# Prospective Memory

Sharda Umanath, Joan Toglia, and Mark A. McDaniel

## Introduction

Prospective memory (PM) refers to tasks in which one must remember to carry out an intended action at some point in the future. Good PM is vital in everyday life (McDaniel and Einstein 2007), whether remembering an appointment, paying a bill, or taking a prescription. While PM is important for everyone, the consequences of failure can be much greater for older adults. A missed doctor's appointment or a forgotten pill can have dire repercussions. In addition, older adults complain most about PM failures compared to other memory issues (McDaniel and Einstein), and PM ability declines with age, at least for some types of PM (for a review, see Henry et al. 2004). Given the potential beneficial impact, PM is an ideal target for training, especially in older adults. Yet, very few cognitive training programs in general, or specifically for older adults, have attempted to train PM (see Waldum et al. 2014, for a review). Here, we first discuss the theoretical approach—including *what* to train and *how* to train it—that has guided our attempts to train PM. We then provide evidence from existing data and current preliminary work supporting and informing this approach.

S. Umanath
Department of Psychology, Claremont McKenna College, Claremont, CA, USA
e-mail: sharda.umanath@cmc.edu

J. Toglia
School of Health and Natural Sciences, Mercy College, Dobbs Ferry, New York, NY, USA
e-mail: JToglia@mercy.edu

M.A. McDaniel (✉)
Department of Psychological and Brain Sciences, Washington University in St. Louis, St. Louis, MO, USA
e-mail: markmcdaniel@wustl.edu

© Springer International Publishing Switzerland 2016
T. Strobach, J. Karbach (eds.), *Cognitive Training*,
DOI 10.1007/978-3-319-42662-4_8

## Theoretical Approach

The fundamental goal in developing a training protocol for PM and a standard goal in cognitive training is to promote transfer or generalization beyond the context of learning. That is, training that learners undergo should be helpful beyond the laboratory and applicable in the real world (see also Guye et al. this volume, Karbach and Kray this volume, Strobach and Schubert this volume, Swaminathan and Schellenberg this volume). However, transfer following cognitive training has been elusive (see Hertzog et al. 2009; McDaniel and Bugg 2012). With this challenge in mind, our broad approach is to look at existing literature and focus on identifying effective PM strategies that learners can be explicitly taught to apply and generalize more broadly. This is a somewhat innovative approach as other cognitive training protocols have embraced different underlying assumptions. For example, some cognitive training has taken a *restorative* approach, attempting to enhance the underlying neural physiology to improve cognition (see Lustig et al. 2009, for a review; Taatgen this volume; Wenger and Shing this volume). Other cognitive training programs include only practice of relevant tasks rather than explicit instruction on how to approach them (e.g., for attentional control, Karbach and Kray 2009; Kramer et al. 1995; Mackay-Brandt 2011; for retrospective memory control, Jennings and Jacoby 2003; for working memory, Harrison et al. 2013; Redick et al. 2013). Even one of the very few training programs aimed at improving PM used only practice and was only somewhat successful in producing transfer (Rose et al. 2015). In contrast, rather than attempting to modify the nervous system or rely on learners gaining spontaneous insights into how to best handle PM tasks through repetitive practice, our approach is to teach effective, efficient strategies with which learners can tackle PM tasks.

We adopted such an approach for several interrelated reasons. First, the PM literature has revealed that dissociated processes underlie different PM tasks (described below), as opposed to perhaps more unitary skills (tasks) that seem to submit to restorative or practice-alone regimens (e.g., attentional control, working memory). Second, PM strategies have been identified that we assume are directly useful in everyday PM tasks (unlike some trained retrospective memory strategies; cf. McDaniel and Bugg 2012). Of note is that PM in the laboratory is quite different than PM in the real world. PM tasks that are encountered in everyday life are widely variable and occur in a myriad of contexts; for example, they include remembering to put a rent check in the mail every month, remembering to pick up a friend at the airport, and remembering to give a housemate a message. By contrast, laboratory PM tasks involve remembering to press a particular key when a given target appears (the word *president* or the syllable *tor*) during an ongoing task (answering trivia questions; Einstein et al. 1995). Thus, a challenge for a PM training program is creating strong connections between the laboratory training context and the situations learners are faced with in their daily lives (see also Guye et al. this volume). Because practice alone can produce brittle skills that are tightly tied to training (e.g., Healy et al. 2005), we felt that appropriately selected strategies and training could better allow learners to link the laboratory context to everyday PM situations.

In fact, Bottiroli et al. (2013) found benefits of a strategy approach for promoting transfer—on retrospective memory tasks—specifically with older adults (see also Wenger and Shing this volume; PRIMs theory in Taatgen this volume). Third, available evidence suggested that these strategies might help override age-related cognitive limitations that attenuate PM performance for older adults (e.g., Liu and Park 2004). In sum, for PM our aim has been to create and test a cognitive training intervention that is applicable for improving PM in the real world and teaches learners effective practical strategies informed by the basic PM literature.

Despite little work on *training* PM, the broader PM literature indicates a number of strategies that learners could use to improve their PM. As just noted, there are different types of PM that rely on different processes (McDaniel and Einstein 2007) and accordingly are associated with different effective strategies. Focal PM tasks involve cues that are presented in the focus of attention and thus are easy to recognize as a cue for performing the related task. For example, seeing a coworker in the hallway can act as a focal cue to give that person a message. In other words, simply seeing that coworker might automatically bring to mind the PM task of relaying the message. Because PM intentions like this are associated with focal cues that can stimulate spontaneous retrieval of the intention, they can be performed without actively looking for the cue. Previous research indicates that creating a strong association between the anticipated cue and the PM intention (an implementation intention strategy) can improve performance on focal tasks (e.g., McDaniel and Scullin 2010).

In contrast, non-focal tasks involve cues that occur outside the focus of attention and are therefore more difficult to notice. For instance, one may need to stop at the grocery store after work, but the store itself is not easy to notice in the midst of a routine drive home where one must pay attention to traffic, etc. Here, actively monitoring for the cue is needed in order to successfully notice (Einstein et al. 2005), otherwise one might drive right by the store. The implementation intention strategy that is effective for focal tasks would not be as helpful in non-focal PM tasks since the key is to notice the cue in the first place (Breneiser 2007). Thus, the best strategy for non-focal tasks may be to simply check for the cue frequently and actively attend to that intention (an event-monitoring strategy; see also Wenger and Shing this volume).

Similarly, time-based PM tasks, wherein an intended action must occur at a particular time, require this type of active monitoring. Furthermore, the only cue is the time itself, whereas in focal and non-focal tasks, events are the cues. This type of task is especially challenging for older adults (Einstein et al. 1995). Prior work indicates that learners who check the clock more often as the target time nears perform intended actions more frequently (Einstein et al.). Consistent with this finding, older adults are less likely than younger adults to ramp up their monitoring as the target time approaches (Einstein et al. 1995; Park et al. 1997). Teaching older adults to use this strategic clock checking may be the most effective strategy for improving their performance on time-based tasks.

Beyond strategies to teach older adults, an important question is how to implement the training. In what form should these strategies be taught such that older adults learn them well and learn to apply them outside the context of learning? Several key factors may be critical for designing the most beneficial training program.

## Key Factors for Training: The EXACT Study

As part of a larger cognitive training and aerobic exercise program (EXercise And Cognitive Training project–EXACT; McDaniel et al. 2014), McDaniel and colleagues developed a protocol specifically aimed at improving PM through strategy use (Waldum et al. 2014 describe this protocol in detail; see also Pothier and Bherer this volume). Five main components were implemented in an 8-week intensive intervention. First, learners were given explicit instructions about effective strategies to use in PM tasks, specifically tailored for each type of task. Second, both to increase the generalizability of training and capitalize on previous memory research, the training context varied greatly. In terms of generalizability, as mentioned above, PM tasks are widely variable, both in task type (focal, non-focal, time based) and in context. Accordingly, learners were trained using several ongoing tasks that tapped different types of PM. Encountering various scenarios during training might make learners' approach more flexible and resilient in the face of new PM challenges. Additionally, learners may start to be able to identify the different types of PM tasks and then transfer the appropriate strategies accordingly. This line of reasoning is also consistent with memory research on encoding variability wherein multiple contexts at the learning stage can improve later memory for the to-be-remembered material (Hintzman and Stern 1978).

Third, combined with the wide variety of laboratory tasks, homework was added to the program. That is, learners were given assignments to complete outside the laboratory regarding PM situations they faced in daily life. Explicit practice applying the training they received in the lab to their regular lives is likely to be beneficial for later transfer (e.g., Schmidt et al. 2001). Fourth, as the training program went on, the difficulty of the tasks increased. Learners were asked to keep in mind more PM objectives, and the nature of the tasks also became more challenging. Simultaneously, the trainer's involvement decreased from initially providing explicit strategy instruction prior to each training task to later expecting the learners to use the relevant strategies without prompting. This idea of increasing the difficulty across the training program is consistent with the broader literature on cognitive training. In the restorative approach, the demands of the task are incrementally increased to push the ultimate level of acquisition of the trained skill (e.g., retrospective memory training, Jennings and Jacoby 2003; attentional training, Mackay-Brandt 2011). Additionally, in the occupational therapy domain, strategies are trained such that learners are required to initiate and apply the strategies across activities that systematically differ in physical similarity and context but remain at the same level of complexity. In this sideways approach, task difficulty is only increased after strategy transfer has been observed (Toglia 2011). Again, intervention is designed to encourage transfer and generalize the training to learners' everyday lives.

Fifth, a key component of the EXACT project was to evaluate the training effects with computer simulations of cognitively challenging real-world tasks (e.g., cooking breakfast, Craik and Bialystok 2006; remembering health-related information and the sources of that information). Older adults completed (pre- and post-training) a simulation of going through the course of a day for three successive days (the Virtual Week (VW) task; Rose et al. 2010). During the course of each day, the older adults have to remember a number of prospective tasks, such as "remember to drop off dry cleaning when you go shopping" and "remember to take asthma medication at 11 a.m. and 9 p.m." (in the game, a person's token passes squares that indicate the virtual time for the day).

The results of the EXACT study were especially encouraging with regard to training PM (see McDaniel et al. 2014). Eight weeks of cognitive training on laboratory PM tasks with the components discussed above produced significant gains (from pre- to posttests) in remembering to perform the real-world VW PM tasks relative to a control that did not receive PM training or an aerobic exercise control (a real clock time-based task did not show training effects). By contrast, cognitive training did not produce significant gains for the cooking breakfast or memory for health information tasks. However, the EXACT study was not designed to isolate the impact of particular training components to the success of the training protocol for improving PM; accordingly, many basic issues remain unanswered (see Waldum et al. 2014, for detailed discussion).

Briefly, the cognitive training included attentional control training tasks and retrospective training tasks in addition to PM training; thus, though plausible, it remains uncertain that the PM training alone would be sufficient to produce transfer to the real world like VW tasks. Also, the PM training protocol included a number of components—including using a different laboratory task each week (variable training) and explicit strategy instruction—either or both theoretically could have been instrumental in promoting transfer. Initial support for the value of these components comes from noting that in the EXACT protocol, the attentional control training and the retrospective memory training, following the precedent from the literature, generally did not include explicit strategy instruction and repeatedly used the same training task over the course of the eight weeks. As just mentioned, there was no significant transfer of training to the real-world attentional control task (cooking breakfast) or to the real-world retrospective memory task (memory for health information). Clearly, experiments that directly compare variable training (varying the parameters of the practice task rather than keeping it constant; e.g., Kerr and Booth 1978; Goode et al. 2008) to training with a single task and directly compare explicit strategy instruction with a typical practice-only procedure (e.g., Kramer et al. 1995; Jennings and Jacoby 2003) would provide valuable insights as to the importance of these factors in promoting the generalizability of cognitive training. In the next section, we describe our ongoing research doing just that in PM training.

Finally, a feature of the EXACT project that poses practical limitations is that the cognitive training was a huge undertaking, requiring a great deal of commitment and investment from the trainers and the learners. A major practical issue is whether a more efficient training program focusing on PM per se and restricting training to one session (rather than multiple sessions as in EXACT) could support transfer of strategies to real-world PM tasks. Initial studies have reported significant improvements with older adults in everyday-like PM tasks using a brief implementation intention instruction for the target PM task (Liu and Park 2004; Shelton et al. 2016). Accordingly, it seemed possible that a single PM strategy training session could support transfer, and if so, then an efficient and nondemanding training protocol could be provided to older adults to improve their everyday PM success.

## Ongoing Research

Our ongoing research aims to address the questions raised above. Specifically, our focus is on evaluating the success of PM training within a single 60–90 min training session that uses variable training tasks versus a single training task and that uses explicit strategy instruction versus practice alone. At present, we have completed testing on only a handful of participants (up to three in each condition of four conditions defined by the factorial combination of strategy instruction versus practice alone and variable versus a single training task). Overall, for the transfer task (Virtual Week), those who trained with variable training tasks and received explicit strategy instruction showed the most improvement in performance (19 % improvement from pretest to posttest compared to an average of just 10 % across all other conditions). We caution that these data simply show some initial trends that may hint at what aspects of training are the most beneficial for improving prospective memory in older adults.

## Metacognitive Strategy Training

It may be that neither explicit strategy instruction nor practice alone (such that learners might not discover their own strategies) is most optimal. Instead, guided use of effective strategies that integrates metacognitive components may extend benefits of strategy training by helping a person recognize when and why a particular strategy is applicable and thus increase probability of generalization. Metacognitive strategy training focuses on the general process of how to go about a task, including analyzing task demands, strategy generation and selection, and self-monitoring and self-evaluation of performance (Toglia 2011). A learner-centered approach that actively engages the participant in a collaborative process of planning or choosing strategies and evaluating effectiveness can be integrated with metacognitive strategy training by using systematic questions and guided prompts to facilitate self-generation of strategies (Polatajko et al. 2011; Toglia 2011). Learner-centered approaches, such as guided discovery, are rooted in constructivism theories of learning that suggest that learning is enhanced when the learner is actively engaged in the process of discovering solutions themselves.

Preliminary evidence supporting use of guided metacognitive strategy techniques in enhancing transfer of learning or generalization has been reported for older adults (Bottiroli et al. 2013; Dawson et al. 2013) as well as for cognitive rehabilitation of executive functions in individuals with stroke or brain injury (Skidmore et al. 2014; Toglia et al. 2010). For example, Bottiroli et al. (2013) found that transfer of learning was facilitated in older adults by encouraging active involvement in analyzing memory tasks involving lists, stories, locations, or paired associates and adapting strategies to meet task demands. Guided metacognitive strategy training, however, has not been applied to PM training. Another important question therefore is whether PM

**Table 1** Guided metacognitive strategy framework for prospective memory training

| Treatment session components | | Metacognitive focus |
|---|---|---|
| Pre-activity discussion | Identify type of PM | Analysis of task demands |
| | Identify everyday activities that involve similar PM requirements | Connect PM task with everyday activities. Identify similarities of task characteristics |
| | Generate strategies for PM | Plan and choose strategies that match task demands |
| During task | Stop and mediate after errors are observed | Self-monitoring skills |
| | Guide generation of alternate strategies if needed | Strategy adjustment based on performance |
| After task | Participant summarizes methods used and comments on strategy effectiveness | Self-evaluation of performance |

strategies are best learned through explicit instruction or through guided metacognitive methods.

We adapted a guided metacognitive strategy framework described by Toglia (2011) to the training of PM. The framework is outlined in Table 1 and consists of three components: (1) pre-activity discussion on analyzing task demands, identifying similarities with meaningful activities, and self- generation of strategies; (2) mediation during the task to facilitate self-monitoring and use of alternative strategies when needed; and (3) after-task questioning aimed at promoting self-evaluation of performance and strategy use. We conducted a pilot pre-post intervention study with 15 healthy older adults, ranging from age 60–90 with a median age of 66, to further develop and test the feasibility and effectiveness of a guided metacognitive strategy approach for PM training. All participants were living independently in the community and scored above the cutoff of 26 on the Montreal Cognitive Screening Assessment. The Virtual Week task (VW task previously described) was used 5–8 days before and after a single guided metacognitive strategy training session to determine whether there was a significant increase in proportion of completed PM tasks following intervention. Participants returned 1 week later for the training session. This session includes three different computerized PM games ("famous faces," "general knowledge trivia", and "Where's Waldo"), previously described by Waldum et al. (2014). The games were counterbalanced and involved different types of PM with increasing difficulty across the tasks (focal + time based, non-focal + time based, a combination of all three or focal, non-focal, and time based).

After a general introduction to types of PM, the participant was then presented with PM trial tasks and asked to identify the type of PM required by the task (focal, non-focal, time based). The trainer followed a script and used systematic questioning to guide the person to the correct response. Next, guided questioning was used to help the person identify how the PM training task was similar to everyday activities or situations. They were then encouraged to identify strategies or the best methods to optimize performance. If the individual was unable to generate strategies

**Table 2** Means as a function of type of prospective memory task and time of test, with paired $t$-tests of pre-post differences ($n = 15$)

| Outcome | Pretest | | Posttest | | |
|---|---|---|---|---|---|
| | *M* | SD | *M* | SD | *t* |
| Regular event based | .623 | .35 | .845 | .25 | −2.06 |
| Regular time based | .555 | .43 | .823 | .22 | −2.92* |
| Irregular event based | .667 | .67 | .823 | .21 | −1.87 |
| Irregular time based | .333 | .36 | .667 | .36 | −2.39* |

*$p < .01$

with prompts or chose strategies that were judged as inefficient by the examiner, the examiner did not provide comments. Instead the person was given the opportunity to try the activity using their own methods.

During the activity, the examiner stopped and mediated performance as errors occurred and guided the person to reassess the effectiveness of their method. If needed, the person was encouraged to adjust or generate alternative strategies. At the end of the activity, the participant was asked to identify the methods they used to help themselves remember, comment on strategy effectiveness, and whether they would change the way they went about the activity if they did the activity again. One week after training, participants completed 3 days of the VW task and a questionnaire regarding the use of strategies during VW as the final assessment.

Our pilot results show promise for a single-session metacognitive strategy approach. Results of paired sample $t$-tests between pre- and posttest scores for time-based VW tasks revealed significant differences (see Table 2 for means and $t$-values). Event-based tasks demonstrated marginal differences, with $t$-values just below significance levels. This trend is consistent with findings by Waldum et al. (2014), who found a treatment effect for time-based but not event-based PM tasks. Although preliminary findings are encouraging, conclusions cannot be drawn without a control group comparison, which is presently in progress.

## Conclusions

All in all, our preliminary results suggest that a relatively brief training session can produce transfer of learned PM strategies to at least a simulation of real-world PM tasks. A unique aspect of our research is the appreciation of different types of PM tasks, with training oriented toward informing learners of these differences and highlighting particular strategies targeted at the different type of tasks. It seems that a parallel approach for retrospective memory training might be considered to improve outcomes for assisting older adults with their everyday retrospective memory challenges (cf. McDaniel and Bugg 2012). Clearly, a definitive conclusion awaits more complete experimental findings, but at this point, we are encouraged that the present training approach might benefit older (and younger) adults in improving their everyday prospective remembering.

More generally, our research is attempting to examine and identify essential ingredients of cognitive training that enhance successful outcomes and generalization. There are many choices to be made in developing cognitive training, and as researchers, we need to be confident that those decisions will provide the greatest improvement (Schmiedek this volume). Fundamentally of interest is what we are trying to train. Many programs have targeted cognitive capacities themselves (see Guye et al. this volume). Instead, our approach is to focus on teaching effective strategies that older adults can use to tackle the PM situations they face.

One concern is how to implement this kind of strategy training, starting with how extensive the training ought to be. Though several sessions may be beneficial, the right kind of single training session may help older adults, which is a more practical proposition. In such a single session, the variability of the tasks that participants are exposed to in training is likely to be critical to later generalizability; experiencing a few different tasks may allow for more robust and flexible strategy development and application. In strategy training, we are also investigating whether explicit strategy instruction or guided metacognitive strategy training might be best. It appears that having such support in instruction does benefit older adults over allowing them to try and develop their own approach to PM tasks (practice alone).

Finally, the ecological validity of the training and the assessments of learning and transfer are critical. PM looks quite different inside and outside the laboratory. Thus, it is an important goal to foster the transfer of effective strategy use from training to the real world. As such, training programs must consider the balance and inclusion of laboratory training, homework, and simulated real-world activities during training such as the VW task. As these different considerations are explored, we are confident that an effective and efficient PM training for older adults will emerge, one that promotes transfer and generalizability to the real-world PM challenges.

**Acknowledgments** A special thanks is extended to Mercy College Occupational Therapy (OT) students Kim Havel, Mary Tremmel, Teresa Sanchez, and Hasena Punwasie for their assistance with the guided metacognitive strategy pilot project. The authors would also like to thank Deborah Koh for her help with the current prospective memory training work at Washington University. Some of the research discussed was supported by the National Institute on Aging Grant T32 AG000030 awarded to SU.

## References

Bottiroli, S., Cavallini, E., Dunlosky, J., Vecchi, T., & Hertzog, C. (2013). The importance of training strategy adaptation: A learner-oriented approach for improving older adults' memory and transfer. *Journal of Experimental Psychology: Applied, 19*, 205–218.

Breneiser, J. (2007). *Implementation intentions and cost in prospective memory retrieval.* Unpublished doctoral dissertation, Washington University.

Craik, F. I. M., & Bialystok, E. (2006). Planning and task management in older adults: Cooking breakfast. *Memory & Cognition, 34*, 1236–2124.

Dawson, D., Richardson, J., Troyer, A., Binns, M., Clark, A., Polatajko, H., et al. (2014). An occupation-based strategy training approach to managing age-related executive changes: A pilot randomizedcontrolledtrial. *ClinicalRehabilitation,28*,118–127.doi:10.1177/0269215513492541.
Einstein, G. O., McDaniel, M. A., Richardson, S. L., Guynn, M. J., & Cunfer, A. R. (1995). Aging and prospective memory: Examining the influences of self-initiated retrieval processes. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 21*, 996–1007.
Einstein, G. O., McDaniel, M. A., Thomas, R., Mayfield, S., Shank, H., et al. (2005). Multiple processes in prospective memory retrieval: Factors determining monitoring versus spontaneous retrieval. *Journal of Experimental Psychology: General, 134*, 327–342.
Goode, M. K., Geraci, L., & Roediger, H. L. (2008). Superiority of variable to repeated practice in transfer on anagram solution. *Psychonomic Bulletin & Review, 15*, 662–666.
Harrison, T. L., Shipstead, Z., Hicks, K. L., Hambrick, D. Z., Redick, T. S., & Engle, R. W. (2013). Working memory training may increase working memory capacity but not fluid intelligence. *Psychological Science, 24*(12), 2409–2419. doi:10.1177/0956797613492984.
Healy, A. F., Wohldmann, E. L., Parker, J. T., & Bourne, L. E. (2005). Skill training, retention, and transfer: The effects of a concurrent secondary task. *Memory & Cognition, 33*(8), 1457–1471.
Henry, J. D., MacLeod, M. S., Phillips, L. H., & Crawford, J. R. (2004). A meta-analytic review of prospective memory and aging. *Psychology and Aging, 19*, 27–39.
Hertzog, C., Kramer, A. F., Wilson, R. S., & Lindenberger, U. (2009). Enrichment effects on adult cognitive development: Can the functional capacity of older adults be preserved and enhanced? *Psychological Science in the Public Interest, 9*, 1–65.
Hintzman, D. L., & Stern, L. D. (1978). Contextual variability and memory for frequency. *Journal of Experimental Psychology: Human Learning and Memory, 4*, 539–549.
Jennings, J. M., & Jacoby, L. L. (2003). Improving memory in older adults: Training recollection. *Neuropsychological Rehabilitation, 13*, 417–440. doi:10.1080/09602010244000390.
Karbach, J., & Kray, J. (2009). How useful is executive control training? Age differences in near and far transfer of task-switching training. *Developmental Science, 12*, 978–990. doi:10.1111/j.1467-7687.2009.00846.x.
Kerr, R., & Booth, B. (1978). Specific and varied practice of a motor skill. *Perceptual and Motor Skills, 46*, 395–401.
Kramer, A. F., Larish, J. F., & Strayer, D. L. (1995). Training for attentional control in dual task settings: A comparison of young and old adults. *Journal of Experimental Psychology: Applied, 1*, 50–76. doi:10.1037/1076-898X.1.1.50.
Liu, L. L., & Park, D. C. (2004). Aging and medical adherence: The use of automatic processes to achieve effortful things. *Psychology and Aging, 19*, 318–325.
Lustig, C., Shah, P., Seidler, R., & Reuter-Lorenz, P. A. (2009). Aging, training, and the brain: A review and future directions. *Neuropsychology Review, 19*, 504–522.
MacKay-Brandt, A. (2011). Training attentional control in older adults. *Aging, Neuropsychology, and Cognition, 18*, 432–451.
McDaniel, M. A., Binder, E. F., Bugg, J. M., Waldum, E. R., Dufault, C., Meyer, A., et al. (2014). Effects of cognitive training with and without aerobic exercise in cognitively-demanding everyday activities. *Psychology and Aging, 29*, 717–730.
McDaniel, M. A., & Bugg, J. M. (2012). Memory training interventions: What has been forgotten? *Journal of Applied Research in Memory and Cognition, 1*, 45–50.
McDaniel, M. A., & Einstein, G. O. (2007). *Prospective memory: An overview and synthesis of an emerging field.* Thousand Oaks, CA: Sage.
McDaniel, M. A., & Scullin, M. K. (2010). Implementation intention encoding does not automatize prospective memory responding. *Memory & Cognition, 38*, 221–232.
Park, D., Herzog, C., Kiddor, D., Morrell, R., & Mayhorn, C. (1997). Effect of age on event-based and time-based prospective memory. *Psychology and Aging, 12*, 314–327.
Polatajko, H. J., Mandich, A., & McEwen, S. (2011). The cognitive orientation to daily occupational performance (CO-OP): A cognitive-based intervention for children and adults. In N. Katz (Ed.), *Cognition, occupation and participation across the life span: Neuroscience, neuroreha-*

*bilitation and models of intervention in occupational therapy* (3rd ed., pp. 299–321). Bethesda, MD: AOTA Press.

Redick, T. S., Shipstead, Z., Harrison, T. L., Hicks, K. L., Fried, D. E., Hambrick, D. Z., et al. (2013). No evidence of intelligence improvement after working memory training: A randomized, placebo-controlled study. *Journal of Experimental Psychology: General, 142*, 359–379.

Rose, N. S., Rendell, P. G., Hering, A., Kliegel, M., Bidelman, G. M., & Craik, F. I. M. (2015). Cognitive and neural plasticity in older adults' prospective memory following training with the Virtual Week computer game. *Frontiers in Human Neuroscience, 9*, Article 592. doi: 10.3389/fnhum.2015.00592.

Rose, N., Rendell, P. G., McDaniel, M. A., Aberle, I., & Kliegel, M. (2010). Age and individual differences in prospective memory during a "Virtual Week": The roles of working memory, vigilance, task regularity, and cue focality. *Psychology and Aging, 25*, 595–605.

Schmidt, W., Berg, I. J., & Deelman, B. G. (2001). Prospective memory training in older adults. *Educational Gerontology, 27*, 455–478.

Shelton, J. T., Lee, J. H., Scullin, M. K., Rose, N. S., Rendell, P. G., & McDaniel, M. A. (2016). Improving prospective memory in healthy older adults and very mild Alzheimer's Disease patients. *Journal of the American Geriatrics Society, 64*(6), 1307–1312.

Skidmore, E. R., Dawson, D. R., Butters, M. A., Grattan, E. S., Juengst, S. B., Whyte, E. M., et al. (2014). Strategy training shows promise for addressing disability in the first 6 months after stroke. *Neurorehabilitation and Neural Repair, 29*, 668–676. doi:10.1177/1545968314562113.

Toglia, J. P. (2011). The dynamic interactional model of cognition in cognitive rehabilitation. In N. Katz (Ed.), *Cognition, occupation, and participation across the life span: Neuroscience, neurorehabilitation, and models of intervention in occupational therapy* (3rd ed., pp. 161–201). Bethesda, MD: AOTA Press.

Toglia, J., Johnston, M. V., Goverover, Y., & Dain, B. (2010). A multicontext approach to promoting transfer of strategy use and self-regulation after brain injury: An exploratory study. *Brain Injury, 24*(4), 664–677. doi:10.3109/02699051003610474.

Waldum, E. R., Dufault, C., & McDaniel, M. A. (2014). Prospective memory training: Outlining a new approach. Advanced Online Publication *Journal of Applied Gerontology*. doi:10.1177/0733464814559418.