The Forgotten Reminders: Personal Reminders Examined Through Self-probed Retrospection During Reading and Writing

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Abstract

Reminders are spontaneously arising recollections of past personal experiences that are instrumental in that they occur in response to an ongoing task to which they are perceived as being related. While related areas of research have found the number of off-task thoughts to decrease with the difficulty of the on-going task, task difficulty has yet to be examined in reminders. Here we present a series of studies examining the effects of task difficulty on reminders as well as further examining the phenomenological characteristics of reminders. Experiments 1 – 3 provide evidence that the frequency of reminders during different types of reading and writing task decreases with increasing difficulty associated with the parallel task. Experiment 4 shows that the content of reminders varies systematically with characteristics of the parallel task, indicating their context dependency and potential instrumentality. Findings are discussed in relation to research on mind wandering and involuntary autobiographical memories.

The Forgotten Reminders: Personal Reminders Examined Through Self-probed Retrospection During Reading and Writing

1. Introduction

Reminders are spontaneous recollections of previous experiences which have been studied with regards to their usefulness in an on-going task (i.e., problem solving, reading, etc.) (Schank, 1982, 1999; Ross, 1984; Larsen and Laszlo, 1990; Larsen and Seilman, 1988). Much of the research on reminders was conducted during the 1980's and 1990's before Berntsen's (1996) seminal work investigating involuntary autobiographical memories in everyday life. Though none of the previous research on reminders discussed involuntary memories per se, the researchers' general language seems to indicate the phenomenon of reminders is similar to if not the same as involuntary memories. Seilman and Larsen (1989), describes the phenomenon of personal resonance as occurring when self-knowledge is activated. Further, while the personal experiences may not at first reach consciousness, it should be easier to bring to consciousness through priming and spreading activation. Similar descriptions and discussions of involuntary retrieval have been made (Berntsen, 2010). Since we are employing similar methods to those in the earlier reminders literature, we will continue to use the term reminders throughout for consistency.

Previously, reminders have been studied predominantly with regards to artificial intelligence (AI), problem solving, and analogical learning (Schank, 1982, 1999; Ross, 1984). There has been a paucity of literature concerning the effects of reminders on on-going everyday tasks. Similarly there have been few studies on reminders with a clear autobiographical content. One exception from this general picture is research conducted by Larsen and colleagues (Larsen and Laszlo, 1990; Larsen and Seilman, 1988) who forged a path in this arena by studying reminders with a predominantly autobiographical content in relation to the reception of fictional literature.

Unfortunately, this was an area of study which lost steam and died out before researchers fully plumbed the depths of the phenomenon. Here we take up the threads from this previous line of research and study reminders of autobiographical events in relation to other tasks.

In the following series of studies, we will examine the phenomenon of autobiographical reminders as a function of the characteristics of the task during which they occur. In contrast to the early work during the late 1980's and early 90's which concentrated on reminders during reading, we here include both reading and writing tasks. We will examine whether the frequency of the reminders varies as a function of the associated difficulty of the parallel task, and whether the content of the reminders is related to the content of the task. We briefly relate our work to the literatures of mind wandering as well as involuntary autobiographical memories.

1.1 Previous Research on Reminders

According to Schank's theory of dynamic memory (Schank, 1982, 1999), reminders of distinctive past episodes help to establish a context for the processing of novel problems. Following up on this theory empirically, Ross (1984) established a causal link between reminders and performance on problem solving. Ross found that performance varied according to whether the test example context in a text processing task was the same as during the study phase, not shown before, or the same as before but with another principle. The condition in which the context was the same during the study and the test example led to the highest performance on solving the problems provided, while the context which was studied with another principle, and therefore inappropriate, led to the lowest performance.

While Ross (1984) studied reminders of a previous learning episode in a laboratory context, the idea that reminders might support the interpretation of novel situations by providing a relevant and well-understood context (Schank, 1982) was extended to autobiographical memory and the

reception of literature by Larsen and colleagues. Larsen and Seilman (1988) investigated reminders of personal events during reading with a self-probed retrospective method which was comprised of two different stages. In the first stage of the task, participants were asked to read a literary text. Participants were instructed to mark in the text where a memory came to mind while they were reading the text. Besides marking within the text, participants were also asked to give the experimenter one word which they felt covered the content of the reminding. After the participants had finished reading the text, the second phase of the task included using the cues to help the investigator and the participant to go back within the text and examine the memories which came to mind while the participants were reading the literary text. The task, therefore, included the participants monitoring for the phenomenon during an on-going task (i.e., reading), and marking in the text where each reminding occurred by either underlining the text which cued the reminding or by marking in the margin of the text where the reminding had occurred. This series of tasks combined with retrospective evaluations participants made about the reminders, are what the authors termed a “self-probed retrospective” task. The authors found that both types of text exhibited an equal number of reminders. The literary text generated twice as many “active” experiences (i.e., “events with the person as participating actor” p. 419) as the expository text leading to the authors’ proposal of *personal resonance* during reading—that is, reminders of personal events during reading help to set up a personal context for the reception of the fictional text.

Larsen and Laszlo (1990) extended the work on personal resonance with a cross-cultural approach. Participants were asked to read a literary text in which the time and place were vague, but the themes were more prominent in the Hungarian culture studied as opposed to the Danish culture. Frequency of recorded reminders was not significantly different between the two cultures; however, Hungarians rated their reminders as more vivid. Unsurprisingly, Hungarians rated the

story as taking place close to them and from a close time period (modern) while Danes rated all time periods equally and from a country/culture not their own. Hungarians found the story easier to understand and enjoyed reading it more than Danes. The authors hypothesized that Hungarians were engaged, while Danes experienced “detached observation” (p. 434). A number of factors contributed to the “appreciation” of the literature by each culture. Danes experienced more non-events (i.e., being reminded of a feeling without context) than Hungarians, while Hungarians’ reminders reached “event” status more often than Danes. The number of self-experienced events was positively correlated with interest. Considering Hungarians indicated more self-experienced events than Danes, the previous findings all coincide.

1.2 Reminders in Relation to Other Forms of Spontaneous Thought

By coming to mind with no strategic search, reminders belong to a larger class of spontaneous thought processes. A related area of research is therefore that of mind wandering, which may be defined as “off task thought during an ongoing task or activity” (McVay & Kane, 2010, p. 188). In both the mind wandering and daydreaming literature, researchers have been able to manipulate the frequency of off- task thoughts. A robust finding is that off task thoughts are correlated with the difficulty of the presented task (Singer, 1966; Antrobus, Singer, & Greenburg, 1966; Filler & Giambra, 1973; Teasdale, Lloyd, Proctor, & Baddeley, 1993). As the difficulty of the task increases, the frequency of off-task thoughts decreased. In this research, off-task thoughts are very broadly defined as any thought unrelated to the current task.

We previously stated that we believe reminders to be a form of involuntary memory. Involuntary autobiographical memories are memories of personal events that occur with no preceding attempt of retrieval (Berntsen, 1996). Research to date indicates involuntary memories typically occur during moments of inactivity or boredom and mostly in response to concrete contextual cues in the

ongoing situation (Berntsen, 2009, for review). Because involuntary memories are spontaneously arising memories of personal events they would seem to be the same as the autobiographical reminders during reading of literature studied by Larsen and Seilman (1988). Since it would seem the two phenomenon are the same based on operationalizations, we discuss further some of the previous findings related to involuntary memories. Everyday involuntary memories have often been studied in comparison with voluntary (strategically retrieved) autobiographical memories (e.g., Berntsen, 1998; Berntsen & Hall, 2004; Johannessen & Berntsen, 2010; Rubin & Berntsen, 2009; Rasmussen & Berntsen, 2011; Schlagman & Kvavilashvili, 2008). Such studies have shown that involuntary memories more frequently refer to specific events, that they involve more mood impact and tend to be considered as less central to the person's life story and identity (Berntsen, 2010, for review). Unlike voluntary memories, they occur most frequently when attention is diffuse, such as in situations with boredom (Rasmussen and Berntsen, 2011).

Notably, no studies have examined whether reminders of autobiographical events occur most frequently during less engaging and attention demanding tasks as is the case for involuntary memories. The present studies were conducted to begin to fill this gap in our knowledge.

1.3. Overview of the Present Studies

The overarching aim of the present series of studies was to examine the relation between autobiographical reminders and characteristics of the parallel task. The work presented here is quite exploratory, but we make reference to related areas of research to base our hypotheses. Based on previous research, we expect the difficulty of the current on-going task to affect the number of reminders recorded. We will systematically vary the difficulty of the on-going task. In Study 1, we vary the task in order to explore whether or not reminders occur during tasks other than reading and whether task difficulty and personal engagement affects the frequency of reminders. We then

will further examine task difficulty with regards to the frequency of reminders in Study 2 across three different tasks. Study 3 was undertaken in order to examine the relationship of difficulty and reminders frequency when the reading and writing tasks have similar content. Lastly, we attempt to determine if the reminders are relevant to the task at hand in Study 4 by manipulating the temporal context associated with the task. Across all four studies we use the self-probed retrospection method for recording reminders as was developed by Larsen and Seilman (1988). We expand this method by using it in relation to other tasks than reading and by also including a voluntary memory comparison condition, which has not been included in previous work.

3. Experiment 1

Previous studies of autobiographical reminders have only studied this phenomenon in response to the reading of literature. However, in light of the widespread nature of spontaneous autobiographical memories in daily life, reminders of autobiographical events are also likely to occur in response to other types of task, such as during writing. To which extent this happens is the key question of the present study. A related question is whether the perceived difficulty of the task influences the frequency of reminders. To determine whether or not autobiographical reminders do indeed occur during other types of tasks besides reading, we retained the reading condition previously used by Larsen and Seilman (1988) and Larsen and Laszlo (1990) in relation to reminders, but added a second condition where participants were asked to write a literary environmental description of a particular place of personal significance.

3.1. Method

3.1.1. Participants

Participants consisted of 42 Aarhus University students (23 females, $M_{age} = 24$, $SD = 2.28$).

There were 20 and 22 participants in the writing and reading conditions, respectively.

3.1.2. Materials and Procedure

The design was implemented to elicit and examine reminders during the reading and writing of an environmental description of a particular place of personal significance to the writer. In the writing condition, the environmental descriptions were written by each participant. An environmental description was described to the participants as a detailed description of a place/environment where the participant had lived. It was supposed to convey the particular atmosphere of this place. Participants were instructed to write a description of the place they had lived before coming to university. They were asked to write the description as though they were to lead a reader into a novel about their life. The environmental description could be regarded as a 'setting' for such story. As a comparison to these potentially spontaneously occurring reminders, we included a voluntary memory condition.

Before the writing task, participants were instructed not to write about concrete memories associated with the place they were writing about, only a description of the place itself. However, if a memory happened to spontaneously come to mind while writing they were asked to indicate this by marking the place in the text with a brief one or two word cue signifying to the participant what the memory was about. This is a slightly modified version of the self-probed retrospection task employed by Larsen and Seilman (1988). We allowed the participants to write brief cues, as opposed to verbally conveying them to the experimenter, and they were not limited to one word in

their description. The environment the participants were prompted to write about was the place/environment they had lived before attending university.

During the reading condition, participants were asked to read an excerpt from either Isak Dinesen's *Out of Africa* or Henry David Thoreau's *Walden*, randomized across participants. The excerpts chosen were both environmental descriptions laying a setting for the story. Both contained detailed and lengthy descriptions of the environmental setting of the story, as experienced by the narrator. Thus, by describing the setting for the novel, they could be considered as parallels to the environmental description task in the writing condition. As with the writing condition, participants in the reading condition were asked to record possible reminders by marking within the text where a memory occurred and to write a brief cue (cf. Larsen & Seilman, 1988).

Once the students had either read or written a text for ten minutes, they were asked to fill out a general questionnaire about the task itself. The questions were as follows: how captivating the participant found the task (rated on a 7-point scale from not at all captivating to very captivating); the difficulty of the task (rated on a 7-point scale from not at all difficult to very difficult); how relevant the participant found the task (rated on a 7-point scale from very unfocused to very concentrated).

Afterwards, the participants filled out a questionnaire pertaining to the phenomenological qualities of the reminders experienced while completing the task. The questionnaire was completed for the first five reminders which occurred during the task. Participants were asked about the specificity of the event and this was rated as either a specific memory or a generalized event. A specific event was defined as happening within the course of a day. Participants were then asked to indicate their responses to the following questions: to what extent the memory triggered a physical reaction (rated on a 7-point scale from "not at all" to "to a very high degree"); the vividness of auditory and visual imagery associated with the event (rated on a 7-point scale from

“not at all” to “to a very high degree”); the perspective of the participant in the event (rated on a 7-point scale from “not at all” to “an observer’s eyes”); did the event have an effect on mood (rated as either “better”, “worse”, or “unchanged/unaffected”); the emotionality of the event (rated on a 7-point scale from “extremely negative” to “extremely positive”); the intensity of the feelings associated with the event (rated on a 7-point scale from “not at all” to “to a very high degree”); the previous rehearsal of the event (rated on a 7-point scale from “almost never” to “extremely often”); the importance of the event (rated on a 7-point scale from “not at all” to “to a very high degree”); the extent of the event relating to their personal identity (rated on a 7-point scale from “completely disagree” to “completely agree”); the centrality of the event to the life story (rated on a 7-point scale from “completely disagree” to “completely agree”); coherency of the event (rated on a 7-point scale from “not at all” to “to a very high degree”); whether or not the event was related to the task (rated as either “yes” or “no”); and finally, the participants were asked to indicate the age of the event.

Participants were then asked to go back to the first five places in the text where a reminding occurred. The participants were then asked to voluntarily retrieve a memory to the same place in the text each reminding had occurred. As any differences which may be found between the reminders and voluntary memories may be due to the cue which elicited the memory, we directed the participants to the same place in the text in order to attempt to use the same cues for both conditions. In this way, we attempted to establish control of the cues eliciting reminders and memories. Participants were directed to voluntarily retrieve a new memory, not the same one that came to mind while reading or writing the text. Again, participants were asked to fill out a questionnaire concerning the phenomenological qualities of the memories retrieved.

3.2. Results

We will present the frequency of reported reminders first, before discussing findings related to the characteristics of the task, and then finally focusing our discussion on the characteristics of the reported memories.

In the present study, we hypothesized that there would be differences between the frequency and specificity of reminders based on the type of task the participants were asked to complete, while recording reminders. We expected for there to be more reminders in the reading condition, because we assumed this task to be less personally engaging (more boring) than the writing task. However, while there was a trend for the reading condition ($M = 6.09$, $SD = 4.46$) to evoke more reminders ($M = 3.95$, $SD = 2.37$), this did not reach statistical significance ($t(32.61) = 1.97$, $p = 0.058$) but would have if we had conducted a one-sided t-test ($p < .05$). One significant result was found pertaining to the first questionnaire which covered questions specific to the task. Participants rated the writing condition ($M = 5.75$, $SD = 1.52$) as being more *relevant* to them than the reading condition ($M = 3.27$, $SD = 1.55$), $t(40) = 5.23$, $p < .001$. This is to be expected considering that participants were writing about their own homes in the writing condition but were reading another person's environmental description in the reading condition.

While we included the voluntary memory condition as a comparison for the reminders, our main focus are the reminders and how the different tasks affect the reminders. The two cuing conditions (i.e., reminders and voluntary memories) are different enough to create cuing differences and warrant separate inspection. This is because the voluntary memory condition was essentially the same across the reading and writing condition since in both cases it was conducted after the reading and writing tasks were completed. Thus, it had no parallel task. However, this is not the case for the reminders condition. In this condition, participants are asked to complete a task while also monitoring for "reminders"; creating a dual task. Directly comparing the effects of both

the task (reading and writing) and the memory condition (reminders and voluntary memories) simultaneously in a 2 x 2 factorial design would therefore be inappropriate. Consequently, the following analyses were conducted on the task (reading vs. writing) and split into discrete analyses for reminders and voluntary memories, unless stated otherwise.

The data concerning phenomenological characteristics of the reported memories were clustered around the 42 participants, since each participant recorded varying numbers of reminders, and therefore also a varying number of voluntary memories. Because of the clustered nature of the data, each event could not be handled as an independent observation, and the subsequent analyses utilized aggregate scores (Wright, 1998). Each participant recorded at most five reminders (and five voluntary memories). In the case of specificity, which was rated as a binary variable by the participants, we have calculated the mean proportions for each participant (see Miles & Berntsen, 2011; Berntsen & Hall, 2004; Berntsen & Jacobsen, 2008; Schlagman & Kvavilashvili, 2008).

The writing condition elicited more remote reminders ($M = 10.30$, $SD = 4.39$) than the reading condition ($M = 6.52$, $SD = 4.49$), $t(38) = 2.69$, $p < 0.01$, and the reminders retrieved during writing were accompanied by more physical reaction ($M = 3.59$, $SD = 1.70$) than reminders in the reading condition ($M = 2.62$, $SD = 1.35$) as well, $t(38) = 1.99$, $p = 0.05$. This is in line with the finding that the writing condition was more engaging. There was no difference in the specificity of the reported reminders between the reading ($M = .62$, $SD = .36$) and writing ($M = .49$, $SD = .35$) condition, $t(38) = 1.21$, $p > 0.05$.

This same pattern of results was found for the memories recalled voluntarily. Voluntary memories in the writing condition ($M = 9.52$, $SD = 4.54$) were further into the past than the reading condition ($M = 5.07$, $SD = 3.19$), $t(38) = 3.56$, $p < 0.001$. The writing condition ($M = 3.39$, $SD = 1.50$) was also rated higher on physical reaction than the reading condition ($M = 2.44$, $SD = 1.24$), $t(38) =$

2.18, $p < 0.05$. Additionally, the voluntary memories in the writing condition ($M = .95$, $SD = .16$) were also rated as being more related to the task than the reading condition ($M = .73$, $SD = .34$), $t(38) = 2.63$, $p < 0.01$.

3.3. Summary and Discussion

Study 1 showed that autobiographical reminders occur in contexts other than reading, namely in response to a comparable writing task. We also found a tendency for reminders to be more frequent during reading than during writing, probably reflecting that the reading task was perceived as less engaging and may have generated more boredom and diffuse attention. Although they were less frequent, reminders during the writing task were more remote and involved more physical reaction at the time of recall. In Study 2 we further pursue the relation between the engagement and/or difficulty of the parallel task and reminders of autobiographical events.

4. Experiment 2

In the second study of this series, we extended the previous paradigm. Now that we have established that autobiographical reminders occur in other contexts than reading, we attempted to replicate as well as to extend the findings from Study 1 in yet another context. More precisely, we expected to replicate the results concerning the difficulty and/or engagement of the task and the frequency of the reminders. As an extension, we added another task – a word generation task – which we expected, due to the associative nature of the task, the participants to find easier than both the reading and writing conditions. For the word generation task, we expected that the frequency of reminders would increase due to the ease of the task. We also expected participants to record fewer reminders in the writing than in the reading task.

4.1. Method

4.1.1. Participants

The participants were 149 psychology undergraduate students at Aarhus University (123 females, $M_{age} = 24$, $SD = 4.2$). There were 48, 46, and 55 participants in the word generation, reading, and writing tasks, respectively.

4.1.2 Materials and Procedure

In the present study, we added a third task we predicted would be less difficult than either reading or writing. The participants were randomly assigned to one of the three tasks: reading, writing, or a word generation task.

The participants received the same two texts in the reading condition as used during Study 1. For the writing instructions, we used the same environmental description task as in Study 1. Participants were asked to write about the place they had lived before coming to university. For the word generation task we used a variation of the categories from the FAS (words beginning with the letter 'F', animals, and things at the supermarket) (Lezak, 2004). However, in contrast to the FAS, where participants have to generate words within a one minute time frame, the time frame for the word generation task was wide, rendering the task considerably less demanding. Participants were given the same 10 minute interval as with the reading and writing conditions and told to write as many things in each category as possible, excluding proper nouns, and to move on to the next category when they could no longer think of items in the current category. We added this task due to its associative nature and its similarity to a controlled, continued word association task. A similar word association task was used to elicit involuntary memories within the laboratory (Ball, 2007). For all three tasks; personal reminders were recorded through the self-probed retrospection method (Larsen & Seilman, 1988) as used in Study 1.

As in Study 1, the participants were asked to work on the task for ten minutes before the experimenter asked them to stop. After the ten minutes were completed, the participants were given a general questionnaire about the task similar to the one used in Study 1. Two questions were added to this questionnaire relating to the participants' level of concentration and whether or not their minds wandered from the task. Once the questionnaire was complete participants were asked to retrieve memories to the first five places within the text where reminders occurred. Participants were then asked to fill out the same questionnaire from Study 1 about the phenomenological qualities of the memories.

4.2. Results

Our first analyses concern the task manipulation. We hypothesized that the writing condition would be more difficult than the reading condition and that the word generation task would be less difficult than both the writing and reading conditions. The results indicate that our initial hypotheses were correct. Participants found the writing task to be more difficult than either the reading or word generation tasks, $F(2, 146) = 10.59, p < .001$. Fisher's least significant difference (LSD) post-hoc analyses confirmed the writing condition was more difficult than the reading condition ($p < .005$) and the word generation condition ($p < .001$). There were, however, no significant differences between the reading and word generation conditions.

We predicted that the number of reminders would decrease with the level of difficulty. As expected, there were differences in the number of reminders between the tasks, $F(2, 145) = 3.67, p < .05$. Tamhane post-hoc analyses (unequal variances) revealed that the writing condition elicited fewer reminders than the reading condition ($p = .064$) and the word generation condition ($p < .05$).

There were several other differences found between the three tasks as regards the initial task questionnaire. As in Study 1, participants found the writing task to be more *relevant* [$F(2, 146) =$

12.22, $p < .001$]. Surprisingly, the word generation task was rated as being more *captivating* [$F(2, 146) = 10.59, p < .001$]. The participants rated their level of *concentration* higher for the word generation task [$F(2, 146) = 10.59, p < .001$].

As in Study 1, each event could not be handled as an independent observation, and all of the following analyses, with the exception of specificity, utilized aggregate scores (see Study 1, Miles & Berntsen, 2011; Berntsen & Hall, 2004; Berntsen & Jacobsen, 2008; Schlagman & Kvavilashvili, 2008). We calculated mean proportions for each participant with regards to specificity.

Only ratings concerning relevance to *lifestory* [$F(2,135) = 5.62, p = .005$] was found to be reliably different across tasks. Tamhane post-hoc analyses showed that reminders during the writing task ($M = 2.71, SD = 1.69$) were found to be rated higher on *lifestory* than the word generation task ($M = 1.71, SD = .91$), $p < .001$, and the reading task ($M = 2.49, SD = 1.62$) was likewise rated higher than the word generation task, $p < .05$. However, no differences were found between the reading and writing tasks $p > .05$.

Only one difference between tasks was found for the memories voluntarily retrieved. The memories were found to differ with regards to *perspective*, $F(2,136) = 4.17, p < .05$. Tamhane post-hoc analyses revealed the memories in the word generation task ($M = 2.43, SD = 1.25$) were rated as coming less from an observer's *perspective* than memories in the reading ($M = 3.23, SD = 1.87$), $p = .072$, and writing ($M = 3.41, SD = 1.83$), $p < .01$, tasks.

4.3. Summary and Discussion

In Study 2 we found a relatively systematic relation between the difficulty of the task and the frequency of recorded reminders. The writing task was rated as the most difficult and personally relevant of the three tasks, and fewer reminders were recorded during this task compared to both the reading and the word generation task. At the same time, reminders during writing were rated as

more central to life story. Thus, in Study 2, we again found that fewer reminders occurred during the writing than the reading task. However, these findings were extended to a word generation task which the participants found to be less difficult than the reading or writing task. Fewer reminders occurred during the writing task than either the reading or word generation tasks, extending the same pattern of results from Study 1.

5. Experiment 3

While the previous two studies show a robust pattern of results with regards to the relationship between task difficulty and the frequency of reminders, there may be a potential confounding factor included in the tasks. The reading condition in the two studies was an environmental description written by another person than the reader, which is to say that the texts were not written by the individual participants about an environment familiar to them. Participants in the writing condition were engaged in a writing task that, while still an environmental description lacking episodic memory content, was nevertheless a description of an environment highly familiar to them. This may have led to a diminished effect of the relationship we wished to study, and accounting for the personal (self-referential) nature of the writing task may provide a clearer picture of the relationship between task difficulty and the frequency of reminders.

Therefore, to further explore the potential effects the more personally relevant writing task may have had on the frequency of reminders in the writing condition, we modified the writing prompt in the current study to more closely resemble the environmental description portrayed in the reading condition. We would expect in this instance that the pattern of results from the first two studies will be more pronounced in the current study with there still being fewer reminders in the writing condition than the reading condition.

5.1. Method

5.1.1. Participants

The participants were 40 students at Aarhus University ($M_{age} = 22.65$, $SD = 2.97$). There were 20 participants in each of the two conditions.

5.1.2. Materials and Procedure

We chose to follow a similar procedure to the one described in Study 1. Half of the participants in the study were randomly assigned to a reading condition in which they were asked to read an excerpt from Isak Dinesens' *Out of Africa*. In this instance, we chose only one text in order to more fully match the writing condition's content to that of the reading condition. For the writing condition, participants were asked to write about a fictional individual that had recently moved from Denmark to Kenya in order to match the topic of the reading task. Again, as in the previous two studies, participants were asked to write an environmental description of the place as though leading a reader into an introduction of this person's life. By asking participants to write about an individual unknown to them, about an environment that is unfamiliar as well, we removed the more self-referential component inherent in the earlier writing tasks used in studies 1-2. This also provides more overlap in content between the reading and writing tasks. During both tasks, personal reminders were again recorded using the self-probed retrospection method (Larsen & Seilman, 1988) utilized previously.

Similar to the first two studies, the participants were asked to work on the task for ten minutes before the experimenter asked them to stop. After the ten minutes were completed, the participants were again given a general questionnaire about the task. Following completion of the general task questionnaire, participants were again asked to rate the first five reminders on a number of phenomenological qualities. Unlike the previous two studies, since we were primarily focused on

whether removing the personal content from the writing condition would affect the relationship between difficulty of the on-going task and reported reminders, we did not include a voluntary task. We predicted that the reading condition would yield more reminders than the writing condition.

5.2. Results

Of particular interest was the number of reported reminders in light of the reported difficulty ratings below. Similar to the previous studies, there were significantly more reminders reported in the reading condition ($M = 5.25$, $SD = 2.27$) than the writing condition ($M = 2.42$, $SD = 1.35$), $t(31.18) = 4.76$, $p < .001$. In this particular instance, there were more than double the number of reminders in the reading condition than the writing condition.

Since we modified the writing task, we were particularly interested in the analyses concerning the task manipulation. These analyses refer to the first general questionnaire given to the participants after completion of the reading or writing task. As predicted, and following the same pattern of results from the first two studies, participants rated the writing task ($M = 4.5$, $SD = 1.47$) as more *difficult* than the reading task ($M = 3.20$, $SD = 1.36$), $t(38) = 2.90$, $p < .01$. Participants also reported having been more *concentrated* during the writing task ($M = 5.50$, $SD = .95$) in comparison to the reading task ($M = 4.20$, $SD = 1.20$), $t(38) = 3.81$, $p < .001$.

The following analyses of the phenomenological characteristics of the reminders were again based on aggregated scores as in Studies 1 and 2. There were only a couple of significant findings on the larger questionnaire pertaining to the phenomenological qualities of the reported reminders. The reading task ($M = .75$, $SD = .28$) was accompanied by reminders which were more *specific* than the reminders reported in the writing condition ($M = .45$, $SD = .44$), $t(30.33) = 2.49$, $p < .05$. Finally, as reported in the preceding study, the reminders in the writing condition ($M = 4.95$, $SD =$

1.50) were rated as more *vivid* than the reminders in the reading condition ($M = 4.09$, $SD = .91$), $t(29.44) = 2.17$, $p < .05$. No other variables were significantly different between the two conditions.

5.3. Summary and Discussion

In Study 3 we continued to find a similar pattern of results between the difficulty of the ongoing task and the frequency of reported reminders. The writing task was rated as the most difficult and there were fewer reminders recorded during this task compared to the reading task. The specificity of the reported reminders was similar to that reported in Study 1, whereby the reminders were more specific for the less difficult reading condition. Also similar to previous findings in Study 2, reminders in the current study reported during the writing task were rated as more vivid. While these were the only significant differences between the two conditions for the current study, it is worth noting two variables in which differences were reported in Study 2, but not in the current study. In Study 2, the reminders reported in the writing condition were rated as more central to life story. That was not the case in the current study, which is unsurprising given the personal nature of the writing task in the previous studies. This could be an indication that the personal component from previous studies was successfully excluded in the current manipulation. In Study 4 we turn toward the content of the reminders which occur during the writing task.

6. Experiment 4

Another question which arises after the first two studies in the series is: are the reminders which the participants report actually related to the content of the task at hand or are they task unrelated thoughts as seen in the mind wandering literature? Previously reminders concerning problem solving have been shown to be of assistance not a hindrance (Ross, 1984). Likewise,

Larsen and Seilman (1988) hypothesized that personal reminding during the reading of fictional literature helped to establish a mental context for the story and create a sense of personal resonance.

So, with regards to reminders in the current tasks, we attempted to answer whether or not the reminders occurring during writing, were directly related to the on-going task. We chose to par down the task to just the writing condition used in Studies 1-2. In Study 4, we directly compare two temporal conditions (remote versus recent target) within the writing task. We would expect that if the reminders which occur during the task are task-related and potentially helpful, the age of the events which come to mind should then reflect the temporal condition the participants have been assigned to. Thus, participants writing about their childhood environment would have reminders dating further back in time than participants writing about their current environment.

6.1. Method

6.1.1. Participants

Participants consisted of 259 undergraduate students from Aarhus University (216 females, $M_{age} = 24$ years, $SD = 6.28$). There were 131 and 128 in the childhood and current conditions, respectively.

6.1.2. Materials and Procedure

A 2 (temporal distance: Childhood vs. Current) x 2 (memory type: Reminders vs. Voluntary) mixed design was employed, where temporal distance was between subjects and memory type within. In one condition, the participants were asked to write about their childhood home and in the second condition they were asked to write about their current home. The manipulation of place was an attempt to manipulate the temporal distance of the memories evoked. In this way, we

manipulated the cues to the reminders. We used the same self-probed retrospection method as in the previous three studies.

Once the participants had written for five minutes, they were asked to stop writing and answer a few questions about the first reminding marked in the text they had written. Since we were only examining the first reminding, we decided to reduce the time requirement for the task, expecting that many would have had at least one reminding within the first five minutes of the task. The questions posed during the current study were as follows: specificity of the event (rated as either a specific memory or a generalized memory); mood impact (rated on a 7-point scale from “not at all” to “to a very high degree”); the age of the memory; the extent of the event relating to their personal identity (rated on a 7-point scale from “not central to the identity” to “more central than any other”); the centrality of the event to the life story (rated on a 7-point scale from “not central to the lifestory” to “more central to the lifestory than any other”); uniqueness of the remembered event in comparison with other events from that period in their life (rated on a 7-point scale from “much like other experiences” to “completely unique and different from others”); the extent to which the event had been previously rehearsed (rated on a 7-point scale from “never” to “more often than any other”).

As with both Studies 1,2, and 3, the participants were asked to go back to the same place in the text where the reminding had occurred and to voluntarily retrieve a memory. The same questions posed to the participants for the reminders in this study were asked of the voluntary memories as well. We did not include the first questionnaire from Studies 1 through 3 which was related to the difficulty of the tasks, as we were not manipulating the cognitive demands of the task the participants were given (e.g., only a writing task was given).

6.2. Results

In the current study, each participant was asked to answer questions to only the first reminding in the text. As such, we did not calculate aggregate scores for the analyses. Also, in contrast to Studies 1, 2, and 3 by constraining our inquiry to one task (e.g., writing task), we are given the opportunity to directly compare the reminders to the voluntary memories. The following results will include both main effects of the temporal manipulation, as well as main effects of the memory type and any interactions found between the two (see Table 1 for corresponding *Ms* and *SDs*).

Results revealed a number of main effects for the temporal distance condition. As expected, reminders evoked while writing about the childhood home were more temporally remote than reminders associated with the current home [$F(1,224) = 263.55, p < .001$]. Temporally remote events tend to be less specific than recent events and our results coincide by showing fewer specific events in the childhood condition [$F(1,217) = 29.14, p < .001$]. The childhood condition was also accompanied by a higher *mood impact* than the current condition [$F(1,223) = 15.81, p < .001$]. Lastly, the childhood condition was found to be more central to the participant's *identity* [$F(1,225) = 6.53, p < .05$] and *lifestory* [$F(1,225) = 6.93, p < .01$].

There were also several main effects of memory type. Surprisingly, and against previous research on involuntary autobiographical memories as recorded in everyday life, the reminders were found to be less *specific* than the voluntary memories [$F(1,217) = 11.53, p < .001$]. However, the reminders were found to be less relevant to the *lifestory* [$F(1,225) = 7.11, p < .01$] and *identity* [$F(1,225) = 16.34, p < .001$], which is consistent with previous studies on involuntary memories (Berntsen, 2010). Only one interaction was found relating to the age of the memories. While reminders in the childhood condition were more temporally remote than voluntary memories, they

were less temporally remote than voluntary memories in the current condition [$F(1,224) = 7.88, p < .01$].

6.3. Summary and Discussion

As expected, there were systematic differences between the childhood and current conditions. The reminders which occurred during the childhood task were dated as more distant into the past than the reminders during the current task. In line with previous research in autobiographical memory (Miles & Berntsen, 2011), we found the reminders in the childhood condition not only to be more remote, but also to be less specific. In addition, they were rated as more central to life story and identity. The findings suggest that the reminders have some relevance, or at least semantic relationship with, the ongoing task.

7. General Discussion

As predicted the current series of studies shows that autobiographical reminders of autobiographical events do indeed occur during tasks other than reading (Larsen & Seilman, 1988). We also showed that the frequency of the reminders varied systematically with the difficulty of the ongoing task. Furthermore, we manipulated the content of the reminders by manipulating the temporal component present in the writing task. We found consistency between the temporal context of the writing task and the dating of the reported reminders, supporting their context dependency and potential instrumentality in relation to the ongoing task.

Why did the frequency of reminders decrease as the difficulty of the task increased? This finding is similar to findings in the daydreaming literature in that when the difficulty of the task increases the frequency of mind-wandering episodes decreases (see Smallwood & Schooler, 2006, for a review). An increase in off-task thought has been associated with boredom (Singer, 1966; Kane, Brown, McVay, Silvia, Myin-Germeys, & Kwapil, 2007). The reading and word generation

tasks from the present series of studies could also be deemed boring, and the reading tasks were rated by the participants as less captivating. As a result the participants might have been searching for more exciting stimulation while engaged in the less cognitively demanding tasks at hand (i.e., word generation and reading). The current series of tasks contains an added component which could further increase the cognitive load. Since the participants were given one task to complete (i.e., word generation, reading, writing) while monitoring a second on-going task (e.g., identifying and reporting reminders), the task essentially becomes one of divided attention. These tasks would require a higher degree of executive functioning and further constrain spreading activation and inhibit task-irrelevant thought. All of the components listed above may potentially lead to reminders, or the absence thereof, as well as the other phenomena discussed below which are associated with reminders.

Involuntary memories share a key feature as the reminders from the current series of studies. Involuntary memories seem to occur most frequently while attention is diffuse or more specifically when the task is not cognitively demanding but instead is quite boring for the participant. As mentioned previously, Singer (1966) found a similar pattern of results in his daydreaming studies as with the current reminders (see also Antrobus, Singer, & Greenburg, 1966; Filler & Giambra, 1973; Teasdale, Llyod, Proctor, & Baddeley, 1993). As the difficulty of the task decreases; the frequency of off-task thought increases. Berntsen (1998) and Schlagman and colleagues (2007) also found that a majority of the involuntary memories in their studies occurred when a participant was engaged in tasks which did not require much attention.

There are a few potential drawbacks to the current design. Firstly, we are unable to directly compare the reminders to the voluntary retrieval condition across tasks in Studies 1 and 2. As mentioned above, during the reminders condition, the memories came to mind in response to an ongoing task, which were designed to differ between subjects in these studies. However, this was

not the case for the voluntary retrieval condition, in which all participants were asked to retrieve memories to the same cues as had elicited the reminders (no matter whether the latter had occurred during reading or writing). It therefore was not meaningful to directly compare the reminders to the voluntary retrieval condition in Studies 1 - 3, as the conditions are too dissimilar to warrant direct comparison. Further, in Studies 1 and 2 there may have been another added distinction between the reading and word generation tasks as compared with the writing task. During the writing condition, the participants were asked to write about their home which may already have engaged retrieval mode (Tulving, 1983). As such, the participants may not have distinguished between reminders and the information retrieved from memory which was needed in order to write the environmental description, therefore lowering the reported number of reminders in this condition. We attempted to address this potential concern from studies 1 and 2, by giving the participants a less self-referential writing prompt in Study 3.

This final point creates another avenue of discussion. As previously stated, participants in the writing condition may have engaged in retrieval mode while completing the task. We were then also asking the participant to monitor their thoughts and distinguish between information attained via voluntary retrieval and memories which occurred spontaneously in relation to the task. Mace (2006) designed a methodology to investigate the phenomenon of chaining. Participants engaged in a traditional voluntary autobiographical memory retrieval task and then were asked to report if these voluntary memories triggered other memories. In many cases, involuntary memories did occur when remembering the past. The same complication arises from traditional studies of involuntary memories involving diaries. Participants are asked to monitor their thoughts throughout the day, and distinguish between the two forms of retrieval (Schlagman & Kvavilashvili, 2008). While distinguishing between the two forms of retrieval may seem difficult, participants do seem to be

able to differentiate; resulting in an established difference in phenomenological characteristics of the memories in the two types of memory retrieval.

In the series of studies presented above, we have examined a form of spontaneously occurring memories which have been previously termed “reminders”. Our paradigm stemmed from the reminders tradition of Larsen and colleagues (Larsen & Seilman, 1988). Therefore, throughout we discuss the phenomenon within this context. It is not entirely clear to what extent personal reminders as examined here are similar to involuntary autobiographical memories as studied through naturalistic diary studies in daily life, or whether and how the two phenomena differ. We operationalized reminders as spontaneously occurring episodic memories in relation to an on-going task. As pointed out in the introduction, involuntary memories do not always occur in response to an ongoing task and may not necessarily be functional in nature. Nonetheless, there are certainly similarities with regards to these two phenomenon; we assume that they are probably one in the same or at least highly similar and do not necessarily need to be categorized as different types of memory phenomena. Rather reminders may be a subset of spontaneous autobiographical memories as reported in a variety of contexts in daily life (Berntsen, 2009). The present work leaves a need for more research to establish the link between personal reminders and involuntary autobiographical memories. At any rate, the present series of studies suggests that reminders of personal events may be commonly occurring during a variety of cognitive tasks and therefore are a phenomenon worth pursuing in future research (Hintzman, 2011). The self-probed retrospection method used in the present series of studies may be extended to a variety of cognitive tasks.

Authors Note

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Table 1

Characteristics of reminders vs. voluntary memories by temporal distance

Note. *= $p < .05$, **= $p < .01$, ***= $p < .001$

	Childhood				Recent				Main				Interactions	
	Reminders		Voluntary		Reminders		Voluntary		Temporal distance		Memory retrieval			
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i>	η_p^2	<i>F</i>	η_p^2	<i>F</i>	η_p^2
Specific	.27	.44	.38	.49	.50	.50	.67	.47	29.14***	.12	11.53***	.05	.57	.00
MoodImpact	4.20	1.55	4.20	1.71	3.53	1.57	3.43	1.78	15.81***	.07	.15	.001	.15	.001
Age (distance in years)	13.87	6.92	12.73	7.16	1.56	4.58	2.47	4.37	263.55***	.54	.09	.00	7.88**	.03
Identity	2.73	1.71	3.49	1.85	2.45	1.62	2.83	1.79	6.53*	.03	16.34***	.07	1.69	.01
Lifestory	3.11	1.81	3.56	1.93	2.64	1.80	3.02	1.88	6.93**	.03	7.11**	.03	.06	.00
Unique	3.51	1.75	3.65	1.86	3.66	1.84	3.89	1.90	1.05	.01	1.33	.01	.07	.00
Rehearsal	3.04	1.50	3.21	1.90	3.08	1.59	3.06	1.64	.12	.00	.29	.00	.44	.00