THE EFFECTS OF PERFORMANCE PREDICTIONS AND CUE FOCALITY ON PROSPECTIVE MEMORY PERFORMANCE

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PERFORMANCE

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Abstract: The present study investigated the extent to which memory beliefs (as indexed by performance predictions and postdictions) affected older adults' prospective memory (PM) performance on PM tasks that had different retrieval processing demands. Participants were sequentially assigned to a prediction condition (prediction, no prediction) and a PM condition (focal, nonfocal). During the experiment, participants completed a lexical decision task (LDT) that required making word judgments about letter strings. Participants in the prediction condition then predicted their PM performance. Next, participants completed a distractor task before carrying out the PM task embedded in the LDT. All participants then postdicted their PM performance. PM performance was scored as the proportion correct out of ten opportunities. Given that recent research has suggested that making predictions about one's PM performance may serve as an effective strategy to improve younger adults' PM performance (Kytola & Reese-Melancon, manuscript in preparation; Meier, von Wartburg, Matter, Rothen, & Reber, 2011; Rummel, Kuhlmann, & Touron, 2013), predictions were expected to have a beneficial effect on older adult's PM performance. However, predictions were hypothesized to be more effective for improving participants' PM performance on the PM task with nonfocal cues. Results demonstrated that predictions did not improve participants' PM performance. The addition of the PM task led to ongoing task costs (McDaniel & Einstein, 2007; Smith, 2003), but predictions did not increase participants' monitoring retrieval processes for either PM task.[1] Predictions and postdictions accurately reflected participants' actual PM performance on both PM tasks, and their confidence scores were high. Finally, a relationship between perceived task importance and PM performance was found indicating that as PM task importance ratings increased, PM performance also increased. Whereas importance ratings were generally higher for the ongoing task than the PM task, they were equal when participants predicted their PM performance. However, the ratings were higher for the ongoing task than the PM task when participants did not predict their PM performance. These findings suggest that predictions may not be useful to employ as a strategy to improve older adults' PM performance, even on more difficult PM tasks. Implications of these findings are discussed.

Keywords: Older adults, aging, predictions, cue focality, metamemory, memory self-efficacy

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

In our everyday lives, remembering to fulfill future intentions in the midst of completing other actions is essential. To be productive, people must be able to remember to take medication, pay bills, and attend scheduled meetings, among many other important activities. *Prospective memory* (PM) refers to our ability to remember to carry out future intentions and it makes completing these types of tasks possible (McDaniel & Einstein, 2007). Although PM is important for individuals of all ages, it is especially crucial for older adults because living independently throughout later adulthood may not be possible if one cannot successfully remember to complete future actions while also remembering which actions have already been completed (Einstein & McDaniel, 1990; Park, Hertzog, Kidder, Morrell, & Mayhorn, 1997; Rendell & Thomson, 1999; Skladzien, 2010). Given that prior work has demonstrated that roughly half of all reported memory complaints and lapses are prospective in nature (Crovitz & Daniel, 1984) and that PM declines with age (Henry, MacLeod, Phillips, & Crawford, 2004; Ihle, Hering, Mahy, Bisiacchi, & Kliegel, 2013; Kliegel, Jäger, & Phillips, 2008), research is needed to identify factors that underlie age-related differences in PM performance as well as strategies that could potentially improve PM in late life.

Prospective Memory Performance

Past research has shown that younger adults tend to outperform older adults on PM tasks, but meta-analyses have failed to find a pattern to fully explain these age group differences (Henry et al., 2004; Ihle et al., 2013; Kliegel et al., 2008). While it is widely acknowledged that numerous factors likely contribute to age-related differences in PM performance (Einstein, McDaniel, & Scullin, 2012; McDaniel & Einstein, 2007), a large body of evidence suggests that this variation depends on the setting in which a PM task is completed (e.g., naturalistic versus laboratory setting; Henry et al., 2004), the type of PM task that is completed (e.g., time-based versus event-based task; McDaniel & Einstein, 2007), and the type of retrieval cues that are available while a PM task is being completed (e.g., focal versus nonfocal cues; Kliegel et al., 2008; Ihle et al., 2013) as these factors impact PM task demands (i.e., the amount of attentional resources required to complete a PM task; McDaniel & Einstein, 2000; Smith, 2003).

Prospective Memory Performance in Naturalistic Versus Laboratory Settings

Broadly, PM has been examined in both naturalistic and laboratory settings. In *naturalistic settings* in which PM tasks involve carrying out everyday activities (e.g., taking medication or making a call on the telephone), research has indicated that older adults often perform better than younger adults showing little to no age-related declines in PM performance (Henry et al., 2004). Conversely, in *laboratory settings* in which PM tasks involve completing unusual activities (e.g., completing tests of short-term memory or making lexical decisions), research has demonstrated that older adults often perform worse than younger adults showing significant age-related declines in PM performance (Henry et al., 2004; Phillips, Henry, & Martin, 2008). This general pattern of age-related benefits in naturalistic settings and age-related deficits in laboratory settings is formally referred to as the *Age-Prospective Memory-Paradox* (Aberle, Rendell, Rose, McDaniel, & Kliegel, 2010; Rendell & Craik, 2000; Schnitzspahn, Ihle, Henry, Rendell, & Kliegel, 2011).

One theoretical framework that has historically been useful for understanding age-related differences in *retrospective memory* (RM) performance, and more recently age-related deficits in PM performance (Einstein & McDaniel, 1990; Einstein et al., 2005; Ellis, 1996) is Craik's (1986) *Environmental Support Hypothesis* (*ESH*). The *ESH* posits that the amount of environmental support (i.e., retrieval cues) available during retrieval varies across tasks and ranges from low (e.g., no cues) to high (e.g., many cues). Tasks performed in naturalistic settings often allow for more external retrieval cues (e.g., alarms, calendars, etc.) than do tasks performed in laboratory settings that strictly limit the utilization of such cues. As a result, laboratory tasks tend to be more difficult than naturalistic tasks for older adults since they provide greater experimental control over the availability and use of retrieval cues to aid memory (Henry et al., 2004).

Previous research has generally shown that free and cued recall laboratory tasks measuring RM provide a moderate amount of environmental support (Craik, 1983; 1986; Craik & McDowd, 1987) whereas PM tasks often provide a lower amount of environmental support (Einstein, Smith, McDaniel, & Shaw, 1997; Henry et al., 2004; McDaniel & Einstein, 2000). More specifically, free and cued recall tasks provide explicit retrieval cues at the time of recall, but PM tasks do not (Einstein & McDaniel, 1990; Einstein & McDaniel, 1996; Harris, 1984; McDaniel, 1995; McDaniel & Einstein, 2007; Kvavilashvili, 1987; Smith, 2016). Since PM tasks do not provide an explicit prompt at the time an intention is to be recalled, PM tasks are hypothesized to require more self-initiated retrieval processes than other memory tasks. Given that the attentional resources (i.e., cognitive processing speed, inhibitory control, etc.) necessary for using self-initiated retrieval cues decline with age (Craik, 1986; Henry et al., 2004; Kliegel & Jäger, 2006; Zeintl, Kliegel, & Hofer, 2007), PM tasks are hypothesized to be more difficult for older adults than younger adults.

Prospective Memory Performance on Time-Based Versus Event-Based Tasks

In addition to different types of settings, PM has also been examined using time-based and event-based PM tasks (Einstein & McDaniel, 1990; Einstein, McDaniel, Richardson, Guynn, & Cunfer, 1995; McDaniel & Einstein, 2007). On *time-based PM tasks* that require an intention to be carried out at a specific time (e.g., taking medication at 9:00am) or after a certain amount of time has elapsed (e.g., making a call on the telephone in 45 minutes), research has shown that older adults consistently perform worse than younger adults (d'Ydewalle, Bouckaert, & Brunfaut, 2001; Einstein et al., 1995; Henry et al., 2004; Ihle et al., 2013; Kliegel et al., 2008; Martin & Schumann-Hengstetler, 2001; Maylor, 1995; Park et al., 1997). However, findings have been somewhat mixed on *event-based PM tasks* that require an intention to be carried out when a particular event occurs (e.g., giving a message to co-worker when you see them at a meeting; Henry et al., 2004; McDaniel & Einstein, 2007; Salthouse, Berish, & Siedlecki, 2004). Whereas some studies have indicated that older adults perform worse than younger adults on event-based PM tasks (Cherry, Martin, Simmons-D'Gerolamo, Pinkston, Griffing, & Gouvier, 2001; Dobbs & Rule, 1987; Kidder, Park, Hertzog, & Morrell, 1997; Mäntyla & Nilsson, 1997; Maylor, 1993, 1996; Park et al., 1997; West & Covell, 2001), others have found that older adults perform as well as or better than their younger counterparts on these types of PM tasks (Cherry & Lecompte, 1999;

Einstein & McDaniel, 1990; Einstein et al., 1995; Kominsky & Reese-Melancon, 2017; Reese & Cherry, 2006; Rendell, McDaniel, Forbes, & Einstein, 2007).

Consistent with Craik's (1986) *ESH*, time-based PM tasks often provide a low amount of environmental support and require a high amount of self-initiated retrieval processes whereas event-based PM tasks often provide a high amount of environmental support and require a low amount of self-initiated retrieval processes (d'Ydewalle et al., 2001; Einstein et al., 1995; Harris & Wilkins, 1982; Henry et al., 2004). Consequently, time-based PM tasks tend to be more difficult than event-based PM tasks for everyone, but especially older adults. Although some research has shown that older adults engage in clock monitoring less often than younger adults (Einstein et al., 1995; Park et al., 1997), age-related declines in time-based PM performance are speculated to result from deficits in attentional resources (Groot, Wilson, Evans, & Watson, 2002) as well as poorer estimation of time intervals (Einstein et al., 1995; Henry et al., 2004). Given that a clear pattern of age-related differences in PM performance emerge on time-based PM tasks, but not on event-based PM tasks (Henry et al., 2004; Ihle et al., 2013; Kliegel et al., 2008), it is essential to examine the characteristics of event-based PM tasks that often result in age-related PM performance deficits.

Prospective Memory Performance on Event-Based Tasks with Focal Versus Nonfocal Cues

According to McDaniel and Einstein's (2000) *Multiprocess Framework* (*MPF*), event-based PM tasks have different types of cues available during the formation of a PM intention, and these cues are characterized as either focal or nonfocal depending on how they are processed as part of an ongoing activity during the retention of a PM intention (Brandimonte, Einstein, & McDaniel, 1996; Kliegel et al., 2008; McDaniel & Einstein, 2007). On a PM task with *focal cues*, individuals *directly process* information relevant to successfully performing an ongoing task *and* a PM intention (Maylor, 1996; Maylor, Darby, Logie, Della Sala, & Smith, 2002). However, in a PM task with *nonfocal cues*, individuals *do not directly process* information pertinent to successfully performing an ongoing task and a PM intention (Kliegel et al., 2008; McDaniel & Einstein, 2000). As a result, *cue focality* has been shown to impact the amount of environmental support that a PM task provides and thus the amount of self-initiated retrieval processes required to complete certain PM tasks (Brewer, Knight, Marsh, & Unsworth, 2010; McDaniel & Einstein, 2000; 2007).

Einstein et al. (2005) exemplifies both a typical laboratory PM task and the concept of cue focality. In this study, participants were instructed to complete an ongoing category judgment task in which they were presented with a series of word pairs on a computer screen and had to decide whether the lowercase word (e.g., *tiger*) was a member of the category represented by the uppercase word (e.g., *ANIMAL*). Participants in the focal PM condition were told to press the forward slash key when a specific word (e.g., *tortoise*) appeared as one of the words presented during the ongoing category judgment task. Since the PM cue *tortoise* fits into the semantic category of *ANIMAL*, there is a high amount of processing overlap between the PM intention and the ongoing category judgment task. Thus, it should be sufficient to rely on spontaneous retrieval processes (i.e., the intention "popping" into mind; Meier, Zimmerman, & Perrig, 2006) to remember to successfully carry out the PM intention during the ongoing category judgment task (McDaniel & Einstein, 2000; Scullin, McDaniel, Shelton, & Lee, 2010; Scullin, McDaniel, & Shelton, 2013).

On the other hand, participants in the nonfocal PM condition were told to press the forward slash key when the syllable *tor* (e.g., *tor*toise) appeared in any of the words presented during the ongoing category judgment task. Given that the PM cue *tor* is difficult to recognize in a word compared to the PM cue *tortoise* that is a word in and of itself, there is a low amount of processing overlap between the PM intention and the ongoing category judgment task. Consequently, it should be necessary to engage in effortful monitoring retrieval processes (i.e., deliberately bringing the intention into mind; Scullin et al., 2013) to remember to complete the PM intention during the ongoing category judgment task. Although spontaneous and effortful monitoring retrieval processes may simultaneously reinforce PM, employing effortful monitoring retrieval processes decreases the amount of attentional resources available for the ongoing task and often leads to ongoing task performance costs (i.e., task interference) whereas spontaneous retrieval processes do not (McDaniel & Einstein, 2007; Scullin et al., 2013; Smith, 2003).

In keeping with McDaniel and Einstein's (2000) *MPF* and Craik's (1986) *ESH*, recent research has demonstrated that older adults perform worse than younger adults on PM tasks with nonfocal cues compared to PM tasks with focal cues (Ihle et al., 2013; Kliegel et al., 2008; Rendell et al., 2007) since the ability to employ effortful monitoring retrieval processes declines with increasing age (Craik, 1986; Henry et al., 2004; Kliegel & Jäger, 2006; Zeintl et al., 2007), but the ability to use relatively spontaneous retrieval processes does not. These results suggest that age-related PM performance differences should be clearly evident on PM tasks with nonfocal cues, but less so on PM task with focal cues indicating that PM age effects depend on the demands of the PM task. However, it is possible that differences in the extent to which individuals are aware of the demands of PM tasks in relation to their own PM abilities may also influence the size and direction of these effects. For instance, if an individual does not understand the difficulty of a PM task ahead of time, they may not recognize that a strategy will need to be employed to successfully perform the PM task. Alternatively, if an individual does adequately understand the difficulty of a PM task beforehand, they should be able to recognize the necessity of employing a sufficient strategy, such as engaging in effortful monitoring for the PM cues, to successfully perform the PM task. Based on this logic, one factor that has not been well studied that may further explain age-related differences in PM performance is metamemory.

Metamemory and Memory Self-Efficacy

Metacognition or "knowing about knowing" is a broad term that describes knowledge and awareness of one's cognitive functioning (Brown, 1978; Bieman-Copeland & Charness, 1994; Cavanaugh, 1982; Flavell & Wellman, 1977; Metcalfe & Shimamura, 1994; Schwartz, 2011; Tarricone, 2011). A specific component of metacognition termed *metamemory* describes one's awareness of cognitive processes (e.g., monitoring and regulating abilities) that are necessary for completing various memory-demanding tasks (Dunlosky & Bjork, 2008; Schwartz, 2011). Although studying metamemory in its broadest sense is helpful for understanding what kind of information individuals know about their overall memory functioning and cognitive processes, it does not necessarily address the extent to which awareness of one's own memory abilities (i.e., memory performance awareness) impacts one's actual memory performance. As a result, some metamemory researchers study *memory self-efficacy* (MSE), or one's beliefs about one's own memory abilities in different situations, to investigate the relationship between memory beliefs and memory performance (Beaudoin & Desrichard, 2011; Berry, West, & Dennehey, 1989; Berry, 1999; Berry, Hastings, West, Lee, & Cavanaugh, 2010; Cavanaugh & Green 1990; Devolder, Brigham, & Pressley, 1990; Hertzog, Dixon, & Hultsch, 1990; Hess & Blanchard-Fields, 1999; Tarricone, 2011).

As put forth in Bandura's (1986) *Social Cognitive Theory*, *self-efficacy* is broadly described as beliefs about an individual's ability to succeed on any given task. Unlike the contemporary cognitive approach (Beaudoin & Desrichard, 2011; Berry, 1999; Hess & Blanchard-Fields, 1999), Bandura originally proposed that individuals used self-efficacy in a social context. For example, an individual's level of self-efficacy stemmed from observing others and thinking about how one might be able to complete similar tasks relative to others based on those observations. More important, though, was his idea about how having low or high levels of self-efficacy could influence one's performance on tasks in a variety of domains. Bandura argued that individuals with high self-efficacy (i.e., high confidence in their ability to complete certain tasks) would be more likely to successfully perform tasks and achieve goals than those with low self-efficacy (i.e., low confidence in their ability to complete certain tasks; Bandura, 1977; 1986; 1997; Berry & West, 1993; Berry, 1999; Gardiner, Luszcz, & Bryan, 1997; Wells & Esopenko, 2008).

This early concept is especially relevant to MSE because if an individual feels confident in their ability to perform a memory task (i.e., high MSE), that individual should be more likely to achieve satisfactory memory performance than an individual who does not feel confident in their ability to perform a memory task (i.e., low MSE). However, from a modern theoretical perspective, it is critical to note that even if an individual has high MSE, they may not necessarily be aware of the memory task demands. As such, if an individual poorly appraises the demands of a memory task, doing so may result in poorer memory performance awareness such that the individual will erroneously feel confident in their ability to competently perform the memory task. Under these circumstances, one may be less likely to recognize that a strategy will need to be employed to successfully perform the memory task which may subsequently lead to poorer-than-expected memory performance. On the other hand, if an individual adequately appraises the demands of a memory task, doing so should result in better memory performance awareness such that the individual will accurately feel confident in their ability to competently perform the task. Moreover, since one should be more likely to recognize whether a strategy will need to be utilized to successfully perform the memory task in this situation, memory performance should be as good as expected or better (for similar views, see Anderson, McDaniel, & Einstein, 2017; Crumley, Stetler, & Horhota, 2014; Lachman & Andreoletti, 2006; and Knight, Harnett, & Titov, 2005). Therefore, Bandura's (1986) *Social Cognitive Theory* should be a valuable approach to use (Beaudoin & Desrichard, 2011; Berry, 1999) to determine whether MSE influences actual memory performance (MP; referred to as MSE-MP relationship, hereafter).

CHAPTER II

REVIEW OF LITERATURE

Memory Self-Efficacy—Prospective Memory Performance Relationship

On the whole, previous research examining the MSE-MP relationship has been mixed. Since most studies have been correlational rather than experimental in nature, not enough is known about the complex MSE-MP relationship (Beaudoin & Desichard, 2011). Much of the extant literature has focused exclusively on RM (especially episodic memory) and suggests that there is a moderate, positive relationship between MSE and RM performance at best (Beaudoin & Desrichard, 2011; Crumley et al., 2014). However, for tasks involving PM, this relationship remains unclear. One important factor that makes the relationship between MSE and PM performance difficult to interpret is methodological variability in terms of how MSE and PM performance have been measured across different age groups.

To better understand the literature on the MSE-MP relationship, it is important to point out that MSE has been operationally defined and measured in two different ways (Beaudoin & Desrichard, 2011; Berry, 1999; Crumley et al., 2014). For theorists who argue that MSE describes individuals' *general beliefs* about their ability to perform on tasks across *several* memory domains and situations (Hertzog & Dixon, 1994), metamemory questionnaires consisting of one or more subscales related to memory beliefs such as the Cognitive Failures Questionnaire (CFQ: Broadbent, Cooper, FitzGerald, & Parkes, 1982), the Metamemory in Adulthood Questionnaire (MIA: Dixon, Hultsch, & Hertzog, 1988), the Memory Functioning Questionnaire (MFQ: Gilewski, Zelinski, & Schaie, 1990), and the Prospective and Retrospective Memory Questionnaire (PRMQ: Crawford, Smith, Maylor, Della Sala, & Logie, 2003; Smith, Della Sala, Logie, & Maylor, 2000) are commonly used to measure this type of MSE, formally referred to as *global MSE* (i.e., memory rating-based MSE; Beaudoin & Desrichard, 2011).

Global Memory Self-Efficacy—Prospective Memory Performance Relationship

Of the studies that have examined the relationship between global MSE and PM performance, the vast majority have done so for older adults (Dobbs & Rule, 1987; Groot et al., 2002; Jonker, Smits, & Deeg, 1997; Kliegel & Jäger, 2006; Mäntyla, 2003; Maylor, 1990; McDonald-Miszczak, Gould, & Tychynski, 1999; Reese & Cherry, 2006; Rönnlund, Vestergren, Mäntyla, & Nilsson, 2011; Salthouse et al., 2004; Schmidt, Berg, & Deelman, 2001; Sunderland, Watts, Baddeley, & Harris, 1986; Zeintl, Kliegel, Rast, & Zimprich, 2006; Zelinski, Gilewski, & Anthony-Bergstone, 1990). Some studies have also examined this relationship for younger adults (Kliegel & Jäger, 2006; Marsh, Hicks, & Landau, 1998; Meeks, Hicks, & Marsh, 2007; Reese & Cherry, 2006), but because older adults must use MSE to monitor the extent to which their PM abilities are declining with age in order to effectively determine whether compensatory strategies will be needed to maintain PM performance (for a similar view, see Umanath & Marsh, 2014), research has largely focused on determining if global MSE is useful for explaining age-related differences in older adults' PM performance (Beaudoin & Desrichard, 2011). Despite this strong developmental emphasis, just four studies have found a significant link between global MSE and PM performance for older adults (Mäntyla, 2003; Maylor, 1990; McDonald-Miszczak et al., 1999; Zeintl et al., 2006). Further, only one study has demonstrated evidence of the relationship between global MSE and PM performance for younger adults (Kliegel & Jäger, 2006). These findings (or the lack thereof) indicate that a marginal relationship exists, at best, between global MSE and PM regardless of age group.

Although the aforementioned studies had adequate sample sizes to detect the MSE-MP relationship for PM, they may have resulted in relatively few significant findings for several reasons. First, different global MSE measures were administered (e.g., the CFQ, Broadbent et al., 1982; the MIA, Dixon et al., 1988; and the PRMQ, Crawford et al., 2003; Smith et al., 2000) raising the question of whether one questionnaire was better than another at evaluating the relationship between MSE and PM performance. Since metamemory questionnaires focus almost exclusively on measuring memory beliefs about general functioning and forgetting across broad domains and tasks, they often have few items specifically devoted to PM (Reese & Cherry, 2006; Smith et al., 2000). Due to providing little information about memory beliefs exclusively related to PM abilities, the CFQ and the MIA may not have adequately measured the MSE-MP relationship for PM. Despite including more specific items about PM, the PRMQ may also have been unsuccessful in measuring the relationship between MSE and PM performance because it comprises of questions about the perceived frequency of everyday PM errors rather than PM beliefs about performing certain tasks (for a similar view, see Uttl & Kibreab, 2011). Second, PM performance was measured using different types of PM tasks and scoring procedures making it more difficult to clearly interpret the MSE-MP relationship for PM.

The above limitations are worth mentioning because they leave gaps in the literature that need to be addressed to more fully understand the MSE-MP relationship for PM. In particular, coupled with previous findings indicating that individuals' memory beliefs tend to vary from one situation to another based on the relevant characteristics of the task and situation (Bandura, 1986; 1997; Beaudoin & Desrichard, 2011; Hertzog & Hultsch, 2000), they suggest that it would be more effective to examine the relationship between MSE and PM performance using measures that include specific questions that target individuals' knowledge and beliefs about their PM abilities as opposed to their general memory abilities. This approach would be especially useful for investigating the MSE-MP relationship for PM in older populations because it would allow researchers to determine whether age-related differences in PM performance may be due to a lack of knowledge about PM functioning, an inadequate understanding of PM abilities on PM tasks with certain demands, or both. Additionally, this approach would also allow researchers to more thoroughly examine the extent to which age-related deficits in PM performance may be differentially attributed to MSE when it is measured using "performance level" estimates about the ability to competently carry out a PM task versus "confidence level" estimates about the ability to confidently carry out a PM task. Like many RM researchers, some PM researchers have posited that older adults perform worse than younger adults on some PM tasks likely as a result of having lower levels of confidence in their PM abilities (Crumley et al., 2014; Pearman & Trujillo, 2013). However, whereas this relationship has frequently been examined for RM, it is important to highlight that no studies have empirically tested it for PM and further research is needed to understand the MSE-MP relationship for PM from various perspectives.

Given that global MSE was largely unsuccessful in detecting the MSE-MP relationship for PM, theorists who postulate that MSE represents individuals' *specific beliefs* about their ability to perform a task within a *single* memory domain in a *particular* situation (Berry & West, 1993; Berry, 1999) are using performance predictions made before completing a memory task to measure another type of MSE, formally referred to as *local MSE* (i.e., performance prediction-based MSE; Beaudoin & Desrichard, 2011; Berry, 1999; Hertzog et al., 1990; McDonald-Miszczak, Hunter, & Hultsch, 1994) to understand the MSE-MP relationship for PM. That is, researchers are investigating how individuals' knowledge of the demands of PM tasks with particular characteristics (e.g., different setting, task, and cue types) and awareness of PM abilities on these types of PM tasks are related to one's actual PM performance.

Local Memory Self-Efficacy—Prospective Memory Performance Relationship

To date, one study has examined the relationship between local MSE and PM performance for older adults (Devolder et al., 1990), and five studies have done so for younger adults (Devolder et al., 1990; Kytola & Reese-Melancon, manuscript in preparation; Meier et al., 2011; Meeks et al., 2007; Rummel et al., 2013). One reason for this change in the developmental emphasis on studying the MSE-MP relationship for PM may have to do with the fact that prior studies focusing on older adults did not provide researchers with enough compelling evidence that age-related global MSE differences would reliably help explain age-related PM performance deficits. As a result, researchers may have been hesitant to continue extensively examining this relationship using local

MSE for older adults because the necessary data collection would be too intensive in terms of time and resources compared to younger adults. Another potential explanation is that researchers may have sought to determine whether local MSE is reliably related to younger adult's PM performance using an established methodological approach before investigating this relationship for older adults. Irrespective of the cause, very little is known about the relationship between local MSE and older adults' PM performance making it exceedingly difficult to determine whether it may help further explain age-related differences in PM performance. To answer this question in the present study, the performance prediction paradigm used to measure local MSE will first be described followed by relevant findings from previous studies that examined the relationship between local MSE and PM performance.

Within the typical performance prediction paradigm, individuals are told they will complete a memory task in the near future, but before actually completing the task each of the individuals is asked to make a single judgment (e.g., single-item prediction) or multiple judgments (e.g., multi-item prediction) about how well they believe they will perform on that task in that situation. When making a *single-item prediction*, individuals must either indicate the total number (e.g., 15 out of 20, Devolder et al., 1990) or percentage (e.g., 0% to 100%; Kytola & Reese-Melancon, manuscript in preparation; Meeks et al., 2007; Rummel et al., 2013) of items they think they will remember during the task. When making a *multi-item prediction*, individuals must specify the likelihood that they will remember a certain number (e.g., 1 to 5, 6 to 10…16 to 20; Berry et al., 1989) of items during the task. For each of these levels, individuals must then indicate how confident (e.g., 10% to 100%; Berry et al., 1989) they are about remembering those items during the task. Once the required memory task is completed, the absolute accuracy with which individuals assessed their performance on that task is determined by comparing the extent to which their predicted performance reflects their actual performance (Bruce, Coyne, & Botwinick, 1982; Connor, Dunlosky, & Hertzog, 1997; Devolder et al., 1990; Gardiner et al., 1997; Hertzog et al., 1990; Shaw & Craik, 1989). Since the act of making a prediction about one's performance on a task inherently requires some kind of appraisal of task demands as well as an appraisal of one's ability to complete the task (Bieman-Copland & Charness, 1994; Gardiner et al., 1997; Hertzog et al., 1990; McDonald-Miszczak et al., 1994; Woo, Schmitter-Edgecombe, & Fancher, 2008), it is assumed that individuals who are able to accurately predict their performance (i.e., have a smaller discrepancy between predicted and actual performance) are able to do so because they have a greater awareness of the demands required to complete the task in relation to their ability to complete the task. In addition to making either a single-item or multi-item prediction before completing a task, individuals are sometimes also asked to make a single judgment (e.g., single-item postdiction) about how well they believe they performed on the required task immediately after completing it. When making a *single-item postdiction*, individuals must either indicate the total number (e.g., 15 out of 20, Devolder et al., 1990) or percentage (e.g., 0% to 100%; Kytola & Reese-Melancon, manuscript in preparation; Meeks et al., 2007; Rummel et al., 2013) of items they think they successfully remembered during the task. Thus, similar to performance predictions, performance postdictions can be used to assess the absolute accuracy with which individuals' postdicted performance reflects their actual performance (Devolder et al., 1990; Kytola & Reese-Melancon, manuscript in preparation; McDonald-Miszczak et al., 1994; Meeks et al., 2007; Rummel et al., 2013).

In a seminal study, Devolder et al. (1990) examined the extent to which younger and older adults were able to accurately make single-item predictions and postdictions about their performance on several laboratory RM tasks (e.g., free recall, cued recall, and recognition) and one naturalistic, time-based PM task (e.g., appointment keeping). The results demonstrated that younger adults were more accurate than older adults in predicting their RM performance and they outperformed older adults on these memory tasks. However, older adults were more accurate than younger adults in predicting their PM performance and they outperformed younger adults on the PM task. Further, whereas younger adults were underconfident in their ability to complete the RM tasks and overconfident in their ability to complete the PM task, older adults exhibited the opposite pattern in confidence on the RM and PM tasks. Both age groups were more accurate in postdicting their past memory performance (Connor et al., 1997; Hertzog et al., 1990; Hertzog & Dixon, 1994; Kytola & Reese-Melancon, manuscript in preparation; Meeks et al., 2007; Metcalfe & Shimamura, 1994) than in predicting their future memory performance. Given that the accuracy of participants' predictions, but not postdictions, varied across tasks these results suggest that individuals may be more aware of their abilities to perform on some memory tasks than others and that age is an important factor to take into consideration when attempting to explain age-related differences in memory performance.

Although finding that younger adults performed better than older adults on the RM tasks is consistent with age-related differences predicted by Craik's (1986) *ESH*, observing that older adults performed better than younger adults on the PM task is not consistent with some previous aging research (Ihle et al., 2013; Kliegel et al., 2008). One explanation for this inconsistency is that allowing participants to complete the PM task outside of the laboratory may have made it easier for them to use compensatory strategies (i.e., external retrieval cues) to reduce the amount of self-initiated retrieval processes needed to complete the PM task (Henry et al., 2004). Due to the fact that it is unclear whether participants employed a strategy to accomplish their PM performance on this particular PM task and whether doing so influenced participants' PM performance predictions, it is difficult to draw reliable conclusions about the relationship between local MSE and PM for older adults from this single study.

To conceptually replicate Devolder et al.'s (1990) findings with proper experimental control in a sample of younger adults, Meeks et al. (2007) investigated the extent to which participants were able to accurately make single-item predictions and postdictions about their performance on two different laboratory, event-based PM tasks and whether participants' self-reported PRMQ scores (Crawford et al., 2003; Smith et al., 2000) correlated with their actual PM performance. For the PM task manipulation, participants in one PM condition were instructed to press the forward slash key when they saw a word that represented an animal (e.g., *goat*; Einstein et al., 2005) appear on the screen during an ongoing computerized lexical decision task (LDT) in which they were told to press 'YES' (F key) if the string of letters was a word or 'NO' (J key) if the string of letters was not a word. Participants in the other PM condition were instructed to press the forward slash key when they saw the syllable tor (e.g., dormi*tor*y) appear on the screen during the ongoing LDT. Both PM tasks had nonfocal cues and thus were expected to be difficult to complete due to requiring a high amount of self-initiated retrieval processes (Brewer et al., 2010; Kliegel et al., 2008). However, it is important to note that the animal PM condition was hypothesized to be easier to complete than the syllable PM condition because it should require a lower amount of self-initiated retrieval processes to recognize the word *goat* as an animal than it does to identify the syllable *tor* (Einstein et al., 2005; McDaniel & Einstein, 2007). Therefore, this subtle difference in cue focality was anticipated to be helpful for determining whether participants' predictions/postdictions would vary across the PM tasks as a function of the PM task demands.

Overall, Meeks and colleagues (2007) found that participants in the animal PM condition were more accurate in predicting their PM performance than participants in the syllable PM condition, and those in the animal PM condition outperformed those in the syllable PM condition on the PM task. One trend observed that contradicted Devolder et al.'s (1990) results with a naturalistic PM task, but replicated other research using laboratory PM tasks (Knight et al., 2005; Schnitzspahn et al., 2011) was that participants were underconfident in their ability to successfully complete both of the PM tasks (but see Kytola & Reese-Melancon, manuscript in preparation). According to the authors, this finding may be partially explained by the fact that participants did not predict their future PM performance with the possibility in mind that they would employ a compensatory strategy to complete the PM task, but they likely did use a strategy to achieve their PM performance. Indeed, the data indicate that participants in both PM conditions, but especially those in the syllable PM condition, engaged in effortful monitoring for the subtle PM cues given that their response times (RTs) on the ongoing LDT items were faster before the PM intention was formed (i.e., during the baseline block) than after the PM intention was formed (i.e., during the PM block) potentially resulting in better-than-expected PM performance (Scullin et al., 2013; Smith, 2003). Similar to other studies, participants were less accurate in predicting their future PM performance than in postdicting their past PM performance (Devolder et al., 1990; Kytola & Reese-Melancon, manuscript in preparation). However, scores on the global MSE measure, the PRMQ, were not related to PM performance in either PM condition which is consistent with previous research (Kliegel & Jäger, 2006; Mäntyla, 2003; Rönnlund et al., 2011; Zeintl et al., 2006). This pattern of findings suggests that local MSE is related to actual PM performance but global MSE is not, providing further evidence supporting the idea that individuals do not have a general view of their PM abilities that applies to all PM situations. Instead, individuals' views of their PM abilities likely vary with the demands of the particular PM task they are trying to accomplish (for a similar view, see Crumley et al., 2014; Kytola & Reese-Melancon, manuscript in preparation).

Based on the previous findings, a more sophisticated approach like Meeks et al.'s (2007) that examines the relationship between local MSE and PM performance on laboratory, event-based PM tasks should be advantageous to use in older populations for several reasons. First, unlike Devolder et al.'s (1990) method that investigated the extent to which age-related differences in local MSE accounted for age-related deficits in older adults' laboratory RM performance compared to their naturalistic, time-based PM performance, this particular approach would allow researchers to directly compare the extent to which older adults' local MSE may vary depending on the demands of different memory tasks in the same domain. Within the domain of PM, examining the extent to which older adults are able to accurately make single-item predictions and postdictions about their performance on laboratory PM tasks that have different retrieval processing demands would allow researchers to better understand whether older adults are able to adequately appraise the demands of PM tasks that vary in difficulty in relation to their own PM abilities that may be declining. Second, this approach would also allow researchers to gain insight into whether older adults are able to recognize whether a strategy should be utilized to successfully perform some PM tasks and how older adults are able to achieve their PM performance as indicated by their ongoing and PM task performance respective to each other.

Although Meeks et al.'s (2007) study was well designed and highly useful for understanding the relationship between local MSE and PM performance, it failed to consider whether the act of making predictions about one's memory abilities could have an effect on one's actual memory performance. That is, if making a prediction could have a reactive effect. There is some evidence to suggest that predicting one's future RM performance can enhance RM performance (Kelemen & Weaver, 1997; Spellman & Bjork, 1992, but see Hertzog et al., 1990), but researchers have only recently investigated whether predicting one's future PM performance improves actual PM performance for younger adults (Kytola & Reese-Melancon, manuscript in preparation; Meier et al., 2011; Rummel et al., 2013). Meier et al. (2011) examined the extent to which making predictions about future PM performance impacted participants' actual PM performance on laboratory, event-based PM tasks and found that making predictions improved PM performance, but only when the PM task employed nonfocal cues. However, the local MSE measure, ongoing task, and PM task in this study were considerably different than those previously used in the PM literature making it challenging to determine the generalizability of the findings.

To overcome the challenge of methodological variability, Rummel et al. (2013) decided to use Meeks et al.'s (2007) local MSE measure, ongoing LDT, and PM targets to conceptually replicate Meier et al.'s (2011) novel findings on the reactive effects of predictions on PM performance. To better understand how predictions might improve PM performance, participants were assigned to one of three experimental prediction conditions. In one condition, participants made a single-item prediction about their PM performance. In another condition, participants not only made a single-item prediction about their PM performance, but they also made a single-item prediction about their LDT performance. Lastly, in a control condition, participants made no prediction about their PM or LDT performance.

Similar to Meier et al.'s (2011) findings, Rummel et al. (2013) found that making predictions improved participants' actual PM performance in the nonfocal PM condition (Exp. 1), but not in the focal PM condition (Exp. 2). Since individuals tend to perform better on PM tasks with focal cues than on PM tasks with nonfocal cues (Kliegel et al., 2008), the act of making a prediction about one's future PM performance may not have been as beneficial for participants in the focal PM condition because they were already performing near the peak level (i.e., a ceiling effect; Meier et al., 2011). Regardless of cue focality though, participants who predicted their PM performance responded more slowly to LDT items in the PM block relative to the baseline block than participants who did not predict their PM performance indicating that participants in the PM prediction condition likely achieved better PM performance by engaging in effortful monitoring to “search” for the PM cues (Meeks et al., 2007; Meier et al., 2011; Scullin et al., 2013; Smith, 2003). However, when participants predicted their PM performance *and* their LDT performance, the reactive effects of predictions on performance and monitoring retrieval processes were eliminated. As hypothesized by the authors, requiring participants to make judgments about their ability to complete two tasks simultaneously can cancel out the beneficial effects of predictions likely because neither task is perceived to be more important than the other. Taken together, these findings indicate that making predictions can be used as a strategy to improve PM performance on more difficult PM tasks potentially by encouraging participants to strategically allocate attentional resources to the PM task rather than the ongoing LDT (for a similar view, see Rummel & Meiser, 2013). Thus, it should be exceptionally valuable to implement this established approach modified from Meeks et al.’s (2007) earlier study to assess both the reactivity and accuracy components of the local MSE-MP relationship for PM in older populations since PM is sensitive to age-related decline even on easier PM tasks that employ focal cues (Henry et al., 2004; Ihle et al., 2013; Kliegel et al., 2008).

Whereas the previous studies have exclusively used single-item predictions to measure the relationship between local MSE and PM performance (Devolder et al., 1990; Meeks et al., 2007; Rummel et al., 2013), many studies have utilized multi-item predictions to measure the local MSE-MP relationship for RM (Beaudoin & Desrichard, 2011; Crumley et al., 2014). Specifically, the Memory Self-Efficacy Questionnaire (MSEQ: Berry et al., 1989) that was created based on Bandura’s (1986) *Social Cognitive Theory* has historically been employed to examine the extent to which individuals’ (namely older adults’) views of their RM abilities vary with the demands of the particular

RM task that they are trying to accomplish. For instance, on a laboratory RM task such as a free recall task, the MSEQ requires individuals to judge their ability to recall items from a list of words. Upon receiving the RM task instructions (e.g., "Here is a list of 30 words, please study these words carefully because later you will be asked to recall them"), individuals would be instructed to indicate whether they believe they could complete various levels of the RM task (e.g., "If I studied 30 words for 3 seconds each, I believe I could remember 1 to 5/6 to 10/…26 to 30 words correctly from a list of 30 items"; Berry et al., 1989). Then, for each of these levels, individuals would be told to indicate how confident they are that they could successfully complete the RM task on a percentage scale ranging from 10% to 100%. These performance level and confidence level estimates are assumed to represent the extent to which individuals to aware of RM task demands in relation to their own RM abilities (Berry et al., 1989; Hertzog et al., 1994).

Given that the MSEQ requires individuals to provide separate performance level and confidence level estimates about their future memory performance, it may provide individuals with more information about memory task demands. In turn, making multi-item predictions may then prompt individuals to think more deeply about those memory task demands in relation to their own memory abilities thus potentially making it easier to recognize whether a strategy will need to be utilized to successfully perform a given memory task. To extend previous PM work and empirically test this hypothesis, Kytola and Reese-Melancon (manuscript in preparation) adapted Berry et al.'s (1989) MSEQ measure and investigated the extent to which multi-item predictions were more effective than single-item predictions for improving PM performance on PM tasks with focal and nonfocal cues compared to no predictions. To remain consistent with previous PM research, Meeks et al.'s (2007) and Rummel et al.'s (2013) single-item MSE measure, ongoing LDT, and PM targets were used.

Overall, making predictions improved PM performance for participants in the nonfocal PM condition, but not for participants in the focal PM condition. Similar to prior work (Meier et al., 2011; Rummel et al., 2013), one explanation for this finding may be that those in the focal PM condition significantly outperformed those in the nonfocal PM condition and thus did not experience the beneficial effects of making predictions about their future PM performance as there was little room left for improvement. Importantly, multi-item predictions were found to be more effective for improving participants' PM performance in the nonfocal PM condition than were single-item predictions. Although it is possible that multi-item predictions may have been more effective as a result of providing participants with more information about PM task demands and/or made the PM task seem more important than the ongoing task, the data indicate that multi-item predictions may also be more effective due to encouraging participants to more strategically allocate attentional resources to the PM task rather than the ongoing LDT (for a similar view, see Meeks et al., 2007 and Rummel et al., 2013). In keeping with this hypothesis, participants in the single-item and no prediction conditions generally responded more slowly to LDT items in the PM block than in the baseline block in both PM (e.g., cue focality) conditions. However, this pattern was different for participants in the multi-item prediction condition across the PM (e.g., cue focality) conditions. Whereas participants in the focal PM/multi-item prediction condition responded similarly to LDT items in both the PM block and the baseline block, participants in the nonfocal PM/multi-item prediction condition responded more slowly to LDT items in the PM block than in the baseline block demonstrating that participants engaged in effortful monitoring to "search" for the subtle, nonfocal PM cues (Meeks et al., 2007; Meier et al., 2011; Scullin et al., 2013; Smith, 2003).

With regard to participants' performance level and confidence level estimates in the multi-item prediction condition, Kytola and Reese-Melancon (manuscript in preparation) found that participants in the focal PM/multi-item prediction condition performed better than participants in the nonfocal PM/multi-item prediction condition. However, neither participants' performance level nor confidence level estimates differed significantly across the PM (e.g., cue focality) conditions indicating that participants in the focal PM/multi-item prediction condition and the nonfocal PM/multi-item prediction condition may have been unaware of the PM task demands in relation to their own memory abilities prior to completing the PM task. Specifically, those in the focal PM condition were underconfident in their PM abilities whereas those in the nonfocal PM condition were overconfident in their PM abilities. While it might be concerning that participants in the nonfocal PM condition were initially overconfident in their ability to perform a difficult PM task, it appears that the reactive effect of making a multi-item prediction may have allowed participants to become more aware of the PM task demands in relation to their own memory abilities throughout the PM task thus improving PM performance. On the one hand, this finding suggests that multi-item predictions should be useful for assessing both the reactivity and accuracy components of the local MSE-MP relationship, especially in older populations that typically exhibit greater variability in performance level and confidence level estimates of PM abilities. However, given that one of the defining characteristics of a PM task is delaying an intention without giving an explicit prompt as to when the PM information is to be recalled (Einstein & McDaniel, 2007), doing so may result in a confound because the PM intention(s), the PM target(s), or both must be presented repeatedly for participants to make multi-item predictions. Therefore, in order to avoid allowing participants to rehearse the PM information for a subsequent PM task and thus measuring short-term memory performance instead of PM performance, it would be advantageous for researchers to examine the relationship between local MSE and PM by having participants make single-item performance level and confidence level estimates about their PM abilities. By utilizing this approach, researchers would remain consistent with past work while gaining a better understanding of how well individuals are aware of PM task demands in relation to their own PM abilities.

Summary

Collectively, results from prior research on the relationship between local MSE and memory performance indicate that individuals are more aware of their abilities to perform on some memory tasks than others (Devolder et al., 1990; Meeks et al., 2007). In particular, Devolder et al. (1990) demonstrated that older adults were more accurate in predicting their naturalistic, time-based PM performance than younger adults, but that younger adults were more accurate in predicting their laboratory RM performance than older adults. Meeks et al. (2007) found that individuals were more accurate in predicting their laboratory, event-based PM performance when the PM task had more salient retrieval cues (i.e., focal) than when the PM task had more subtle retrieval cues (i.e., nonfocal) revealing that cue focality impacts the accuracy of individuals' predictions about their future PM performance. In addition to earlier work on the accuracy component of the local MSE-MP relationship for PM, Meier et al. (2011), Rummel et al. (2013), and Kytola and Reese-Melancon (manuscript in preparation) found that making predictions can improve individuals' performance on PM tasks with nonfocal cues illuminating the importance of examining the reactivity component of the local MSE-MP relationship for PM.

Gaps in the Literature

Unfortunately, no studies to date have investigated whether making predictions can improve older adults' performance on laboratory, event-based PM tasks with focal and nonfocal cues. Given that older adults may experience more substantial benefits from making predictions about their future PM performance on PM tasks with focal and nonfocal cues than younger adults as a result of declines in PM with increasing age (Henry et al., 2004; Ihle et al., 2013; Kliegel et al., 2008; McDaniel & Einstein, 2007), the first goal of the present study was to examine the reactivity component of the local MSE-MP relationship for PM among older adults. Moreover, the second goal of this study was to examine the potential underlying mechanism(s) of the reactive effects of predictions on older adults' performance on laboratory, event-based PM tasks with focal and nonfocal cues. Finally, since only one study has investigated the extent to which younger and older adults are able to accurately predict and postdict their PM performance on a naturalistic, time-based PM task (Devolder et al., 1990), and no studies have assessed the extent to which older adults are able to accurately predict and postdict their PM performance on a laboratory, event-based PM task with focal and nonfocal cues, the third and final goal of this study was to examine the accuracy component of the local

MSE-MP relationship for PM among older adults. For both components, single-item predictions (Devolder et al., 1990; Kytola & Reese-Melancon, manuscript in preparation; Meeks et al., 2007; Rummel et al., 2013) and postdictions (Devolder et al., 1990; Kytola & Reese-Melancon, manuscript in preparation; McDonald-Miszczak et al., 1994; Meeks et al., 2007) were assessed using established questionnaires from past studies. Additionally, as previously mentioned, these questionnaires were modified to include a single-item prediction about how confident participants were in their ability to successfully perform the PM task.

Specific Aims

The primary aim of this study was to extend previous work that assessed the local MSE-MP relationship for younger adults with single-item predictions (Devolder et al., 1990; Kytola & Reese-Melancon, manuscript in preparation; Meeks et al., 2007; Rummel et al., 2013) to a sample of older adults to examine the extent to which predictions were useful for improving older adults' PM performance on event-based PM tasks with focal and nonfocal cues.

The second aim of this study was to compare the extent to which predictions impacted older adults' ongoing task performance for PM tasks with focal and nonfocal cues. Performance costs (i.e., task interference) on the ongoing LDT are thought to reflect increased monitoring retrieval processes for the PM task, and prediction condition was expected to interact with PM task type to influence cost.

The third aim of this study was to compare the extent to which predictions and postdictions accurately reflected older adults' actual PM performance on PM tasks with focal and nonfocal cues.

CHAPTER III

METHOD

Design

This study employed a 2 (Prediction condition: prediction, no prediction) x 2 (PM condition: focal, nonfocal) x 2 (LDT block: baseline, PM) mixed factorial design. Prediction condition and PM condition were measured between subjects and LDT block was measured within subjects. For the between subjects manipulations, a sequential assignment to conditions approach was used in which the first participant to sign up for the experiment was assigned to condition 1 (prediction, focal). The three following participants to sign up for the experiment were then sequentially assigned to conditions 2 (no prediction, nonfocal), 3 (no prediction, focal), 4 (prediction, nonfocal). All additional participants were assigned to conditions using this same rotation pattern until all cells contained at least 20 participants, at which point the assignment process was complete. The primary dependent variable was PM performance. Secondary dependent variables were LDT response times (RTs), LDT accuracy scores, prediction/postdiction difference scores, prediction/postdiction confidence scores, and task importance ratings.

Participants

A total of 120 healthy, community-dwelling older adults residing in Stillwater, Oklahoma and surrounding areas who indicated English as their first language participated in the study. This sample size was chosen on the basis of an a priori power analysis (1 - β = .86) using the software G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) to detect a medium-sized effect according to Cohen's conventions (Cohen, 1988). Participants were primarily recruited from local civic organizations including the City of Stillwater Senior Activity Center (SAC), the Osher Lifelong Learning Institute (OLLI), and the Emeriti Association (EA) at Oklahoma State University (OSU) in person and by e-mail. Participants were also recruited via informational flyers posted around the local community as well as through word of mouth to family members and friends. The study was conducted at two research sites; participants were given the choice to complete the study at the City of Stillwater SAC or at the Memory and Cognitive Aging research laboratory at OSU. Each participant was tested individually in a private, single session that lasted an hour and a half and was compensated with 10 dollars upon completion of the study.

All participants were prescreened for dementia with the 6-Item Cognitive Impairment Test (6CIT Kingshill Version 2000; Brooke, 2001; see Appendix A) and postscreened for depression with the Geriatric Depression Scale (GDS; Sheikh & Yesavage, 1986; see Appendix B). Scores above the recommended cutoff point for either dementia (e.g., a score greater than 7 out of 28) or depression (e.g., a score greater than 5 out of 15) were used as exclusion criteria. No participants were excluded for dementia and only one participant was excluded for depression but they were later replaced. Two participants who had absolute z-scores larger than 2.5 on the LDT (Stevens, 2009) were considered outliers and excluded from all analyses. The final sample consisted of 118 participants (74 women, 62.7%) who ranged from 60 to 92 years of age (M_{age} = 72.36 years, *SD* = 7.50) and demonstrated at least 20/32 corrected visual acuity assessed with a standard Snellen eye chart.

Participants completed a demographic questionnaire soliciting information regarding ethnicity, education level, and health status (Older American Resources and Services Multidimensional Functional Assessment Questionnaire, OARS: Duke University Center for the Study of Aging and Human Development, 1975; see Appendix C). The majority of participants were Caucasian (91.5%), but the sample also included participants who indicated that they were African American (0.8%), Native American (1.9%), or of multiple ethnicities (5.0%). Only one participant chose not to report their ethnicity (0.8%). Further, a large number of participants indicated that they were college graduates (M_{edu} = 16.04 years, *SD* = 3.08), and generally reported being in excellent (31.4%) or good (50.8%) health. Participants completed Gardner and Monge's (1977) 30-item Word Familiarity Survey as a measure of verbal intelligence (*M* = 19.51, *SD* = 4.63) as well as the Backward Digit Span (BDS; Wechsler, 1955; *M* = 3.80, *SD* = .90) and the Size Judgment Span (SJS; Cherry & Park, 1993; *M* = 3.06, *SD* = .51) as measures of working memory. A composite working memory score was calculated by converting the BDS and SJS scores to z-scores and then averaging the two for each participant.

Four 2 (Prediction condition: prediction, no prediction) x 2 (PM condition: focal, nonfocal) between-subjects factorial analyses of variance (ANOVAs) were conducted on the education level, health status, vocabulary, and working memory scores to statistically determine pre-experimental group equivalence. No main effects or interactions were found for any of the demographic variables, *p*s > .30. Further, no effects were found for working memory, *p*s > .20, but a significant interaction between prediction condition and PM condition was observed for the vocabulary measure, $F(1, 114) = 6.26$, $p = .014$, $\eta_p^2 = .052$, observed power = .70. Follow-up tests of simple effects revealed that there were significant differences in performance on the vocabulary measure between the prediction conditions in the focal PM condition, $t(56) = 2.39$, $p = .020$, but not in the nonfocal PM condition, $t(58) = .980$, $p = .331$. Specifically, among the participants in the focal PM condition, those assigned to the prediction condition performed better on the vocabulary measure than those assigned to the no prediction condition. Follow-up tests also showed that there were significant differences in performance on the vocabulary measure across the PM conditions for those assigned to the prediction condition, $t(56) = 2.52$, $p = .015$. That is, among the participants in the prediction condition, those assigned to the focal PM condition performed better on the vocabulary measure than those assigned to the nonfocal PM condition. Means for demographic and individual difference measures can be found in Table 1.

Materials

Lexical Decision and PM Tasks

The ongoing task was a computerized lexical decision task (LDT) similar to the one used by Kytola and Reese-Melancon (manuscript in preparation) and consisted of 520 trials in which half of the trials were valid English words and half were pronounceable, nonwords. All LDT items were selected from the English Lexicon Project Database (Balota et al., 2007) and were comparable in length (*M* = 5.1 letters per word), number of syllables (M = 1.5 syllables per word), and frequency (M = 23.8 frequency per every 100,000 words). The LDT items were randomly assigned to a trial position within the experimental program for each participant tested. Individuals were asked to make judgments about these items and indicate whether the item presented on the screen was a word by pressing the 'F' key labelled 'YES' or the 'J' key labelled 'NO' on the keyboard. For each trial, a fixation point (+) was presented for 500ms (Allen, Madden, & Crozier, 1991; Robert & Mathey, 2007) followed by the presentation of a single word or non-word for a maximum of 3000ms. After each word judgment was made, the screen went blank until the next trial began with another 500ms fixation point.

The PM task was embedded within the LDT requiring participants to press the F6 key on the keyboard instead of making a word judgment when a target word appeared on the screen. All PM target words were selected from the English Lexicon Project Database (Balota et al., 2007) to closely match the ongoing LDT items in length (M = 5.2), number of syllables (M = 1.5), and frequency (M = 22.3). In the focal PM condition, one target word (e.g., *goat*) was presented ten different times (Einstein & McDaniel, 1990). In the nonfocal PM condition, ten target words from one semantic category (e.g., *animal*) were each presented one time. The PM targets were: *horse, zebra, goat, sheep, moose, rabbit, lion, giraffe, donkey, and camel* (Kytola & Reese-Melancon, manuscript in preparation; Meeks et al., 2007; Rummel et al., 2013). Consistent with the LDT stimuli randomization, the order in which the nonfocal PM target words appeared was randomized for each participant tested. PM targets appeared on trials 25, 50, 75, 100, 125, 150, 175, 200, 225, and 250 of the PM block that consisted of 260 trials.

The LDT also consisted of a baseline block that was divided into two halves. The first half consisted of 130 trials that appeared before any instructions about the PM task were presented. The second half, which also consisted of 130 trials, appeared after the PM task was completed and the participants were informed that they no longer need to look for or respond to the PM targets. Those two halves were then combined to create a composite baseline score that was used to evaluate the extent to which completing the PM task interfered with performance on the ongoing task.[1]

Metamemory Measures

For those in the prediction condition, a single-item MSE questionnaire adapted from Meeks et al. (2007) and modified from Kytola and Reese-Melancon's (manuscript in preparation) study was used to assess participants' predictions about their future PM performance. After receiving the PM instructions but before completing the PM task, participants were instructed to indicate the total percentage of target items they believed they would detect during the LDT using a scale from 0% to 100%. Participants were then instructed to indicate how confident they were that they would detect that particular percentage of target items during the LDT using a scale from 0% to 100% (see Appendices D and E).

For those in both the prediction and no prediction conditions, a single-item MSE questionnaire adapted from Meeks et al. (2007) and modified from Kytola and Reese-Melancon's (manuscript in preparation) study was used to assess participants' postdictions about their past PM performance. After completing the PM task, participants were instructed to indicate the total percentage of target items they believed they successfully detected during the LDT using a scale from 0% to 100%. Participants were then instructed to indicate how confident they were that they successfully detected that particular percentage of target items during the LDT using a scale from 0% to 100% (see Appendices F and G).

Other Measures

Several other short tasks were administered as part of this study to obtain individual difference information from participants. The Trail Making Test (TMT; Reitan & Wolfson, 1985) Parts A and B was given as a measure of visual attention and task switching. A few brief questionnaires were also administered to assess participants' memory of the PM task (see appendices H and I), self-reported importance of the LDT and PM task (see appendix J), and self-reported strategy use (see appendices K and L).

Procedure

Upon arriving at the research site, participants were asked to read a consent form. After written consent was obtained, the experimenter asked all participants to read the instructions on the computer screen carefully and answered any questions participants had throughout the session. The computerized LDT was presented to participants as a "word judgment task" and each participant was instructed to press 'YES' on the keyboard if the string of letters shown was a word or 'NO' if the string of letters shown was not a word. The experimenter told participants that they should try to make word judgments as quickly and accurately as possible. Each participant was presented with 10 practice trials and then completed the first half of the baseline block in which no PM targets items appeared.

Next, the experimenter introduced the PM task which was described as a secondary interest. Participants in the focal PM condition were instructed to press the F6 key on the keyboard instead of making a yes or no word judgment when the word *goat* appeared on the screen as part of the ongoing LDT. Participants in the nonfocal PM condition were instructed to press the F6 key on the keyboard instead of making a yes or no word judgment when words that represented an *animal* appeared on the screen as part of the ongoing LDT. Participants were told to press the F6 key as soon as the PM target items appeared, but if they did not remember to press it at that time, participants were informed that they could press F6 whenever they remembered to do so. The experimenter then asked all participants to restate the instructions in their own words to be certain they understood the task. Once a thorough understanding of the PM task was demonstrated, the experimenter administered participants in the prediction condition the single-item MSE questionnaire for predictions.

Afterwards, participants were instructed to complete the visual search task followed by the vocabulary measure. Then, before beginning the PM block, the experimenter reminded participants that they should press 'YES' on the keyboard if the string of letters shown was a word or 'NO' if the string of letters shown was not a word. The experimenter also reminded participants that they should try to make word judgments as quickly and accurately as possible, but they were not given any additional information about the embedded PM task. Immediately following the PM block, the experimenter administered post-test questionnaires to assess participants' memory for the PM task, self-reported importance of the LDT and PM task, and self-reported strategy use. Next, the experimenter administered all participants the single-item MSE questionnaire for postdictions. After the post-test questionnaires were completed, participants were told they no longer needed to look for the PM target items or press the

F6 key and were asked to make a few more word judgments to complete the second half of the baseline block. Once the second half of the baseline block concluded, the experimenter gave participants the option to take a five-minute break. If taken, once the break ended, the experimenter administered participants the working memory, demographic, and depression measures. Finally, participants were asked to complete a vision test and were then debriefed and compensated.

CHAPTER IV

RESULTS

Overview of Analyses

The general data analysis approach was to perform separate ANOVAs on all dependent measures as a function of prediction condition (prediction, no prediction) and PM condition (focal, nonfocal).

Aim One, Prospective Memory Performance

PM performance was scored as the proportion correct out of ten possible opportunities. PM responses were recorded as correct if participants successfully remembered to press the F6 key on the keyboard any time a target word (i.e., *goat* or words that represented an *animal*) appeared during the ongoing LDT. However, if participants forgot to press the F6 key during the LDT trial in which the PM target word first appeared, they had the opportunity to press it up to three LDT trials (i.e., word judgments) later before a response was scored as incorrect or missed.

A 2 (Prediction condition: prediction, no prediction) x 2 (PM condition: focal, nonfocal) between-subjects factorial ANOVA was conducted on the PM proportion correct scores to statistically determine the effect of making predictions on participants' performance on PM tasks with focal and nonfocal cues. No main effect of prediction condition was found, $F(1, 114) = 1.35$, $p = .248$, $\eta_p^2 = .012$, observed power = .21. A main effect of PM condition (e.g., cue focality) was observed such that PM performance in the focal PM condition was significantly better than PM performance in the nonfocal PM condition, $F(1, 114) = 15.86$, $p < .001$, $\eta_p^2 = .122$, observed power = .98, but no significant interaction between prediction condition and PM condition was found, $F(1, 114) = .120$, $p = .729$, $\eta_p^2 = .001$, observed power = .06. Mean PM performance (as proportion correct) by prediction condition and PM condition can be found in Table 2.

Aim Two, Ongoing Task Cost

All response times (RTs) for the LDT were recorded as the length of time it took for participants to make a judgment about whether the item presented on the screen was a word or not by pressing the keys labeled 'YES' or 'NO' on the keyboard. Consistent with previous PM research (Hicks, Marsh, & Cook, 2005; Kytola & Reese-Melancon, manuscript in preparation; Rummel et al., 2013), analyses were confined to RTs on trials in which words were presented and correctly identified as words. Word trials with RTs of less than 300ms or more than 2.5 standard deviations from an individual's mean RT were trimmed. This resulted in the exclusion of less than 3% of trials. All PM target trials as well as the three trials following each PM target item were also excluded from the RT analyses to control for task switching costs on these trials (Rummel et al., 2013; Smith & Bayen, 2004).

A 2 (Prediction condition: prediction, no prediction) x 2 (PM condition: focal, nonfocal) x 2 (LDT block: baseline, PM) mixed factorial ANOVA on the mean trimmed LDT RTs was conducted to statistically determine the extent to which making predictions differentially impacted participants' monitoring retrieval processes on PM tasks with focal and nonfocal cues leading to greater ongoing task performance costs (i.e., task interference/slower RTs).[1] No main effect of prediction condition, $F(1, 114) = 1.10$, $p = .296$, $\eta_p^2 = .010$, observed power = .18, or PM condition was found, $F(1, 114) = 1.02$, $p = .314$, $\eta_p^2 = .009$, observed power = .17. However, a main effect of LDT block was observed such that participants responded more slowly to LDT items in the PM block than in the baseline block, $F(1, 114) = 36.54$, $p < .001$, $\eta_p^2 = .243$, observed power = 1.00. No significant interactions were found, *p*s > .18. Mean RTs (in milliseconds) by prediction condition, PM condition, and LDT block can be found in Table 3.

Aim Two, Ongoing Task Accuracy

LDT accuracy was scored as the proportion of trials in which words and non-words were correctly identified out of the total number of possible trials in each LDT block (Loft, Humphreys, & Whitney, 2008; Meiser & Schult, 2008; Scullin, McDaniel, & Einstein, 2010; Smith, & Loft, 2014). LDT responses were recorded as correct if participants pressed the 'YES' key on the keyboard whenever words were presented on the screen and the 'NO' key on the keyboard whenever non-words were presented on the screen. All trials presented during the LDT counted towards the total number of possible trials except for the 10 PM target items. There were 260 trials presented in the combined baseline block and 250 trials presented in the PM block.

A 2 (Prediction condition: prediction, no prediction) x 2 (PM condition: focal, nonfocal) x 2 (LDT block: baseline, PM) mixed factorial ANOVA was conducted on the LDT accuracy scores to statistically determine the extent to which completing the PM task influenced the ability to accurately complete the LDT. No main effect of prediction condition, $F(1, 114) = .001$, $p = .973$, $\eta_p^2 = .000$, observed power = .05, or PM condition, $F(1, 114) = .013$, $p = .910$, $\eta_p^2 = .000$, observed power = .05 was found. However, a main effect of LDT block was observed such that participants correctly responded to more of the LDT items in the baseline block ($M = .93$, $SD = .04$) than in the PM block ($M = .82$, $SD = .04$), $F(1, 114) = 1385.01$, $p < .001$, $\eta_p^2 = .924$, observed power = 1.00. No significant interactions were found, ps > .19. Mean LDT accuracy scores (as proportion correct) by prediction condition, PM condition, and LDT block can be found in Table 4.

Aim Three, Prediction Accuracy and Confidence

Performance predictions were assessed using the single-item MSE questionnaire. Predictions were converted from percentages to proportions so that each participant's predicted PM performance could be subtracted from their actual PM performance which was scored as a proportion (Devolder et al., 1990; Meeks et al., 2007; Kytola & Reese-Melancon, manuscript in preparation; Rummel et al., 2013). This resulted in a prediction difference score for each participant. Low difference scores indicate that participants were more accurate in predicting their PM performance whereas high difference scores indicate that participants were less accurate in predicting their PM performance.

An independent samples t-test was conducted on the prediction difference scores to statistically determine the extent to which predictions accurately reflected actual PM performance across the PM conditions (e.g., cue focality). The results indicated that there was no significant difference between the prediction difference scores across the PM conditions, $t(56) = 1.51$, $p = .137$. The prediction score means revealed that participants in the focal PM ($M_{Diff} = .09$, $SD = .24$) and nonfocal PM ($M_{Diff} = -.02$, $SD = .32$) condition were highly accurate in predicting their ability to successfully complete the PM task. Note that two participants who met the previous outlier criteria for absolute z-scores larger than 2.5 on the LDT (Stevens, 2009) were excluded from the analysis (n = 58).

An independent samples t-test was also conducted on the mean confidence scores to statistically determine the extent to which participants' confidence about their ability to accurately predict their PM performance differed across the PM conditions (e.g., cue focality). The results showed that there was no significant difference between the confidence scores across the PM conditions, $t(56) = .298$, $p = .767$. Further, the confidence score means revealed that participants in the focal PM ($M = .83$, $SD = .22$) and nonfocal PM ($M = .82$, $SD = .18$) conditions were highly confident in predicting their ability to successfully complete the PM task.

Aim Three, Postdiction Accuracy and Confidence

Performance postdictions were also assessed using a single-item MSE questionnaire. Postdictions were converted from percentages to proportions so that each participant's postdicted PM performance could be subtracted from their actual PM performance which was scored as a proportion (Devolder et al., 1990; Meeks et al., 2007; Kytola & Reese-Melancon, manuscript in preparation; Rummel et al., 2013). This resulted in a postdiction difference score for each participant. Low difference scores indicate that participants were more accurate in postdicting their PM performance whereas high difference scores indicate that participants were less accurate in postdicting their PM performance. Since this measure was consistent across the prediction and no prediction conditions, the accuracy of postdictions for both conditions was evaluated together.

A 2 (Prediction condition: prediction, no prediction) x 2 (PM condition: focal, nonfocal) factorial ANOVA was conducted on the postdiction difference scores to statistically determine the extent to which postdictions accurately reflected actual PM performance across the PM conditions (e.g., cue focality). No main effect of prediction condition, $F(1, 114) = .097$, $p = .756$, $\eta_p^2 = .001$, observed power = .06, or PM condition, $F(1, 114) = 1.79$, $p = .184$, $\eta_p^2 = .015$, observed power = .26 was found. Additionally, no significant interaction was found, $p = .841$. The postdiction score means revealed that participants in the focal PM ($M_{Diff} = .003$, $SD = .16$) and nonfocal PM ($M_{Diff} = .05$, $SD = .18$) conditions were highly accurate in judging their ability to successfully complete the PM task.

A 2 (Prediction condition: prediction, no prediction) x 2 (PM condition: focal, nonfocal) factorial ANOVA was also conducted on the mean confidence scores to statistically determine the extent to which participants' confidence about their ability to accurately postdict their PM performance differed across the PM conditions (e.g., cue focality). No main effect of prediction condition was found, $F(1, 114) = .475$, $p = .492$, $\eta_p^2 = .004$, observed power = .11. However, a main effect of PM condition (e.g., cue focality) was observed such that confidence scores in the focal PM condition were significantly higher than confidence scores in the nonfocal PM condition, $F(1, 114) =$

8.35, $p = .005$, $\eta_p^2 = .068$, observed power = .82. A marginally significant interaction between prediction condition and PM condition was also found, $F(1, 114) = 3.66$, $p = .058$, $\eta_p^2 = .031$, observed power = .48. Follow up tests of simple effects revealed that there were significant differences in confidence scores across the PM conditions such that participants in the focal PM condition were highly confident when postdicting their ability to have successfully completed the PM task ($M = .95$, $SD = .09$) whereas those in the nonfocal PM condition were slightly less confident when postdicting their ability to have successfully completed the PM task ($M = .86$, $SD = .22$), $t(116) = 2.84$, $p = .005$. Mean performance predictions, postdictions, and confidence scores (as proportions) by prediction condition and PM condition can be found in Table 5.

Task Importance Ratings

A brief questionnaire was administered to assess how important participants thought the LDT and PM task were on a 7-item Likert scale (e.g., 1 = *little importance* to 7 = *great importance*, see Appendix J). Collapsing across all conditions, bivariate correlations calculated using Spearman's Rho (ρ) revealed a positive relationship between perceived task importance and PM performance indicating that as PM task importance ratings increased, PM performance also increased, $\rho = .30$, $p < .001$. To further investigate the relationship between perceived task importance and PM performance, a 2 (Prediction condition: prediction, no prediction) x 2 (PM condition: focal, nonfocal) x 2 (Task type: LDT, PM) mixed factorial ANOVA was conducted on the task importance ratings to statistically determine the extent to which making predictions influenced the perceived importance of the LDT and the PM tasks with focal and nonfocal cues.

No main effect of prediction condition was found, $F(1, 114) = .06$, $p = .801$, $\eta_p^2 = .001$, observed power = .06. However, a main effect of PM condition was observed such that participants in the focal PM condition ($M = 6.48$, $SD = 1.05$) had higher task importance ratings overall compared to participants in the nonfocal PM condition ($M = 6.03$, $SD = 1.73$), $F(1, 114) = 6.48$, $p = .012$, $\eta_p^2 = .054$, observed power = .71. A marginally significant main effect of task type was also found such that participants generally perceived the LDT ($M = 6.39$, $SD = 1.03$) to be more important than the PM task ($M = 6.12$, $SD = 1.48$), $F(1, 114) = 3.62$, $p = .060$, $\eta_p^2 = .031$, observed power = .47. A significant two-way interaction between prediction condition and PM condition, $F(1, 114) = 4.32$, $p = .040$, $\eta_p^2 = .037$, observed power = .54, and a marginally significant two-way interaction between task type and PM condition was also found, $F(1, 114) = 3.88$, $p = .051$, $\eta_p^2 = .033$, observed power = .50, but both were subsumed by a marginally significant three-way interaction between task type, prediction condition, and PM condition, $F(1, 114) = 3.62$, $p = .060$, $\eta_p^2 = .031$, observed power = .47. Follow-up tests of simple effects revealed that there were significant differences in task importance ratings on the LDT and PM tasks between the prediction conditions for those in the nonfocal PM condition, $t(59) = 2.20$, $p = .032$, but not in the focal PM condition, $t(57) = .129$, $p = .898$. That is, among the participants in the nonfocal PM condition, those in the prediction condition perceived the LDT and the PM task to be equally important whereas those in the no prediction condition perceived the LDT to be more important than the PM task. Mean task importance ratings by prediction condition, PM condition, and task type can be found in Table 6.

CHAPTER V

DISCUSSION

Overview of Findings

The present study yielded five primary findings. First, this study extended previous work that assessed the local MSE-MP relationship for younger adults with single-item predictions (Devolder et al., 1990; Kytola & Reese-Melancon, manuscript in preparation; Meeks et al., 2007; Rummel et al., 2013) to a sample of older adults, and found that predictions were not beneficial for improving PM performance in this population. Second, this study demonstrated the addition of the PM task led to ongoing task performance costs consistent with previous PM research (McDaniel & Einstein, 2007; Smith, 2003), but predictions did not increase monitoring retrieval processes for the PM tasks.[1] Third, this study showed that both predictions and postdictions accurately reflected actual PM performance. Fourth, this study revealed that confidence scores regarding the accuracy of predictions and postdictions were high. Fifth, this study demonstrated that there was a relationship between perceived task importance and PM performance, and that task importance ratings were differentially influenced by the predictions and PM tasks. These findings and their theoretical and applied implications are described more fully in the sections that follow.

Aim One, Prospective Memory Performance

Overall, having older adults predict their future PM performance did not have the anticipated beneficial effect on their actual PM performance in the present study, and this was true regardless of cue focality. That is, while participants who completed the PM task with focal cues (e.g., pressing F6 when *goat* was presented ten times) outperformed those who completed the PM task with nonfocal cues (e.g., pressing F6 when *animal words* were presented ten times) closely replicating previous PM research (Einstein et al., 2005; Kliegel et al., 2008; McDaniel & Einstein, 2000), predictions did not improve PM performance on either PM task. On the one hand, finding that predictions did not enhance participants' focal PM performance was not surprising because focal PM tasks tend to require fewer self-initiated retrieval processes to complete than nonfocal PM tasks (Einstein et al., 2005; Kliegel et al., 2008; McDaniel & Einstein, 2000; 2007), and PM performance was already near the peak level (i.e., a ceiling effect). However, based on previous aging research (Ihle et al., 2013; Kliegel et al., 2008), participants were not expected to perform quite as well as they did in the present study where they performed at levels equivalent to younger adults in similar studies (e.g., Kytola & Reese-Melancon, manuscript in preparation; Rummel et al., 2013) on the focal PM task. In any case, this study replicates prior work on the reactive effects of predictions on younger adults' focal PM performance and indicates that predictions may not be useful for improving the PM performance of older adults on PM tasks with focal cues.

Discovering that predictions did not enhance participants' nonfocal PM performance was largely unexpected because nonfocal PM tasks tend to require more self-initiated retrieval processes to complete than focal PM tasks (Einstein et al., 2005;

Kliegel et al., 2008; McDaniel & Einstein, 2000; 2007), and PM performance was nowhere near ceiling. Further, given that past aging research has shown that older adults often experience age-related declines in PM performance (Henry et al., 2004; Ihle et al., 2013; McDaniel & Einstein, 2000; 2007), especially on tasks that employ nonfocal cues, participants were not anticipated to perform as well as (e.g., Kytola & Reese-Melancon, manuscript in preparation) or even better than (e.g., Rummel et al., 2013) their younger counterparts in similar studies employing nonfocal PM tasks. Thus, unlike previous research on the reactive effects of predictions on younger adults' nonfocal PM performance, this study suggests that predictions may not be useful for improving the PM performance of older adults on PM tasks with nonfocal cues.

Although predictions did not enhance older adults' PM performance, there are several possible explanations for this null finding. First and foremost, the sample size utilized in the present study (N = 118) was big enough to detect medium to large effects with roughly 30 participants per cell (Cohen, 1988), but it was probably too small to detect small effects thus limiting the extent to which the data can be accurately interpreted. Given that past research examining the reactive effects of predictions on PM performance among younger adults has yielded small significant effects (e.g., Kytola & Reese-Melancon, manuscript in preparation; Meier et al., 2011) or even marginally significant effects (e.g., Rummel et al., 2013), it is reasonable to assume that the effects would be similar in size for older adults. Second, a large portion of the sample was highly educated and many participants (40%) reported successfully earning a college degree (i.e., completing 16 years of formal education, on average). As a result of having a high level of educational attainment, participants' scores on the measure of verbal intelligence were also high (Cherry & LeCompte, 1999; Cockburn & Smith, 1991; Mäntylä & Nilsson, 1997; Reese & Cherry, 2002). Third, while the sample ranged in age from 60 to 92 years old, the vast majority of participants (72%) reported being between 60 and 75 demonstrating that it was most representative of the older adult sub-age group referred to as the "young-old". Comparable to results from other studies examining PM performance in this age group (Kvavilashvili, Kornbrot, Mash, Cockburn, & Milne, 2009; Kvavilashvili, Cockburn, & Kornbrot, 2013; Kliegel & Jäger, 2006), predictions probably were not effective for improving PM because the young-old adults in the present study were able to cognitively function at an optimal level and thus perform well on the PM task on their own. In keeping with this assertion, very few participants (7.6%) in the entire sample completely forgot to carry out the PM task. Additionally, of the participants who successfully completed the PM task, almost all of them (87.3%) detected at least 5 out of the 10 target items that were presented during the ongoing LDT (i.e., performed better than chance).

In addition to the above sample size and demographic characteristics, certain properties of the PM task used in the present study may have also reduced the impact (if any) predictions would have had on older adults' PM performance. For instance, the demands of the PM task may have been too low relative to the competing demands of the ongoing task such that it was easier than anticipated for participants to remember to press the F6 key when the word *goat* or words that represented an *animal* appeared during the LDT. Consistent with McDaniel and Einstein's (2000) *MPF*, only one participant (0.8%) completely forgot to carry out the focal PM task whereas eight participants (6.8%) completely forgot to carry out the nonfocal PM task indicating that cue focality is an important factor to consider. When the influence of cue focality on PM performance was taken into consideration, nearly all participants in the focal PM condition (97%) detected the word *goat* at least 5 times out of the 10 times it was presented while fewer participants in the nonfocal PM condition (78%) detected the *animal words* at least 5 times out of the 10 times they were presented. Similar to prior PM research with younger and older adults (Ihle et al., 2013; Kliegel et al., 2008; McDaniel & Einstein, 2000; 2007; Rendell et al., 2007), this finding suggests that PM performance was measured reliably. However, even though the PM tasks employed in this study were nearly identical to the ones used in past PM research with younger adults (Kytola & Reese-Melancon, manuscript in preparation; Rummel et al. 2013), it appears that the nonfocal PM task may have more closely resembled a focal PM task (for a similar argument, see Meeks et al., 2007) thus resulting in better-than-expected PM performance for older adults. In other words, when cue focality is viewed along a continuum, the nonfocal PM task used was probably near the mid-point of the continuum between easier focal PM tasks with a single, salient cue and harder nonfocal PM tasks with several, subtle cues (Einstein et al., 2005; Harrison & Einstein, 2010; Marsh, Hicks, Cook, Hansen, & Pallos, 2003) leading to an unexpected PM performance pattern for this population.

Altogether, the aforementioned limitations of the present study likely combined to diminish the effect of predictions on the PM performance of older adults. Therefore, despite the fact that it would add some methodological variability to the extant PM literature, future research should examine whether predictions improve older adults' PM performance when: 1) a larger, more diverse (e.g., less educated and older) sample of older adults is recruited, and 2) a more challenging PM task with more subtle retrieval cues that would require individuals to employ a higher amount of effortful monitoring retrieval processes is embedded in an ongoing LDT (McDaniel & Einstein, 2000; 2007).

Aim Two, Ongoing Task Cost

The addition of the PM task led to ongoing task performance costs (i.e., task interference/slower RTs) on the LDT consistent with previous PM research (McDaniel & Einstein, 2007; Smith, 2003), but predictions did not increase older adults' monitoring retrieval processes for the PM tasks. That is, participants generally responded more slowly to the LDT items in the PM block than in the baseline block replicating prior PM work using a speeded ongoing LDT (Einstein et al., 2005; Hicks et al., 2005; Kytola & Reese-Melancon, manuscript in preparation; Meeks et al., 2007; Rummel et al., 2013). However, participants who predicted their PM performance responded similarly to those who did not predict their PM performance. Participants who completed the PM task with focal cues also responded comparably to participants who completed the PM task with nonfocal cues. Given that past PM research has demonstrated that predictions differentially increased younger adults' monitoring retrieval processes for the PM task across cue focality (Kytola & Reese-Melancon, manuscript in preparation; Rummel et al., 2013), discovering that predictions did not do so for older adults was unusual. Specifically, finding that predictions did not increase participants' monitoring retrieval processes for either PM task was surprising because it was expected that having participants predict their PM performance would make the PM task seem more important than the ongoing LDT and thus encourage them to prioritize the PM task over the LDT (for a similar view, see Kytola & Reese-Melancon, manuscript in preparation; Meeks et al., 2007; Rummel et al., 2013).

Although a relationship between perceived PM task importance and PM performance was discovered in the present study, neither participants' PM performance nor monitoring retrieval processes were related to how important the PM task and LDT were perceived to be relative to each other. In other words, participants' PM performance and LDT response times did not closely correspond with their task importance ratings like prior PM research conducted with younger adults has found (Kytola & Reese-Melancon, manuscript in preparation; Meeks et al., 2007; Rummel et al., 2013). For example, participants generally perceived the LDT to be more important than the PM task, but a different pattern emerged when cue focality was considered. Participants who completed the focal PM task perceived the PM task to be more important than the LDT whereas those who completed the nonfocal PM task perceived the LDT to be more important than the PM task. Additionally, whereas participants who predicted their nonfocal PM performance perceived the LDT and the PM task to be equally important, those who made no predictions perceived the LDT to be more important than the PM task. As such, these findings are not in line with previous PM work indicating that when task importance does positively impact older adults' PM performance, it usually comes at a cost to their ongoing task performance (Hering et al., 2013; Walter & Meier, 2014).

Despite the fact that age-related declines in attentional resources (i.e., cognitive processing speed, inhibitory control, etc.) should make it more difficult for older adults to use self-initiated retrieval cues necessary for completing PM tasks than younger adults (Craik, 1986; Henry et al., 2004; Kliegel & Jäger, 2006; Zeintl et al., 2007) and thus require them to allocate more attentional resources to the PM task than the LDT, it is important to note that participants in the present study may not have had as much trouble engaging in task switching when the PM targets appeared during the LDT because they were highly educated and primarily from the young-old age group. That is, by promoting more frequent cognitive activity and thus maintaining speed of processing and inhibitory abilities longer (Salthouse, 1996), participants' high level of education and relatively young age likely reduced the need to significantly slow down their responses on the LDT within certain parameters to detect the PM target items and ultimately carry out the PM task. Alternatively, given that participants correctly responded to more of the LDT items in the baseline block than in the PM block, it is also possible that they experienced ongoing task performance costs in the form of decreased response accuracy rather than increased response times.

Overall, the findings suggest that having older adults make predictions about their future PM performance did not influence the allocation of attentional resources to the PM task or the LDT above and beyond general dual-task processing by way of increasing the perceived importance of the PM task (Kytola & Reese-Melancon, manuscript in preparation, Meeks et al. 2007; Rummel et al. 2013). Therefore, to better understand the extent to which predictions, cue focality, and/or perceived task importance may impact monitoring retrieval processes for PM tasks in the present study, more sophisticated statistical analyses examining additional variables such as cognitive processing speed (e.g., TMT, Part A; Reitan & Wolfson, 1985), task switching (TMT, Part B; Reitan & Wolfson, 1985), inhibitory control (e.g., late PM key presses), and self-reported strategy use will need to be conducted.[1] Future studies should also more thoroughly examine the speed versus accuracy trade-off to determine whether predictions result in ongoing task performance costs differently in older adults than in younger adults.

Aim Three, Prediction and Postdiction Accuracy/Confidence

Older adults accurately predicted their PM performance on PM tasks with focal and nonfocal cues extending Devolder et al.'s (1990) findings for older adult performance on a naturalistic, time-based PM task to laboratory, event-based PM tasks. Although few participants (14%) predicted their PM performance with perfect accuracy, it is evident that most (80%) understood the demands of the PM tasks with focal and nonfocal cues because the discrepancy between their predicted and actual PM performance was essentially nonexistent or small. Finding that participants were highly accurate in predicting their PM performance on PM tasks with focal and nonfocal cues was somewhat unexpected as prior research has shown that younger adults tend to be more accurate in predicting their focal PM performance than in predicting their nonfocal PM performance (Kytola & Reese-Melancon, manuscript in preparation; Rummel et al., 2013). However, this result is closely in line with RM research demonstrating that older adults are often more accurate in predicting their RM performance than younger adults (Beaudoin & Desrichard, 2011; Connor et al., 1997; Crumley et al., 2014; Pearman & Trujillo, 2013, but see Devolder et al., 1990), and suggests that predictions were measured reliably in the present study. As also indicated by the predictions, older adults were highly confident in their ability to carry out both of the PM tasks. That is, participants were equally confident in their abilities to complete the focal and nonfocal PM tasks. This finding was surprising because work suggests that older adults perform worse than younger adults on some PM tasks as a result of having lower levels of confidence in their PM abilities (Crumley et al., 2014; Pearman & Trujillo, 2013). Moreover, given that past PM research shows that focal and nonfocal PM tasks require different amounts of self-initiated retrieval processes to complete (Einstein et al., 2005; Kliegel et al., 2008; McDaniel & Einstein, 2000; 2007), it was anticipated that participants' confidence levels would be higher on the PM task with focal cues than the PM task with nonfocal cues, but this pattern was not found in the present study. Taken together, the findings indicate that older adults performed well on PM tasks that had different retrieval processing demands and they were highly confident in their ability to do so indicating that this high level of confidence was warranted.

A similar pattern of results emerged for postdictions. That is, participants accurately postdicted their PM performance on PM tasks with focal and nonfocal cues. Given that the discrepancy between their postdicted and actual PM performance was nearly absent, it is apparent that almost all participants (95%) understood how well they performed on the PM task. In keeping with past work (Devolder et al., 1990; Kytola & Reese-Melancon, manuscript in preparation; Meeks et al., 2007), participants were slightly more accurate in postdicting their past PM performance than in predicting their future PM performance providing support for the notion that "hindsight is 20/20". As further indicated by the postdictions, older adults were highly confident that they successfully carried out both of the PM tasks. However, participants were more confident that they completed the focal PM task than the nonfocal PM task. Although participants' confidence level estimates regarding how well they performed the PM task were not expected to vary across cue focality, this finding fits with both the *ESH* (Craik, 1986) and the *MPF* (McDaniel & Einstein, 2000) because it may be more difficult for older adults to definitively remember whether they detected the subtle cues employed in the nonfocal PM task than the salient cues presented in the focal PM task. Since participants performed significantly better on the focal PM task than on the nonfocal PM task, the findings demonstrate that older adults accurately judged the extent to which they performed the PM tasks with focal and nonfocal cues and they were highly confident in their ability to do so indicating that this high level of confidence was also warranted.

Given that participants were highly accurate in predicting and postdicting their PM performance on tasks that had different retrieval processing demands, the findings indicate that older adults do not have a general view of their PM abilities that applies to all PM situations. Instead, older adults' views of their PM abilities likely vary with the demands of the particular PM task they are trying to accomplish (for a similar view, see Crumley et al., 2014; Kytola & Reese-Melancon, manuscript in preparation). Further, they suggest that older adults not only have ample awareness of the demands required to complete certain PM tasks in relation to their ability to complete those PM tasks, but they also have sufficient output monitoring abilities that allow them to remember that a PM task has already been completed (Einstein & McDaniel, 1990; Einstein et al., 1998; Marsh, Hicks, Hancock, & Munsayac, 2002; Marsh, Hicks, Cook, & Mayhorn, 2007; Masumoto, Nishimura, Tabuchi, & Fujita, 2011; Park et al., 1997; Rendell & Thomson, 1999; Skladzien, 2010). Given all of the negative stereotypes associated with aging (Bensadon, 2015; Chasteen, Kang, & Remedios, 2012), it is tremendously encouraging to discover that older adults are quite capable of determining which types of PM tasks they will be able to successfully complete, and in turn, avoid frequent PM lapses that would make it more difficult to live independently throughout later adulthood.

Implications

The present research has several important theoretical and practical implications. First, in addition to contributing to both the metamemory and the PM literature with younger adults (Devolder et al., 1990; Kytola & Reese-Melancon, manuscript in preparation; Meeks et al., 2007; Rummel et al., 2013) in a replicatory fashion by examining the influence of memory beliefs (as indexed by performance predictions and postdictions) on PM performance, this study was the first to extend past research to a sample of older adults by examining the local MSE-MP relationship for PM using predictions with confidence estimates. Although utilizing this particular approach added some methodological variability to the extant PM literature, it ultimately helped bridge the large gap between recent research on the relationship between local MSE and PM for younger adults (Kytola & Reese-Melancon, manuscript in preparation; Meeks et al., 2007; Meier et al., 2011; Rummel et al., 2013) and past research (Devolder et al., 1990) on this relationship for older adults. Consequently, this study should help researchers better understand the local MSE-MP relationship for PM from another useful perspective. Second, concurrent data collection with younger adults will be utilized to make a direct age comparison using identical methodologies. Once all of the younger adult data is collected, the combined results should provide researchers with even more useful information about the relationship between local MSE and PM from a developmental perspective. Third, from an applied standpoint, this study and its extension should allow researchers to determine whether a future intervention program focused on teaching individuals (either younger or older) to use predictions as a strategy to improve their PM performance will be necessary and/or effective. In the event that predictions are not found to be beneficial for enhancing individuals' PM performance in the present investigation, follow-up studies could examine whether they would be useful for improving the PM performance of individuals in different clinical subpopulations such as those with traumatic brain injury (TBI) or dementia.

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FOOTNOTES

[1]A combined baseline block approach was used to analyze the trimmed lexical decision task (LDT) response time (RT) data. However, more sophisticated statistical analyses should be conducted in the future to more fully understand these data.

APPENDICES

APPENDIX A

6-ITEM COGNITIVE IMPAIRMENT TEST

Date:

Name of Assessor:

Participant Number (P#):

Question	Scoring	Score
1. What year is it?	**0 – 4** Correct – 0 points Incorrect – 4 points	
2. What month is it?	**0 – 3** Correct – 0 points Incorrect – 3 points	
3. Can you please remember this address for later? **John, Smith, 42, Elm Street, Orlando**		
4. Without using your wristwatch, can you tell me about what time it is?	**0 – 3** Correct – 0 points Incorrect – 3 points	
5. Can you count backwards from 20 to 1? **20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1**	**0- 4** Correct – 0 points 1 error – 2 points More than 1 error – 4 points	
6. Can you say the months of the year in reverse? **Dec Nov Oct Sep Aug Jul Jun May Apr Mar Feb Jan**	**0- 4** Correct – 0 points 1 error – 2 points More than 1 error – 4 points	
7. Can you please repeat the address I gave you earlier? **John, Smith, 42, Elm Street, Orlando**	**0 – 10** Correct – 0 points 1 error – 2 points 2 errors – 4 points 3 errors – 6 points 4 errors – 8 points	
TOTAL SCORE	**0 – 28**	**/28**

Outcome from Score

0-7 = normal	Referral not necessary at
8-9 = mild cognitive impairment	Probably refer
10-28 = significant cognitive	Refer

APPENDIX B

GERIATRIC DEPRESSION SCALE

INSTRUCTIONS: For each question below, choose the best answer (circle one) that describes how you have felt over the past week.

1. Are you basically satisfied with your life?

YES / NO

2. Have you dropped many of your activities and interests?

YES / NO

3. Do you feel that your life is empty?

YES / NO

4. Do you often get bored?

YES / NO

5. Are you in good spirits most of the time?

YES / NO

6. Are you afraid that something bad is going to happen to you?

YES / NO

7. Do you feel happy most of the time?

YES / NO

8. Do you often feel helpless?

YES / NO

9. Do you prefer to stay at home, rather than going out and doing new things?

YES / NO

10. Do you feel you have more problems with memory than most?

YES / NO

11. Do you think it is wonderful to be alive now?

YES / NO

12. Do you feel pretty worthless the way you are now?

YES / NO

13. Do you feel full of energy?

YES / NO

14. Do you feel that your situation is hopeless?

YES / NO

15. Do you think that most people are better off than you are?

YES / NO

APPENDIX C

DEMOGRAPHIC QUESTIONNAIRE

<u>INSTRUCTIONS</u>: Demographics questionnaires are used to obtain common information about participants. This information will help describe our participants in a general way, and may also be used to distinguish one group of participants from others (for example, by gender). Current health, certain diagnoses, or previous psychophysiological trauma might influence performance on some of the tasks used in this study. Thus, some of the following questions pertain to such issues. *If at any point you feel uncomfortable answering a question, you may omit it*.

1. How would you rate your health at the present time (circle one)?

1. Excellent
2. Good
3. Fair
4. Poor

2. How much do health troubles stand in the way of you doing things you want to do (circle one)?

1. Not at all
2. A little (some)
3. A lot

3. Do you think your health is better, the same as, or worse than most people your age (circle one)?

1. Better
2. Same
3. Worse

4. Sex:

Male / Female (circle one)

5. Age: _______

6. Ethnic background (choose all that apply):
___ Caucasian
___ African American
___ Native American
___ Hispanic/Latino
___ Asian
___ Do not choose to indicate

7. Your marital status (circle one):

1. Never married
2. Married
3. Divorced or separated
4. Widowed

8. Your occupation: ______________________
(if retired, before retirement)

9. If married, your spouses' occupation: ______________________
(if retired, before retirement)

10. How many years of formal education have you completed? __________
(e.g., 9 years = 9th grade; 12 years = high school graduate; 16 years = college graduate)

11. Have you ever been knocked unconscious (circle one)?

Yes / No

1. If yes, how long were you unconscious? ___________
2. How old were you at the time? ___________

12. Many people feel older or younger than they actually are.
What age do you feel most of the time? __________

13. Are you taking any medications that are known to impact your thinking and/or memory (circle one)?

Yes / No / Don't Know

14. Is English your first language (circle one)?

Yes / No

If no, what is? _______

APPENDIX D

FOCAL PM PREDICTION QUESTIONNAIRE

1. What percentage of the goat words do you think you can detect during the word judgment task? (circle one)

0% 10 20 30 40 50 60 70 80 90 100%

2. How confident are you that you can detect _____% of the goat words during the word judgment task? (circle one)

0% 10 20 30 40 50 60 70 80 90 100%

APPENDIX E

NONFOCAL PM PREDICTION QUESTIONNAIRE

1. What percentage of the animal words do you think you can detect during the word judgment task? (circle one)

0% 10 20 30 40 50 60 70 80 90 100%

2. How confident are you that you can detect _____% of the animal words during the word judgment task? (circle one)

0% 10 20 30 40 50 60 70 80 90 100%

APPENDIX F

FOCAL PM POSTDICTION QUESTIONNAIRE

1. What percentage of the goat words do you think you successfully detected during the word judgment task? (circle one)

0% 10 20 30 40 50 60 70 80 90 100%

2. How confident are you that you successfully detected _____% of the goat words during the word judgment task? (circle one)

0% 10 20 30 40 50 60 70 80 90 100%

APPENDIX G

NONFOCAL PM POSTDICTION QUESTIONNAIRE

1. What percentage of the animal words do you think you successfully detected during the word judgment task? (circle one)

0% 10 20 30 40 50 60 70 80 90 100%

2. How confident are you that you successfully detected _____% of the animal words during the word judgment task? (circle one)

0% 10 20 30 40 50 60 70 80 90 100%

APPENDIX H

FOCAL PM POST-TEST QUESTIONNAIRE

Q1: Immediately following the LDT task, record exactly what participants say when asked: *Earlier in the experiment, I asked you to do something else, in addition to making the word judgments. Do you remember what that was*? Write down their exact responses exactly how they say them.

PROMPT 1: *Earlier in the experiment, I told you that we were also interested in people's ability to remember to do things in the future. At that time, I asked you to do something else, in addition to making the word judgments. Do you remember what that was*?

PROMPT 2: *Remember, I wanted you to press a certain key on the keyboard when you saw a certain word. Do you remember what the key and the word were*?

If the participant says *I was to press F6.* Then ask them, *When were you supposed to press F6*?

If the participant says, *I was to respond to the word goat.* Then ask them, *What key on the key board were you supposed to press when you saw the word goat*?

PROMPT 3: *Earlier I asked you to press the F6 key on the keyboard* (point to the key as you say it) *when you saw the goat word while making word judgments. Do you remember me saying that?*

APPENDIX I

NONFOCAL PM POST-TEST QUESTIONNAIRE

Q1: Immediately following the LDT task, record exactly what participants say when asked: *Earlier in the experiment, I asked you to do something else, in addition to making the word judgments. Do you remember what that was*? Write down their exact responses exactly how they say them.

PROMPT 1: *Earlier in the experiment, I told you that we were also interested in people's ability to remember to do things in the future. At that time, I asked you to do something else, in addition to making the word judgments. Do you remember what that was*?

PROMPT 2: *Remember, I wanted you to press a certain key on the keyboard when you saw certain words. Do you remember what the key and the words were*?

If the participant says *I was to press F6.* Then ask them, *When were you supposed to press F6*?

If the participant says, *I was to respond to animal words.* Then ask them, *What key on the key board were you supposed to press when you saw the animal words*?

PROMPT 3: *Earlier I asked you to press the F6 key on the keyboard* (point to the key as you say it) *when you saw the animal words word while making word judgments. Do you remember me saying that?*

APPENDIX J

PM IMPORTANCE QUESTIONNAIRE

INSTRUCTIONS: For each question below, please rate on a 7-point scale the amount of importance you placed on each task. For example, if you placed a lot of emphasis on the word judgment task and not much emphasis on remembering to press the F6 key in response to a cue word, you would circle a 6 or 7 on the first question, and a 1 or 2 on the second question. Please use the full range of the scale and indicate (circle one) how little or how much importance you placed on each task.

	Little importance						A lot of importance
1. Correctly deciding whether the item presented was a word or not.	1	2	3	4	5	6	7
2. Remembering to press the F6 key in response to the cue words.	1	2	3	4	5	6	7

APPENDIX K

FOCAL PM STRATEGY QUESTIONNAIRE

1. Was there anything you did during the course of today's experiment to help you to remember to press F6 when you saw the goat words? Write down whatever they say exactly how they say it.

____

____

____

2. If the participant says no, say, how do you think you remembered to press F6 when you saw the goat words? Again, just write down whatever they say exactly how they say it.

____

____

____

APPENDIX L

NONFOCAL PM STRATEGY QUESTIONNAIRE

1. Was there anything you did during the course of today's experiment to help you to remember to press F6 when you saw the animal words? Write down whatever they say exactly how they say it.

____

____

____

2. If the participant says no, say, how do you think you remembered to press F6 when you saw the animal words? Again, just write down whatever they say exactly how they say it.

____

____

____

Table 1

Demographic and Individual Difference Measures by Prediction Condition and PM Condition

	Prediction Condition			
	No Prediction		Prediction	
	Focal	Nonfocal	Focal	Nonfocal
Age	72.30 (7.71)	71.77 (7.89)	71.21 (6.00)	74.10 (8.19)
Education[a]	16.40 (3.74)	15.57 (2.83)	16.04 (2.74)	16.17 (2.98)
Health[b]	1.77 (.73)	2.03 (.93)	1.89 (.74)	1.93 (.74)
Vocabulary	18.37 (5.18)	19.63 (4.06)	21.54 (4.90)	18.63 (3.84)
BDS[c]	3.73 (.81)	3.70 (1.04)	3.79 (.70)	3.98 (1.01)
SJS[c]	3.02 (.64)	3.03 (.47)	3.16 (.36)	3.02 (.52)

Note. $N = 118$, 28 per cell in the prediction/focal PM condition and 30 per cell in all other conditions. Standard deviations are in parentheses.

[a]Education (9 years = 9th grade, 12 years = high school degree, 16 years = undergraduate degree, 16+ years = graduate degree).

[b]Health at the present time on a 4-point Likert scale (1 = excellent to 4 = poor).

[c]Working memory measures: Backward Digit Span and Size Judgment Span scores range from 2 to 8.

Table 2

Mean Prospective Memory Performance (as proportion correct) by Prediction Condition and PM Condition

	Prediction Condition	
	No Prediction	Prediction
Focal	.88 (.21)	.92 (.15)
Nonfocal	.66 (.36)	.74 (.33)
Total	.77 (.31)	.83 (.27)

Note. *N* = 118, 58 in the focal PM condition and 60 in the nonfocal PM condition. Standard deviations are in parentheses.

Table 3

Mean Lexical Decision Response Times (in milliseconds) by Prediction Condition, PM Condition, and LDT Block

	Prediction Condition			
	No Prediction		Prediction	
	Focal	Nonfocal	Focal	Nonfocal
Baseline	792 (138)	825 (159)	819 (130)	837 (117)
PM	828 (139)	847 (159)	851 (132)	887 (143)

Note. Standard deviations are in parentheses.

Table 4

Mean Lexical Decision Accuracy (as proportions) by Prediction Condition, PM Condition, and LDT Block

	Prediction Condition			
	No Prediction		Prediction	
	Focal	Nonfocal	Focal	Nonfocal
Baseline	.93 (.05)	.92 (.06)	.92 (.04)	.93 (.04)
PM	.82 (.02)	.82 (.06)	.82 (.03)	.82 (.04)

Table 5

Mean Performance Predictions, Postdictions, and Confidence Scores (as proportions) by Prediction Condition and PM Condition

	Prediction Condition			
	No Prediction		Prediction	
	Focal	Nonfocal	Focal	Nonfocal
Prediction			.83 (.18)	.76 (.22)
Confidence			.83 (.22)	.82 (.18)
PM Performance	.88 (.21)	.66 (.36)	.92 (.15)	.74 (.33)
Pred. Difference Score			.09 (.24)	-0.02 (.32)
Postdiction	.87 (.14)	.60 (.38)	.92 (.11)	.69 (.34)
Confidence	.93 (.10)	.90 (.20)	.96 (.09)	.82 (23)
Post. Difference Score	.001 (.10)	.06 (.18)	.00 (.10)	0.05 (.19)

Note. Standard deviations are in parentheses.

Table 6

Mean Task Importance Ratings by Prediction Condition, PM Condition, and Task Type

	Prediction Condition			
	No Prediction		Prediction	
	Focal	Nonfocal	Focal	Nonfocal
LDT	6.20 (1.40)	6.67 (.76)	6.75 (.44)	5.93 (1.05)
PM	6.43 (1.17)	5.80 (1.65)	6.54 (.92)	5.70 (1.84)

Note. The 7-item Likert scale ranged from 1 (*little importance*) to 7 (*great importance*). Standard deviations are in parentheses.

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