beni

Department of General Psychology, University of Padova, Italy

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A B S T R A C T

Interest in mind wandering (MW) has grown in recent years, but few studies have assessed this phenomenon in older adults. The aim of this study was to assess age-related differences between young, young–old and old–old adults in MW using two versions of the sustained attention to response task (SART), one perceptual and one semantic. Different indicators were examined (i.e., reported MW episodes and behavioral indices of MW such as response time latency and variability, incorrect response and omission errors). The relationship between MW, certain basic mechanisms of cognition (working memory, inhibition and processing speed), cognitive failures and intrusive thoughts in everyday life was also explored. Findings in both versions of the SART indicated that older adults reported a lower frequency of MW episodes than young adults, but some of the behavioral indices of MW (response time variability, incorrect response and omission errors) were higher in old–old adults. This seems to suggest that MW becomes less frequent with aging, but more pervasive and detrimental to performance. Our results also indicated that the role of age and cognitive mechanisms in explaining MW depends on the demands of the SART task considered.

1. Introduction

Mind wandering (MW) can be defined as a shift of attention from the environmental context to stimuli and mental representations associated with personal thoughts or ongoing activities, i.e., task-unrelated thoughts (TUTs) (Antrobus, Singer, & Greenberg, 1966; Giambra, 1995; Smallwood, Obonsawin, & Heim, 2003). Although this phenomenon is very common (Kane et al., 2007) and can be useful in some circumstances (Baird, Smallwood, & Schooler, 2011; Baird et al., 2012), it is often unintentional and leads to a less accurate information encoding with consequent cognitive failures and related psychological stress (Schupak & Rosenthal, 2009; Smallwood, Riby, Heim, & Davies, 2006). Hence the interest in MW in numerous studies on different age groups (healthy younger and older adults), as well as in specific populations, including adults with ADHD (Giambra, 1993) and people with depression (e.g., Smallwood, O'Connor, Sudberry, & Obonsawin, 2007).

It is now well documented that aging coincides with a decline in some basic cognitive mechanisms, such as working memory, inhibition and processing speed (e.g., Craik & Salthouse, 2008; Hasher & Zacks, 1988). This decline also explains age-related differences in many cognitive domains and everyday life abilities (e.g., Borella, Ghisletta, & de Ribaupierre, 2011).

Recent theories on MW claim that executive control lies behind the MW phenomenon (McVay & Kane, 2009). As older adults generally have more limited executive control resources than young adults, i.e., less efficient inhibitory mechanisms (attentional control), and a weak working memory performance (Hasher & Zacks, 1988), we might expect them to experience more MW, and report more TUTs than young adults. Instead, an apparently paradoxical decrease in TUT frequency with aging has been reported in various studies and using various models. In particular, Giambra (1973, 1993, 2000) used self-report questionnaires to investigate daydreaming, i.e., task-unrelated image and thought intrusions, finding that their frequency decreased with aging in both longitudinal (Giambra, 2000) and cross-sectional comparisons (Giambra, 1973, 1993). Giambra (1989) also obtained much the same results using more objective methods, which were not sensitive to participants' beliefs and therefore unaffected by any biases (such as those induced by questionnaires). Giambra used a vigilance task (in which participants responded to rare targets) in a retrospective correlational study (1989) that involved 5 experiments (conducted from 1977 to 1980). The results confirmed that TUTs did not increase with aging. In particular, four of the five studies on the frequency of TUTs reported that old–old adults (over 70 years of age) had fewer TUTs than young or middle-aged adults; and three of the five studies also identified a lower frequency of TUTs in young–old (60- to 70-year-olds) than in younger adults. A negative correlation between age and TUTs across the lifespan also emerged in vigilance and reading tasks of variable difficulty (Grodsky & Giambra, 1990–1991). Giambra attributed the results concerning the decrease in TUTs (incompatible

* Corresponding authors at: Department of General Psychology, Via Venezia, 8, 35131 Padova, Italy. Tel.:+39 049 8276622; fax: +39 049 8276600.
E-mail addresses: michela.zavagnin@email.it (M. Zavagnin), erika.borella@unipd.it (E. Borella).

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with the inhibitory hypothesis [Hasher & Zacks, 1988]) to various factors, such as age-related memory decline, or an age-dependent reduction in nonconscious information processing due to older people having less "unfinished business", or fewer matters of concern, whereas young adults can devote their attention to MW as well because of their greater attentional capacity (Giambra, 1989).

Giambra's results (Giambra, 1989, 1993) might also be due, however, to the introspective procedure used – in some experiments participants were asked to report when their mind was wandering during a task (self-caught method) – without taking into account the age-related differences in people's ability to monitor their internal states, and thus report on their TUTs (Einstein & McDaniel, 1997). To test this hypothesis, Einstein and McDaniel (1997) used a more objective and reliable performance-based measure, assessing the frequency of MW on the basis of participants' performance when they were occasionally interrupted while recalling long lists of words: if a participant recalled significantly fewer words than the average, this was interpreted as being due to MW, which led to their failure to encode the stimuli. The results of this study showed that older adults did not differ significantly from young people in this performance-based measure, and the authors concluded that there was no evidence of age-related differences in MW. Parks, Klinger, and Perlmutter (1988–89) came to a similar conclusion when they used a thought sampling procedure during the performance of more or less difficult tasks. They found a higher frequency of evaluative thoughts focusing on steps towards a goal and of attention-control utterances in older than in younger adults, regardless of the task's difficulty. Finally, Jackson and Balota (2012) recently investigated MW in younger and older adults using more recently developed experimental models. The authors presented different versions of the SART (a go/no-go task in which participants had to inhibit a habitual response), in which they also considered response latency as a possible performance-based indicator of MW, and a more demanding reading comprehension task. They expected to find the same level of MW in young and older adults in the more demanding test (the reading comprehension). Instead, they found that older adults reported less MW than their younger counterparts in both the SARTs and the reading comprehension task. The manipulation of the tasks' presentation had a different influence on the frequency of MW episodes reported by younger and older adults, however. In the first two experiments, the young adults reported four times as many MW episodes as the older adults; in the others, the young adults reported only twice as many MW episodes as the older adults (particularly in the more demanding tasks, i.e., the reading comprehension and a slower, longer version of the SART). Older adults also showed a disproportionate post-error slowing in their completion of the SARTs, probably because they found it more difficult to re-engage in the task (possibly due to a greater concern about their performance). The authors suggested that this pattern of results might reflect a greater engagement of older adults in the task (supported by personality measures indicating greater conscientiousness in this age group than in the young adults) that could lead to less MW and more self-evaluation thoughts after errors and that would explain the age-related differences in post-error latency.

Taken together, the above studies indicate either a similar frequency of MW being reported by young and older adults or (in the majority of the studies) a decreasing frequency of MW with aging; regardless of older adults' decline in inhibitory mechanisms (or more generally in executive control), the ability to maintain task goals or context over time could make it difficult to control intrusive thoughts (e.g., Hasher & Zacks, 1988; Balota, Black, & Cheney, 1992).

It is noteworthy that it seems difficult to predict findings concerning age-related differences in MW (between young and older adults) on the strength of the two main hypotheses proposed in the literature (based mainly on evidence of this phenomenon in younger adults), i.e., the "decoupling" hypothesis (Smallwood & Schooler, 2006), and the "control failure × current concerns" hypothesis (McVay, Kane, & Kwapil, 2009). The decoupling hypothesis considers MW as a spontaneous process involving a state in which attention becomes coupled to an internal process and decoupled from the external information (e.g., Barron, Riby, Greer, & Smallwood, 2011; Smallwood, 2010); accordingly, the frequency of MW would be modulated by the amount of resources required by the task and the amount of resources that the person possesses (Smallwood & Schooler, 2006). Thus, older adults' more limited cognitive resources (Craik & Salthouse, 2008) would result in less frequent MW. The results that this hypothesis would lead us to expect were not seen in all of the above-cited studies (i.e., two of the five studies conducted by Einstein & McDaniel (1997), Giambra (1989) and Parks et al. (1988–89)). Nor are the findings reported by Jackson and Balota (2012) consistent with a similar decrease in the frequency of MW episodes that younger and older adults reported with increasingly difficult tasks, as predicted by this decoupling hypothesis.

It seems also difficult to fully explain the above-mentioned results from the "control failure × current concerns" perspective (e.g., McVay & Kane, 2010), according to which TUTs are automatically generated in response to environmental cues, current concerns and personal goals. They enter the sphere of our awareness as a result of an attentional control failure, disrupting goal maintenance processes, so MW would presumably be more common in people with a poor working memory capacity (McVay & Kane, 2009), such as older adults, who may also have difficulty in modulating their MW in relation to the resources demanded by the task. But, according to these authors, it is also important to consider both the amount of thoughts automatically generated and the category of thoughts reportedly involved. In fact, older adults may have fewer current concerns and personal goals, and this would lead to less MW, as Giambra (1989) suggested, but may report more thoughts about their performance, i.e., concern-related thoughts (McVay, Meier, Touron, & Kane, 2013).

We could therefore conclude that it is still not clear how some of the cognitive mechanisms (i.e., working memory and inhibition) evoked by the two different hypotheses in the literature contribute to explaining MW in young and older adults. Likewise, it is therefore still hard to say how a task's complexity (in terms of the demands of the task) modulates MW. In fact, it has been well documented that the frequency of MW decreases for more complex tasks in younger adults (see Smallwood & Schooler, 2006), but this is not the case for older adults. Jackson and Balota (2012) tried to shed light on this aspect, and their experiments showed the different influence of task manipulation on MW frequency as a function of age. But their findings cannot be used to draw any final conclusions because they used a between-groups design and several variables (not only the difficulty of the tasks) were manipulated across the experiments, including the type of task, the rate of presentation of the stimuli, and the duration of the task.

Finally, it is important to make the point that an aspect of the issue has been overlooked, i.e., that the different MW patterns described in the literature may also depend on the age range of the older adults considered, given the difference in the extent of cognitive decline between the young-old (65–74 year-olds) and the old-old (75–85 year-olds), which is more accentuated in the latter group (e.g., Baltes, 1987; Borella, Carretti, & De Beni, 2008). The age brackets of older adults used in previous studies may have masked some of the differences in MW patterns with aging: Giambra divided his sample into two age groups (60–69, 70–89); Einstein and McDaniel (1997) studied a sample of young–old adults (60–76, $M = 65.6$), and Jackson and Balota (2012) considered elderly adults as a homogeneous group across experiments (their mean age ranged between 75.8 and 77.3 years).

Aiming to shed further light on this complex phenomenon, the present study explored the age-related differences in MW, comparing young, young-old and old–old adults, by: i) manipulating the demands of the tasks, presenting different versions of a SART; and ii) directly assessing the relationship between MW and certain cognitive mechanisms (working memory, inhibition and processing speed) using different versions of the SART. A multivariate design was adopted in which all the tasks considered were administered to all the participants.