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Understanding Older Adults' Experience of Prospective Memory Errors and Strategy Use

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ABSTRACT

Prospective memory (PM) is the ability to plan and carry out a specific intention. Among older adults, the frequency of PM errors predicts difficulties with independent living. However, little is known about the nature and appraisal of everyday PM errors in older adults, as well as the strategies used to support PM. We addressed these issues in two qualitative interview studies ($N=30$) with individuals aged 55–86. Findings suggested that older adults were most affected by PM failures that impact others (e.g., forgetting to meet a friend, 19/30 participants). The importance of social support to help remember tasks was also highlighted. External aids (e.g., calendars) were seen as the most useful strategies (27/30 participants), but participants differed in their attitudes toward technological support for memory. Findings highlight the importance of social factors in motivating and supporting PM in older adults and may inform the development of effective strategies to support PM in aging.

1 | Introduction

Remembering to call a friend on their birthday or picking up groceries when passing the shop on the way home relies on a specific memory system called prospective memory (PM). PM is the ability to form an intention and remember to carry it out at the appropriate time and place in the future (Einstein and McDaniel 1996). PM is vital for everyday functioning and can have significant consequences for a person's wellbeing (e.g., forgetting to take one's daily medication). The ability declines significantly with age (Altgassen et al. 2010), is related to maintaining autonomy and independent living in aging (Woods et al. 2015), and is predictive of quality of life (Hering et al. 2018). PM errors are common in everyday life (Terry 1988) but we know remarkably little about the types of PM errors that bother people most and how they develop strategies to deal with them. In two qualitative studies, we explore the types of PM error that older people experience as most troublesome, and how they develop support for their own memory.

To better understand what motivates older adults to carry out PM tasks, greater understanding of the types of PM lapses that occur in daily life is needed. Niedźwieńska et al. (2020) asked participants to record their memory errors in a diary over a 7-day period. Forgetting appointments, medication, and one-off activities (e.g., withdrawing money from an ATM) were the most common PM errors. In another diary study, Mogle et al. (2023) found that forgetting why you entered a room, forgetting to do an errand, or take medication were the most common PM slips. They found that the most irritating type of PM error was forgetting to attend an appointment. However, we know relatively little about which types of everyday PM lapse are perceived as the most problematic or frustrating for older adults, or why this is the case. Deeper understanding of the nature and appraisal of PM errors is needed (Mogle et al. 2019, 2023) to be clearer about how such errors impact on wellbeing.

An active research area on aging and PM has focused on interventions to overcome PM failures. Interventions tend to evaluate

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either training of basic cognitive processes associated with PM (e.g., working memory) or training of PM-focused strategies (e.g., mnemonics) (Reichman et al. 2010). One review found that both process- and strategy-based interventions have the potential to be beneficial (Hering et al. 2014).

Further, in a meta-analysis, Tse et al. (2023) found a positive immediate effect of PM training interventions for both single- and multiple-session interventions. However, no significant longer-term effects were found, indicating a need for continued support as well as a clearer focus on how to implement taught strategies in daily life. In another review, authors reached similar conclusions about process and strategy-based training and found that both internal and external aids can be useful strategy-based approaches to facilitate PM in older adults (Tsang et al. 2022). While internal aids include the use of visualization and mnemonics, the use of a diary or placing objects as visual cues are examples of external reminders.

Some intervention studies focused on medication adherence and suggested that supportive technology such as smartphone reminders could make it easier to use PM strategies (e.g., Insel et al. 2013, 2016). In fact, the use of technological memory aids is a fast-growing area of research. For example, Scullin et al. (2022) found using a smartphone app to be useful in enhancing everyday PM ability in older adults. Recently, a review and meta-analysis on methods of preserving PM in everyday life (Jones et al. 2021) concluded that external memory aids, including the use of assistive technologies, were the most effective way to enhance remembering. It would therefore be useful to understand more about older adults' attitudes to and use of technological aids in daily life to assist their memory.

Some research has looked in more detail at the strategies used to support prospective remembering. The choice and use of PM supporting strategies depend on factors such as task importance (Penningroth and Scott 2019; Kuhlmann 2019) and how much a PM cue stands out from the environment (Harrington et al. 2024; Kliegel et al. 2008). The majority of studies investigating strategy use in PM are based on laboratory tasks rather than the spontaneous strategies used in everyday life. There is a need for further understanding of how older adults use strategies to support day-to-day PM function. According to previous literature, the main strategies that people report using to support PM involve using external memory aids to offload intentions. Such strategies include writing down intentions (Aronov et al. 2015; Jones et al. 2021) or placing an object by the door to remember it (Gilbert et al. 2023). These intention offloading strategies reduce load on cognitive capacity and thus effort needed for remembering (Gilbert et al. 2023). Some classic studies indicate that older adults report using offloading strategies to support everyday memory, such as using calendars or visually prominent reminder cues (Maylor 1990; Gould et al. 1997). However, we still know relatively little about which strategies older adults choose to support PM in their everyday lives, how effective they find such strategies, and why they choose them.

Deciding to use strategies to support memory in everyday life depends on the metacognitive realization that memory errors are occurring. Importantly, there is still limited insight into the metacognitive awareness older adults have of their own

everyday PM errors. Metacognition (i.e., awareness of one's own cognitive abilities) has been found to play an important role in PM ability (Zuber et al. 2024). Older adults tend to underestimate their abilities in lab-based settings, whereas they overestimate them in naturalistic settings (Schnitzspahn et al. 2018). Metacognitive awareness also impacts the strategies used to overcome PM errors. In a lab-based study, Scarampi and Gilbert (2021) found evidence of limited metacognitive knowledge in older adults which might limit their ability to use offloading appropriately to compensate for the decline in PM ability. In more everyday settings, metacognitive factors (such as memory self-efficacy and worry about memory) predicted the likelihood of older adults using external and internal reminder strategies (Gould et al. 1997). In the current study, we will explore further how older adults understand and deploy PM strategies in their everyday lives.

If we are to design effective, motivating, and user-friendly tools to support PM in older adults, it is important that we understand more about the nature and appraisal of PM lapses in everyday life and the strategies that older adults spontaneously use to address such memory errors. Lived experiences are best understood using qualitative approaches, though there are only a handful of qualitative studies of older adults' PM lapses thus far. Hertzog et al. (2019) carried out semi-structured interviews with older adults (aged 55–85), asking specifically about their use of strategies to support their everyday memory. Although the focus was on general memory abilities, one of the most common issues was reported to be failures in PM (e.g., medication taking and remembering to visit family members). Further, although external memory aids were preferred, many participants reported relying on incidental remembering (i.e., spontaneous retrieval). The study provided valuable insight into older adults' self-reported everyday memory errors; however, PM was not the focus of the study, and so it would be useful to look in more detail into the appraisal of PM errors and strategies. In particular, understanding more about which PM errors are perceived as most troublesome and upsetting, and which memory support strategies are perceived as most useful and effective is important to inform the transferability of future intervention strategies.

Auffray and Azzopardi (2020) explored PM errors in everyday life and spontaneous strategy use in 14 older adults (aged 66–89) using an interview approach. Content analysis was used to investigate which memory aids were preferred. Results suggested external aids such as paper diaries were used most frequently, but the use of technological aids was infrequent, while internal aids were only used rarely. For PM errors, forgetting an appointment was the most frequent failure reported. While content analysis provides valuable insights into the types of aids used, a thematic analysis approach can offer deeper insights into why these aids are preferred by older adults.

To inform future interventions, we need to explore in more depth which PM errors impact participants negatively and which memory strategies are preferred and perceived to be effective by older adults. Therefore, the aim of the current interview studies was to enrich existing knowledge on PM errors and strategies in aging by asking older adults directly to appraise and discuss their everyday PM experiences. This was

done through a qualitative approach using three exploratory research questions. Firstly, we aimed to investigate which PM errors are most bothersome in everyday life for older adults. Secondly, we aimed to explore which strategies older adults use to combat these errors. Finally, we wanted to explore which strategies older adults find the most beneficial and which appear to be less useful.

In Study 1, a key theme that emerged was the perceived importance of living with someone else in supporting PM. As most of the participants (14/15) in that study lived with a partner, we wanted to investigate this issue further. Therefore, we conducted Study 2 that included a greater proportion of older adults who lived alone (10/15).

2 | Method

2.1 | Transparency and Openness

We report how we determined our sample size, all data exclusions, and all measures in the study. Study design and analysis were preregistered, and the preregistration from Study 2 can be accessed at <https://osf.io/yvw7t>. Interview data contain personal data and therefore cannot be made more widely available.

2.2 | Design

Two qualitative semi-structured interview studies.

2.3 | Participants

In Study 1, 15 older adults (eight male, seven female) aged 55–86 ($M = 72.3$, $SD = 7.43$) were recruited. In Study 2, 15 older adults (three male, 12 female) aged 63–79 ($M = 72.9$, $SD = 4.1$) were recruited. Participants were recruited through the University's School of Psychology participants panel, local Rotary clubs, and community centers. Exclusion criteria were a current diagnosis of dementia, anxiety, and/or depression.

All participants in Study 1 and 2 self-reported that they required no assistance with daily living and were moderately active and relatively healthy (see Table 1). In Study 1, 14 participants lived with another person and one participant lived alone in sheltered accommodation. For Study 2, 10 participants lived alone, while five lived with a partner. No participants reported any current caring

responsibilities. Twenty-nine participants identified as White, while one identified as Asian. In Study 2, mean self-perceived socioeconomic status (SES) on the 10-point subjective SES ladder (Adler et al. 2000) was 5.7 ($SD = 1.5$), with higher scores indicating higher self-rated SES. No participants were excluded from the studies. The number of participants ($N = 15$ per study) was determined by the recommendations from Willig and Rogers (2017).

2.4 | Ethical Considerations

The studies were approved by the University's Ethics committee (PEC/5235/2023/1). Written informed consent was obtained from participants. To ensure anonymity for participants, all identifying information was removed from the transcripts before analysis. The audio recordings were deleted after transcription.

2.5 | Materials

2.5.1 | Sociodemographics

Participants self-reported their age, gender, occupation, years of education, highest level of education, and current health status on a 5-point Likert scale (from Very poor to Very good), current level of physical activity on a 5-point Likert scale (Very low to Very high), previous or current depression, medication which might affect memory, native language, caring responsibilities, and living situation (living alone or with others). In study 2, SES was also rated (see above).

2.6 | Procedure

The interviews took place at a university or community setting depending on participant preference.

After completing informed consent and demographic information, the interviewer gave participants a lay definition of PM: "What we are going to focus on today is how you remember to carry out tasks that you need to do. This part of memory is called prospective memory, and it is important for things like remembering to call a friend on their birthday and remembering to pick up a particular thing you need when you pass the shop. It also includes things like remembering to take medication or attending a doctor's appointment on time." Interviews covered the frequency and importance of PM errors in daily life, the impact of different types of errors, and the use and preferences for different strategies to reduce errors. For Study 2, an additional question was added regarding the impact of living alone on PM (see Supporting Information S1 for full list of questions).

Upon completion, participants were thanked and debriefed. Interviews lasted between 12 and 47 min.

2.7 | Analysis

Interview recordings were transcribed verbatim and coded manually by two coders; the main coder was a postgraduate student,

TABLE 1 | Descriptive statistics for participants in years of education, self-reported health, and self-reported physical activity levels.

	Study 1		Study 2	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Years of education	17.00	4.38	14.71	4.10
Health (1–5)	4.07	0.80	4.00	0.73
Activity levels (1–5)	3.40	0.51	3.20	0.68

while the second coder was an undergraduate volunteer research assistant. The data were analyzed using inductive thematic analysis following the six-step approach advocated by Braun and Clarke (2006). Stage one involved familiarization with the data by reading the transcripts several times. Stage two was the initial development of codes. During stages three and four, themes were generated, followed by defining and naming the themes in stage five. Finally, the narrative was written as the sixth stage. All authors discussed and helped to refine the themes and final narrative. The epistemological stance was contextualist, which assumes people's words are a window to their reality. The data from the two studies were analyzed separately using an identical approach, with one of the second coders assisting with the first analysis and the other one assisting with the second analysis. The coders broadly agreed on themes and codes conceptually but had initial differences regarding the theme names and details of interpretation, which were resolved through discussion within the research team.

2.8 | Reflexivity

The main researcher was a PhD student in psychology with theoretical knowledge of PM errors, but with limited direct experience of older adults with serious memory failures in real life. Both second coders were third-year undergraduate research assistants, who had some lived experience with family members suffering from minor memory lapses (see full reflexivity statements in Supporting Information S2).

3 | Results

In Study 1, six themes with embedded subthemes were developed during the thematic analysis procedure: (1) External and internal aids, (2) Priorities and demands, (3) Social motivation, (4) Routines and strategic behaviors, (5) Awareness of memory changes, and (6) Negative emotions. In Study 2, five themes were developed: (1) Strategies supporting memory, (2) Prioritization, (3) Social aspects impacting PM, (4) Routines, and (5) Staying alert and active.

Due to an overlap in themes across Study 1 and 2, the results of both studies are presented together (see Tables 2–7). In the following sections, themes, subthemes and illustrative quotes are combined with S1 (Study 1) and S2 (Study 2) notations provided to clarify the source.

3.1 | Theme 1—Aids Supporting Memory

■ If it's not on the calendar, it's not happening.
[P4, S1]

Table 2 shows the subthemes within the memory strategies theme and illustrative quotes for each. Theme 1 directly related to our research aim of understanding more about the strategies used by older adults to support PM. There was an overall inclination to use external memory aids with *diaries/calendars as the preferred tool to support memory* [Theme S1.1.1], and *diaries used to plan ahead and avoid forgetting*

TABLE 2 | Theme 1: Aids supporting memory, with related subthemes and quotes.

Subthemes	Quotes
S1.1.1 Diaries/calendars as the preferred tool to support memory	<i>"I check my diary at the beginning of the week, make sure to put up in that I can think ahead what I'm doing"</i> [P12]
S1.1.2 Use of technological external aids varied depending on experience	<i>"Yes, it's using technology, I think going with the flow on that is very good"</i> [P3]
S1.1.3 Internal aids are of limited use	<i>"I don't really use mnemonics. I don't find they work"</i> [P1]
S2.1.1 Diaries used to plan ahead and avoid forgetting	<i>"Well, I suppose I'm good at constantly referring to this [diary]. In the evenings I go through this. What's on tomorrow? (...) So I certainly rely on this a lot"</i> [P1]
S2.1.2 Internal aids helpful for some individuals	<i>"And I think, I must remember to go and do such and such. And I don't write it down. But you, OK, internalise. And you do think about it"</i> [P4]
S2.1.3 Visual prompts used to remember medications	<i>"I just leave the boxes on the kitchen table where I normally have breakfast. And the evening, I've got pain relief on my bedside table"</i> [P8]

Note: Subtheme numbers S1 = Study 1, S2 = Study 2.

[S2.1.1]. Some participants preferred paper forms, others an electronic version—and some both. A diary/calendar was not only used most but also viewed as being the most helpful aid, addressing our aim to understand more about which memory strategies are perceived as most beneficial. Participants explained using the diary to structure their daily life, by keeping track of their busy schedules as well as avoiding clashes with their partner's plans and often described forgetting events that were not written down. Other external aids included making lists (i.e., offloading) and leaving out objects to prompt certain tasks. When talking about health-related behaviors many participants described remembering medications almost effortlessly. However, participants also frequently used *visual prompts to remember medications* [S2.1.3], for example leaving pills beside their toothbrush.

Technology was often used as an external aid, especially the calendar on a smartphone. Other uses included setting alarms or being reminded by text messages or emails. However, the *use of technological external aids varied depending on experience* [S1.1.2], as well as willingness to learn more. Many participants expressed an interest in learning more, while some pointed out the limits of using technology. Others did not find technology helpful for them and did not express a wish to learn more. This indicates substantial variation in the types of memory aid seen as most beneficial.

The use of internal aids to support memory was only mentioned spontaneously by three participants, who primarily used

TABLE 3 | Theme 2: Prioritization and demands, with related subthemes and quotes.

Subthemes	Quotes
S1.2.1 Working life versus retirement	<i>"My memory is becoming less reliable as I get older. (...) I'm retired, there's no pressure to remember things in particular" [P8]</i>
S1.2.2 Distinct difference between urgency and importance	<i>"I suppose you remember the things that you regard as more important in your life. The most significant and therefore the more prominent in your mind" [P11]</i>
S1.2.3 Remembering as an effortless process	<i>"If they're important, you look forward to them. so, I wouldn't say I have to remember that. There's no way I'd forget it because I'm looking forward to it" [P10]</i>
S2.2.1 Prioritization depends on perceived importance	<i>"So, it's not, you know, my heart won't prevent because I forget. I think if it was, that level of importance that maybe given it a higher priority" [P1]</i>
S2.2.2 Increased forgetfulness when busy	<i>"When I get really busy doing too much, I do sometimes, well, not sometimes... Occasionally forget. And I did forget recently, and it was my COVID injection (...)" [P2]</i>

Note: Subtheme numbers S1 = Study 1, S2 = Study 2.

visualization as an internal aid for example, *"It's all in my head"* [P7, S2]. This illustrates that *internal aids are useful for some individuals* [S2.1.2], whereas most participants reported that *internal aids are of limited use* [S1.1.3], for example, "No, that doesn't work because I've got so many words in my head for songs and poems and things anyway, and I'm inclined to go off piste in that. I'll remember for a little while but then I don't remember how long it's important for" [P5, S2].

When asked specifically about the use of internal aids, a few participants mentioned using repetition or mnemonics to aid their memory, but these methods were used infrequently. One participant mentioned finding it useful to use repetition when walking to the store to buy a few items: "I might do if I'm walking from the house to the Co-op saying right, I've got three things to get" [P10, S2]. Two participants mentioned that they *used* to find internal aids useful but did not use them currently: "Right, I used to do this at school, and we would talk about memories, memorising things" [P15, S2].

3.2 | Theme 2: Prioritization and Demand

Probably I'm too busy. I think I need to start prioritising what's important to me.

[P11, S2]

Table 3 shows the subthemes within the theme of *prioritization and demands* and illustrative quotes for each. A shift in memory

TABLE 4 | Theme 3: Social aspects impacting PM, with related subthemes and quotes.

Subthemes	Quotes
S1.3.1 Priority in remembering tasks involving other people	<i>"My main concern about my memory is forgetting something quite serious and letting somebody down. Because that I would feel very guilty about" [P11]</i>
S1.3.2 Living with a partner facilitates remembering	<i>"Well, living with one's partner certainly helps. And I think living with anybody close would certainly help memory" [P10]</i>
S1.3.3 Emphasis on co-dependence in remembering	<i>"I've a person on the phone and she never knows anything, and I'll say I think you're due an appointment with the nurse for your B12 or something (...)" [P9]</i>
S2.3.1 Social aspects and reminding others aid memory	<i>"I will tell him if something is happening. Because I'm the main organiser for these things, so yes, I do tell him what's going on" [P4]</i>
S2.3.2 Living with somebody versus alone impacts memory differently	<i>"Well, I presume living with somebody, life would be a bit more organised" [P1]</i>

Note: Subtheme numbers S1 = Study 1, S2 = Study 2.

was noted by many of the participants in *retirement versus working life* [S1.2.1]. For most, this reflected having less to remember, and fewer prompts to carry out tasks since they stopped working. A feeling of having slowed down and having a less busy schedule since retiring was also frequently expressed. Participants in Study 1 described a *distinct difference between urgency and importance* [S1.2.2] in remembering tasks. While many things had to be done quickly and efficiently while working, most tasks in retirement were described as less urgent and could often be postponed without major consequences, for example attending an important meeting while working compared to planning to sort out the loft in retirement. Similarly, participants in Study 2 described how *prioritization depends on perceived importance* [S2.2.1].

When asked about what made PM errors worse, *increased forgetfulness when busy* [S2.2.2] was commonly mentioned. This was often related to being more easily distracted or sidetracked if several tasks needed to be remembered at once. One participant described forgetting several of her own tasks when family members were visiting for an extended period, as she was busy attending to their needs.

Lastly, some participants described *remembering as an effortless process* [S1.2.3] in situations where they were highly motivated. This was especially the case for events they found important and prioritized, such as a good friend's birthday. In these instances, participants reported relying on incidental memory tied to eager anticipation of the event.

TABLE 5 | Theme 4: Routines and strategic behaviors, with related subthemes and quotes.

Subthemes	Quotes
S1.4.1 Routine supporting everyday memory	<i>"I think routine helps the memory" [P3]</i>
S1.4.2 Engaging in health behaviors including medication taking is part of routine	<i>"I take blood pressure tablets and that's part of my routine when I come back from the shop in the morning and take blood pressure tablets" [P12]</i>
S1.4.3 Occasionally forgetting to take medications is not a big worry	<i>"There's not an anxiety health-wise, you know, to miss a day but it's just that well established" [P3]</i>
S1.4.4 Planning ahead and strategic behaviors aids PM	<i>"Planning ahead and you know, even going on holidays, let's plan ahead. Let's think what we want to do. It's important" [P12]</i>
S2.4.1 Medications and regular appointments are part of routine	<i>"Most days I'm good at remembering to take [pills] because it's like brushing your teeth and so on (...)" [P3]</i>
S2.4.2 Easier to remember regular events	<i>"The regular things like choir on a Wednesday, Pilates on a Thursday, the regular weekly stuff. I don't need to be reminded" [P11]</i>

Note: Subtheme numbers S1 = Study 1, S2 = Study 2.

3.3 | Theme 3: Social Aspects Impacting PM

What would bother me is forgetting something and letting somebody down.

[P11, S1]

Table 4 shows the subthemes within the *social aspects* theme and illustrative quotes for each. Emphasis was put on the *priority in remembering tasks involving other people* [S1.3.1] compared to tasks only involving the participants themselves. Participants emphasized putting conscious effort into ensuring that they would remember tasks involving people they cared about and generally remembering these events due to their perceived importance. Forgetting things that could potentially let someone down was perceived as particularly bothersome, directly addressing our aim to understand more about the types of PM error which were most troubling. For example, one participant described that while she was out for coffee with a friend, another friend called her to ask where she was as she had double booked herself and forgotten about it. Another shared she had forgotten a hairdresser appointment, and only remembered when they called her. In both cases, participants described this as being particularly troubling because their memory errors affected other people. Although participants reported generally remembering tasks involving other people due to their perceived importance, emphasis was placed on the negative impact it would have on them and others if they were to forget such an event or task.

TABLE 6 | Theme 5: Awareness of changes, staying alert and active, with related subthemes and quotes.

Subthemes	Quotes
S1.5.1 Awareness of increased memory slips with age	<i>"I'm conscious that everything has slowed down a bit and my thinking capacity speed wise isn't what it was" [P3]</i>
S1.5.2 No significant memory issues	<i>"Oh, I have no problem. I'm very organised and always have been so I think because I'm organised it keeps me focused" [P9]</i>
S1.5.3 Maintaining a positive outlook on memory	<i>"Might not be brilliant memory wise, but I'm quite happy nearly 87 and I have no difficulties. I cope. I live alone" [P9]</i>
S2.5.1 Staying busy and socially active is key	<i>"I try to lead a very busy life. My wife died a few years ago, so I was given two pieces of advice. One, keep busy, two accept all social invitations even if you don't want to" [P8]</i>
S2.5.2 Importance in staying both physically and mentally active	<i>"Yeah, that is my main driver, keeping fit and healthy. Being, you know, alert" [P9]</i>
S2.5.3 Awareness of increasing slips with age	<i>"It's just the ageing process, I guess" [P6]</i>

Note: Subtheme numbers S1 = Study 1, S2 = Study 2.

TABLE 7 | Theme 6: Negative emotions and self-perception, with related subthemes and quotes.

Subthemes	Quotes
S1.6.1 Anxiety and worry about forgetting	<i>"So that type of memory slip for detail, can create anxiety and if you're out with your friends socially (...)" [P3]</i>
S1.6.2 Forgetting may lead to negative self-perception	<i>"Well, I felt silly. I felt a bit silly for myself, [name] said, you forgot about that, didn't you? I felt stupid in front of your other half, or your partner" [P1]</i>

Note: Subtheme numbers S1 = Study 1, S2 = Study 2.

The positive impact of how *living with a partner facilitates remembering* [S1.3.2] was expressed by most participants in Study 1. Here, participants mentioned discussing forthcoming events with their partner and helping each other remember the things they might tend to forget, indicating the use of social support as a beneficial strategy to support PM. Although all but one participant in this study lived with a partner, several participants described that living alone would make a difference (e.g., the necessity to implement different kinds of strategies). Likewise, people living with somebody in Study 2 reported reminding each other about events or tasks. However, individuals living alone varied in whether they

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Table 6 shows the subthemes within the *awareness* theme and illustrative quotes for each. Many participants (21/30) reported greater *awareness of increased memory slips with age* [S1.5.1] [S2.5.3]. Examples such as forgetting to pick up particular items at the shop or forgetting the purpose of walking into a room were pointed out as slips that occurred more frequently with age. These errors were often minor and insignificant to their everyday lives, but rather something they were increasingly aware of and often mentioned in relation to their age. Further, slips were exacerbated if participants felt tired or stressed. The majority of participants reported an age-related increase in the amount of PM failures they experienced. For some participants this meant taking on fewer tasks, while others put an emphasis on keeping themselves busy and challenging their memory abilities.

Despite the awareness of increased memory slips expressed by many participants, nine/30 participants reported *no significant issues with memory* [S1.5.2] at present. It was not possible to determine whether these participants experienced no memory slips, were less aware of slips, or thought them too minor to count as errors. Yet, an increase in memory slips with age did not necessarily impact participants negatively. In fact, many participants *maintained a positive outlook* [S1.5.3], expressing gratitude toward their current memory abilities despite their increasing age. Relatedly, an awareness of their increasing age also led many participants to be proactive and try to keep their mind (and memory) active to avoid PM failures.

While different factors appeared to affect different individuals in their remembering, many of the participants agreed that *staying busy and socially active is key* [S2.5.1]. Several participants mentioned finding a balance between staying busy while not overdoing it. Some participants compared themselves to peers of their own age who did not stay socially active and, as a result, often seemed more lonely and appeared older. The *importance of staying both physically and mentally active* [S2.5.2] was also frequently mentioned by participants, who mentioned the link between mental and physical health; specifically, that staying physically active kept them alert and clear-minded.

3.6 | Theme 6: Negative Emotions and Self-Perception

Also, the humiliation (...). I genuinely felt embarrassed because I can't explain why I did it.

In both studies, participants were *engaged in health behaviors, including medication taking and medical appointments, as part of routine* [S1.4.2] [S2.4.1], such as keeping the pills next to their toothbrush to remember taking them in the morning. This meant that taking their medications was seen as a habit that did not require much conscious effort. Other health-related behaviors, such as ordering repeat prescriptions, were also incorporated into the daily routine. While participants generally reported adhering to their medications, participants often highlighted that they tended to forget their pills if their routine was different from usual, for example, being on holiday or having family visiting for an extended period of time. However, participants reported that *occasionally forgetting to take medications is not a big worry* [S1.4.3].

Table 7 shows the subthemes within the *negative emotions and self-perception* theme which appeared only in Study 1. One subtheme was feelings of *anxiety and worry about forgetting* [S1.6.1], most commonly when talking about situations involving others. Although most participants were not worried about their memory at present, they worried their current minor memory slips might lead to bigger memory problems in the future. A few participants also mentioned feelings of blame and annoyance toward themselves, suggesting that *forgetting may lead to negative self-perception* [S1.6.2]. This was particularly the case when the slip had been witnessed by or

I am concerned about my memory because it's sluggish really. So, I do worry about my memory.

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involved others, which often brought feelings of embarrassment and shame.

3.7 | Retrospective Links to PM Failures

I'm not as good with names now. But if I go through the alphabet and say a-b-c, oh it begins with a 'd', what could it be? That helps me.

[P14, S2]

Unsurprisingly, many participants mentioned retrospective memory failures or strategies they had used to address failures in the past. While the focus of the interviews was on PM, the line between retrospective and PM was often blurred for participants. For example, participants often described their struggle to remember names. Again, this appeared to be related to the social importance of remembering people they cared about.

4 | Discussion

The aim of the two qualitative studies reported was to investigate which PM errors are most bothersome for older adults in everyday life as well as strategies employed to combat these errors. Finally, we aimed to explore which strategies were viewed as more or less beneficial. Results of the thematic analysis highlighted several important insights. The first is that social motivation plays an important role in PM abilities and that approximately two thirds of participants (19/30) found forgetting a task with social relevance to be the most bothersome type of PM failure. Further, the impact on PM of living alone appears to be less detrimental than assumed by individuals living with a partner. As social tasks tended to be prioritized and regarded as more important than other tasks, an awareness of the impact of errors on others was a key motivator to remember. Further, the findings highlight that in terms of strategy use, older adults find external aids such as the use of a calendar/diary more helpful than internal aids, addressing our second and third aims.

An important goal of the current studies was to shed more light on which kinds of PM errors older adults experience in their everyday life and what types of errors impacted them most. Most errors were minor PM slips, such as forgetting items from the store. These slips did not significantly impact participants' wellbeing, which suggests that the older adults who took part in this study generally were skilled at navigating PM tasks in their daily life (Henry et al. 2004; Rendell and Craik 2000). According to our findings, the subjectively more significant PM errors can be divided roughly into two separate categories: social tasks (e.g., forgetting social appointments) and health-related tasks (e.g., failing to adhere to medications). Forgetting social tasks was mentioned by most participants to be more bothersome than health-related tasks, as participants feared not being dependable or letting close others down by forgetting. It is interesting that this theme emerged so strongly because social aspects of PM were not a particular focus of our questions. Our qualitative findings in older adults align with

evidence that social motivation enhances PM in young adults (Penningroth et al. 2011).

Our findings of the importance of social motivation (see Theme 4) are in line with the socioemotional selectivity theory (Carstensen 1991), which outlines developmental patterns in social and emotional abilities in aging. According to the theory, older adults maintain their focus on positive emotions and the present due to their limited time perspective compared to younger adults. A key prediction of the theory is the importance of social interaction with close others, which is emphasized in current findings, with participants consistently prioritizing social commitments. Moreover, our findings indicated that most older adults who lived with a partner experienced memory co-dependence: in other words, both partners helped to scaffold each other's PM.

Interestingly, there was a general tendency to regard social commitments as more important than health behaviors, despite health concerns and medication schedules becoming more prominent in older age. This highlights the possible need for a focus on health-related behaviors in future interventions as this is a PM domain with substantial relevance for wellbeing, but which older adults are less motivated to prioritize. Evidence suggests that older adults may restrict themselves from cognitively demanding tasks to reserve their resources for what they regard as important (Hess 2014). It is possible that prompting older adults to reappraise health-related tasks through the lens of social motivation (i.e., highlighting the importance of their health to others) may increase the perceived importance of remembering such tasks. In turn, higher perceived importance could lead to more regular and efficient use of appropriate PM strategies (Penningroth and Scott 2019; Kuhlmann 2019). However, it is possible that older adults do not prioritize medication adherence for many reasons unrelated to memory, such as a lack of perceived benefit or experience of side effects (Rosenbaum and Shrank 2013).

The perceived positive impact on memory of living with a partner reported in Study 1 is a novel finding yet fits with the idea of a focus on close others in old age. A prosocial shift with age has been suggested in terms of an age-related increase in caring about close others' welfare (Isaacowitz et al. 2021). This is supported by current findings where older adults expressed the importance of the wellbeing of those around them. The main motivation for running Study 2 was to explore issues around living alone or with a partner in a sample of people who largely lived alone. Most participants who lived alone reported that this was not an issue in their daily PM experiences. Although a few participants did speculate it might have an impact on their memory, it appeared to depend on several factors such as how many years they had been living alone. It should be kept in mind that the potential impacts of living alone were reported as being positive as well as negative (see Theme 4). Overall, these findings emphasize a need for further investigations on how living arrangements and other close relationships might impact PM.

Regarding strategies used to support PM, the current findings align with previous research finding external aids to be preferred over internal aids (Hertzog et al. 2019; Auffray and Azzopardi 2020; Masumoto et al. 2011). For the current studies,

this was particularly the use of a diary or calendar (see Theme 1), which aligns with previous literature suggesting older adults use offloading strategies to support their everyday memory (Maylor 1990; Gould et al. 1997; Gilbert et al. 2023). Further, technological external aids were reported by some participants to be useful, supporting previous findings by Scullin et al. (2022), who found assistive technologies such as phone calendars or alarms to be effective in aiding PM. Our findings suggest that enthusiasm to implement technological aids might depend on exposure and willingness to learn. Nevertheless, it is possible that such barriers could be overcome with sufficient support and explanation (Scullin et al. 2022).

Internal strategies were found to be of limited use, with only three participants reporting that they use them regularly. It is possible that older adults do not find internal aids as useful as external aids because such strategies are cognitively demanding, requiring use of the executive functions that decline with age (Herrmann et al. 1999) and/or attentional resources that are limited (Meeks et al. 2007). Importantly, it seems that most older adults not only prefer external aids but also find them more helpful in navigating PM in everyday life, which indicates that future research might focus on how to improve such aids rather than training on internal aids (Jones et al. 2021). However, it might also be that older adults are less familiar with internal strategies as they are less commonly used compared to external aids. For some individuals, learning more about specific internal mnemonic strategies to aid PM might be a motivating and a useful addition to their methods of scaffolding memory.

Relatedly, routine and habits were viewed as important support for PM abilities by virtually all participants in both studies (see Theme 4), in line with previous research (Wood and R nger 2016). Repetition of events and appointments meant that less effort needed to be spent on actively remembering as actions happened relatively automatically. Hertzog et al. (2019) found that many older adults relied on incidentally remembering in everyday life, especially for events that occurred as part of a regular routine. Likewise, we found that some of our participants did not feel the need to write down or actively remember certain regular or highly anticipated events. Whether older adults are in fact able to remember effortlessly as described by themselves or whether it is rather a lack of awareness of the strategies they might be using to help them remember is still an open question. This aligns with previous findings of metacognition playing an important role in PM and strategy use (Zuber et al. 2024), with limited metacognitive knowledge in older adults (Scarampi and Gilbert 2021). Our findings also suggest that more strategically planned behaviors, such as physical and mental exercise built into a daily routine, were perceived to enhance PM abilities. Many previous studies have found regular physical exercise to be beneficial for cognitive functioning (e.g., McDaniel et al. 2014).

This study fills a knowledge gap by expanding on previous research on PM errors and spontaneous strategy use (Hertzog et al. 2019; Auffray and Azzopardi 2020) to capture the impact and experience of PM failures in daily life through in-depth analysis of older adults' personal experiences. This raised novel themes that are under-explored in the PM literature on the importance of social factors in motivating and supporting memory among older adults.

One limitation of the current studies is the lack of diversity in the sample due to convenience sampling from a single city. Most participants were relatively affluent, educated, and from higher socioeconomic backgrounds. For future studies, it would be beneficial to recruit participants from a broader range of socioeconomic and ethnic backgrounds as well as from both suburban and rural areas. A more diverse sample would lead to a better understanding of which PM errors are most frequently encountered and are most impactful under different conditions and in different life circumstances. Further, participants were not consulted about whether the final themes accurately reflected their experiences. Such participant validation could have further strengthened the current findings and should be considered for future studies. Finally, the nature of self-reporting PM errors means that we cannot be sure whether participants who reported few PM errors were simply less aware of errors occurring and thereby failed to report them.

In future studies, it would be interesting to interview older adults living in retirement homes or sheltered accommodation, as that might impact how much needs to be remembered and motivation to remember. For example, if medications are delivered daily to individuals, are they still motivated or able to remember it despite not having to? This would bring practical implications for assisting memory in different settings. Middle-aged adults might also be a future focus to investigate the differences in PM errors in late working life compared to memory during the transition into retirement. This could contribute to understanding how structure and busyness relate to the way people remember in real life (Schnitzspahn et al. 2011). Interviewing and comparing young vs. older adults' PM errors and strategy use would add valuable insights, which might help to provide insight into the Age-PM Paradox (i.e., older adults outperforming younger adults in naturalistic settings with the reverse pattern in lab settings) (Schnitzspahn et al. 2018). Future studies might also use quantitative approaches to investigate the different types of PM errors (e.g., event-based vs. time-based) as well as the different strategies employed (e.g., external vs. internal) in the everyday lives of older adults in more detail. Following socioemotional selectivity theory (Carstensen 1991) it could be predicted that older adults are particularly motivated to counteract memory failures with the potential to impact others. These motivational and strategic aspects of lab-based and everyday PM could be explored using in-depth interviews in younger and older samples.

Findings of the current study have several practical implications for future PM interventions. Firstly, older adults could be prompted to elaborate on the social relevance of their intended actions, as our findings suggest that this might help to motivate remembering and/or increase strategy use. This could be helpful in supporting a range of specific PM tasks associated with important outcomes such as adhering to medications. Participants might also benefit from finding ways to involve their partner (or other family or friends) in scaffolding their memory. Our finding that older adults tend to be more forgetful when they are busy, could be highlighted during training so that individuals pay extra attention or use additional memory supports during busy periods. Finally, if future interventions were to incorporate emphasis on prosocial behaviors, it is possible that this could benefit not only PM abilities, but also help to foster healthy aging more generally (Isaacowitz et al. 2021).

5 | Conclusion

The current studies provide new insights into the types of PM errors experienced in daily life by older adults, the perceived importance and impact of these errors, and the strategies spontaneously employed to overcome errors. Findings across two interview studies suggested that social tasks (e.g., remembering a friend's birthday) were often prioritized over health-related tasks (e.g., adhering to medication). External aids (e.g., calendars/diaries) were perceived as more beneficial than internal aids (e.g., mnemonics). Social support for remembering prospective tasks was highlighted by many participants, but those who lived alone did not usually feel that this had a detrimental effect on their memory. Future studies should focus on exploring PM errors in more diverse samples and on determining whether social motivation can be used to aid older adults with PM tasks.

Author Contributions

Maria A. Nygaard: conceptualization, writing – original draft, methodology, formal analysis. **Eva Rubínová:** writing – review and editing, funding acquisition, supervision. **Julia L. Allan:** funding acquisition, writing – review and editing, supervision. **Louise H. Phillips:** supervision, funding acquisition, writing – review and editing.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Preregistration including an analysis plan can be accessed on the Open Science Framework (OSF) at <https://osf.io/yvw7t>.

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