A MOTIVATIONAL-COGNITIVE MODEL OF PROSPECTIVE MEMORY: THE INFLUENCE OF GOAL RELEVANCE

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ABSTRACT

Prospective memory is defined as memory for actions to be performed in the future, such as remembering to take a medication or remembering to mail a bill. A cognitive approach has yielded significant advances in our understanding of prospective memory processes. However, in this chapter, we argue that further insight can be gained by integrating motivational constructs. Specifically, we outline a new, goal-based motivational-cognitive model of prospective memory in which goal-related prospective memories are viewed as benefiting from both effortful and automatic processing throughout all phases of the prospective memory task. Drawing on contemporary goal frameworks, the new model views goals as knowledge structures with associative links to prospective memories. As a result of these associative connections, goal-related prospective memories are predicted (a) to be perceived as more important, (b) to benefit from greater use of mnemonic strategies, (c) to show greater accessibility in memory, (d) to show preferential allocation of attention during retrieval and performance, and (e) to benefit from automatic retrieval processes. Consequently, these processes are predicted to contribute to superior performance for goal-related prospective memories. In this chapter, we also review evidence that supports our new model. By guiding research into the motivational processes contributing to prospective memory, we hope to contribute to a more complete and ecologically valid understanding of prospective memory performance.

Keywords: Cognitive, Goal, Motivational, Memory, Psychologists

I. INTRODUCTION

If a person has a reputation for forgetting to do things he is supposed to do. For instance, he was supposed to remember to mail a package. Although he thought about performing this task on several occasions, when the fateful time arrived it did not occur to him, and he forgot the task. Cognitive psychologists refer to his problem as a failure of prospective memory, which is defined as memory for activities to be performed in the future. Naturally occurring prospective memory tasks are ubiquitous and range from relatively mundane tasks (e.g., a parent remembering to pack a lunch for his or her child or a colleague remembering to include an attachment for an email message) to potentially highly consequential tasks (e.g., an airline pilot remembering to set the wing flaps for takeoff or a diabetic remembering to check blood sugar levels).

The person's generally poor prospective memory performance is not always apparent: He does remember to do certain things. For instance, as a season ticket holder for the local university's men's basketball team, he has to

remember to turn in his season ticket request each year by a specific date in order to keep his seats, which are in a prime location (tenth row). For the past five years, he has unfailingly performed this task. His performance record is also very good for important prospective memory tasks related to his job as a professor. For example, he has forgotten to attend only 1 of his 100+ committee meetings for graduate student theses and dissertations in the past nine years. These personal examples illustrate the fundamental point of this chapter: Motivational factors need to be considered in understanding prospective memory performance.

II. CURRENT STATE OF RESEARCH ON PROSPECTIVE MEMORY

Almost all research on prospective memory has been conducted by cognitive psychologists. Research on this topic is newer and less plentiful than research on retrospective memory, which refers to memory for past events or for information acquired in the past. However, in the past two decades, the field of prospective memory research has expanded greatly. Although there are some similarities between prospective memory and retrospective memory, there is sufficient evidence to support the idea that prospective memory is a distinct construct. In fact, recent evidence has shown differences in brain activity underlying prospective and retrospective memory tasks. Research on prospective memory has yielded significant advances in our understanding of the cognitive processes involved. First, prospective memory appears best conceptualized as a multiphase process (e.g., Ellis, 1996; Kliegel, Martin, McDaniel, & Einstein, 2002). In a model proposed by Kliegel et al. (2002), a prospective memory task includes four phases: intention formation, intention retention, intention initiation, and intention execution. An everyday example of these phases might include deciding to fill up the gas tank when starting the car (intention formation), maintaining this intention during the drive (the retention interval), noticing a gas station and retrieving the intended action from memory (intention initiation), and finally, turning in to the gas station and filling the tank (intention execution). Kliegel et al. (2002) provided support for this multiphase model with evidence showing that different types of executive processes in working memory support different phases of the prospective memory task.

Second, multiple studies have provided information on the role of attention resources in prospective memory. There is evidence that prospective memory performance can suffer when resources for strategic (attention demanding) processing are more scarce (e.g., Penningroth, 2005a; Smith, 2003). However, according to the multi-process theory of prospective memory (McDaniel & Einstein, 2000), retrieval of intentions can be relatively automatic or strategic, depending on characteristics of the task, the cue, the ongoing task, and the individual. If retrieval of intentions occurs automatically, the impact of scarce attention resources should be less significant. In fact, prospective memory performance has been found to utilize both automatic and strategic processes. For example, using a computerized prospective memory task, Einstein et al. (2005) were able to demonstrate either controlled monitoring for the prospective memory cue (e.g., increased RT in the concurrent ongoing task) or spontaneous retrieval (e.g., no increase in RT in the ongoing task). Consistent with predictions of the multi-process model, the type of retrieval processing depended on manipulations of task features. For example, when the ongoing task required focal processing of potential prospective memory cues, prospective memory retrieval was more spontaneous.

The findings presented above illustrate just a few of the developments that have occurred in prospective memory research. Clearly, a cognitive approach to prospective memory research has led to significant advances in our understanding of this complex task. However, we argue that this research has been limited by its predominantly "cold" cognitive focus. More specifically, we argue for integrating "hot" motivational constructs into the study of prospective memory. As illustrated by the second author's personal anecdotes described in the beginning of this chapter, all prospective memories are not alike. Some are more important. Understanding the contribution of motivation to prospective memory performance may advance our current understanding.

III. RATIONALE FOR INVESTIGATING MOTIVATIONAL FACTORS IN PROSPECTIVE MEMORY

Our proposal for incorporating motivational variables into the study of prospective memory is based on three justifications. First, this approach will improve the ecological validity of prospective memory research. An examination of everyday prospective memory tasks for an individual reveals multiple tasks that must be coordinated with each other and with other activities of the day. Under what circumstances is a person more likely to forget to perform a prospective memory task? We argue that motivational variables may help to explain when an individual is likely to exhibit superior or inferior prospective memory performance. Second, researchers in the field of prospective memory have recognized the need to also study motivational variables in prospective memory (e.g., Ellis, 1996, Kliegel et al., 2002; McDaniel & Einstein, 2000).

Third, a motivational approach might also inform research on prospective memory and aging, which has produced paradoxical findings. On laboratory tasks, young adults usually outperform older adults (e.g., Cherry, et al., 2001; Dobbs & Rule, 1987; for exceptions, see Einstein & McDaniel, 1990; Einstein, McDaniel, Richardson, Guynn, & Cunfer, 1995). However, in naturalistic settings, older adults usually perform as well as, or even better than, young adults (e.g., Rendell & Thomson, 1999). For instance, older adults have been shown to outperform young adults on such naturalistic tasks as telephoning the experimenter over the course of two weeks (Moscovitch, 1982), mailing postcards to the experimenter (Patton & Meit, 1993), and performing assigned tasks during their real-life activities that approximated intentions like taking medications (Rendell & Craik, 2000). The reasons for this paradox are still unclear, and they will probably prove to be complex, but motivational factors seem to be likely contributors to an explanation for the paradoxical findings (e.g., Rendell & Craik, 2000).

IV. MOTIVATIONAL-COGNITIVE MODEL OF PROSPECTIVE MEMORY: THE INFLUENCE OF GOALS

The study of motivation within psychology has been marked in the past by a diversity of "classic" theories (Allport, 1950; Freud, 1923; Maslow, 1954; Rogers, 1961). Today, however, researchers interested in motivation are in agreement about its basic underlying cognitive and affective processes (Bandura, 1986, 1999; Carver & Scheier, 1998; Deci & Ryan, 1985; Gollwitzer & Bargh, 1996; Higgens & Sorrentino, 1990; Kruglanski, 1996; Mischel, Cantor, & Feldman, 1996). A construct that is fundamental in these contemporary conceptions of motivation is goals.

V. CONTEMPORARY GOAL MODELS

A goal refers to a mental representation of the aim of a course of action (Kruglanski, 1996; Locke & Latham, 1990). Goals appear to be organized hierarchically. For instance, one may have the goals of reading Steinbeck's *Of Mice and Men*, joining a writing group, and completing a bachelor degree in English. Although these are separate goals, and each may require different skills, they cohere for the individual, who sees them all as contributing to the larger goal of becoming a writer. Also, goals can vary in terms of whether they are temporarily adopted or chronically accessible. For instance, a runner might have the current goal of getting knee surgery so that she can run again. This goal is likely to be temporary and will no longer exist after the surgery. However, that same individual might also have the goal of being a good parent to her son, which is a more permanent goal. Goals differ along a number of other qualitative and quantitative dimensions, as well, including content, specificity, level of challenge or difficulty, and proximity (Locke & Latham, 1990).

Goal representations have been shown to influence attention, thoughts, affect, and behavior (e.g., Bargh, Chen, & Burrows, 1996; Bargh & Gollwitzer, 1994; Roberson, 1989). In short, goals are motivating. For instance, goals direct people's attention to goal-related activities that are required for goal success (Rothkopf & Billington, 1975), influence thinking about activities related to the goal (Klinger, Barta, & Maxeiner, 1980), lead to feelings of satisfaction or dissatisfaction depending on how goal-related performances are subjectively evaluated (Carver & Scheier, 1990; Higgins, 1987), and enhance effort and persistence for behaviors that lead to goal success (Earley, Wojnaroski, & Prest, 1987; Huber & Neale, 1987).

Goals also have been found to be embedded in larger cognitive networks, networks that would appear to be involved in prospective memory performance. In the goal systems theory developed by Kruglanski, Shah, and colleagues, goal representations are linked to representations for the "means" for achieving the goals (e.g., Kruglanski et al., 2002; Shah & Kruglanski, 2003). For example, a person might have the goal of being intelligent, and this goal representation might be linked to the representation for the activity of studying. We suggest that prospective memories, as more specific intentions, are represented at a level subordinate to representations for activities. For example, a person might have the prospective memory "study tomorrow at 2pm in the library," which is linked to the activity of studying, which itself is linked to the goal of being intelligent. In this scenario, the prospective memory would be linked to the goal through associative links and would benefit from such associative connections.

There is evidence that entities in goal networks are associatively linked, including evidence that goals influence the accessibility and performance of subordinate constructs. For instance, there is evidence of top-down activation from goals to means (e.g., Fishbach, Shah, & Kruglanski, 2004). Further, Sheeran, Webb, and Gollwitzer (2005) tested whether superordinate goals influence the performance of related implementation intentions. Implementation intentions are formed by consciously rehearsing a detailed implementation plan (e.g., "If situation X occurs, then I will perform behavior Y;" Gollwitzer, 1993). Sheeran et al. (2005) found that implementation intentions worked better (e.g., participants solved more puzzles) if they were related to an active or strong superordinate goal (e.g., speed). Therefore, superordinate goals again showed "top-down" activation, but, in this case, for a specific type of intention learned in the lab (implementation intentions). These lines of evidence from goals research strengthen our central argument: Namely, top-down activation from goals will influence performance for naturally occurring intentions, or real-life prospective memories.

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ISSN (online): 2348 – 7550

5.1 OVERVIEW OF THE MODEL

Our new motivational-cognitive model of prospective memory is summarized in Figure 1. This is a working model that represents possible relationships between some of the motivational and cognitive variables in prospective memory. That is, some of the proposed links in the model have been tested empirically, but some of the links have not yet been tested. Thus, we hope that this model serves as both an organizing aid for existing evidence and a guide for future research. Central to the model is the notion that prospective memory performance is influenced by goal representations. Specifically, we argue that prospective memories related to goals will be more "motivated," and as such will benefit from top-down "hot" motivational influences. As a result, we argue that goal-related prospective memories will be viewed as more important. The influence of these motivational processes will be such that goal-related (more important) prospective memories will benefit from both effortful and automatic processing throughout all phases of the prospective memory task.

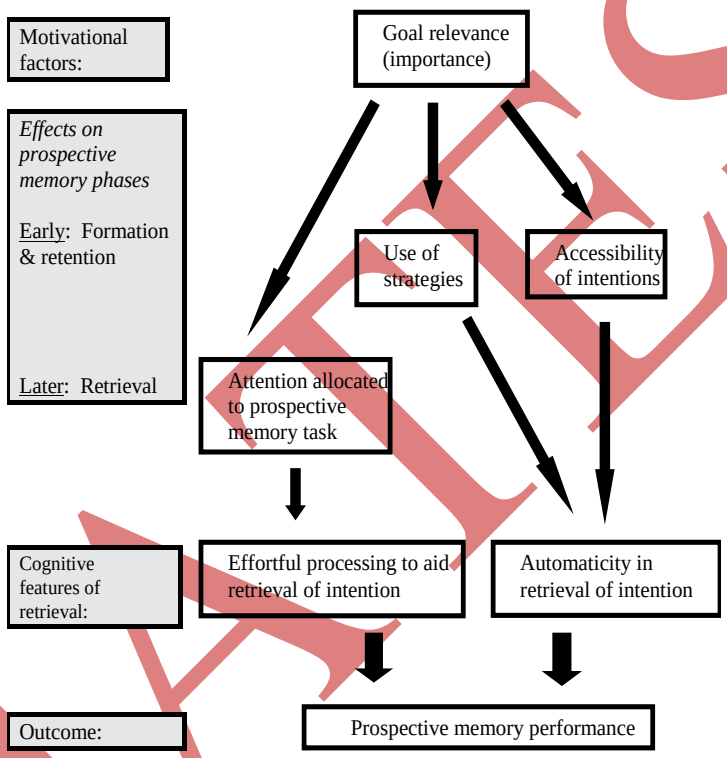

Figure 1. A goal-based motivational-cognitive model of prospective memory.

5.2 EVIDENCE FOR THE GOAL-BASED MOTIVATIONAL-COGNITIVE MODEL OF PROSPECTIVE MEMORY

In the remainder of this chapter, we review evidence supporting our goal-based motivational cognitive model of prospective memory. First, we will review evidence supporting our prediction that goal-related prospective memories will be viewed as subjectively more important. We then present evidence that prospective memories related to goals show benefits in processing (effortful or automatic processing) in various phases of the task. Specifically, we present new evidence showing that goal-related prospective memories show benefits in early phases of the task, from greater use of mnemonic strategies. We also present new findings that show that goal-related prospective memories are more accessible than other prospective memories during the intention retention phase. Finally, we review past research that shows that prospective memory tasks that are linked to an active

goal are performed better, apparently because of increased attention allocated to monitoring for the prospective memory cue.

5.3 A STUDY TO TEST WHETHER GOAL-RELEVANT PROSPECTIVE MEMORY TASKS ARE JUDGED AS MORE IMPORTANT

In our model, we predicted a positive correlation between goal relatedness of prospective memories and perceived task importance. Specifically, individuals ought to rate tasks related to their personal goals as more important than tasks that are not related to their personal goals.

To test this prediction, we used a questionnaire method to assess real-life prospective memories and goals in a sample of 27 college students (age 18 – 30). In the questionnaire, participants were asked to list five prospective memories, or specific examples of things they wanted to remember to do (defined as appointments, tasks, and other things they wanted to remember to do). They then rated the importance of each of these prospective memory tasks. In a later section of the questionnaire, participants considered each prospective memory task they had listed and then indicated if the tasks were related to their goals in specific categories. The categories were adapted from Nurmi (1992). Fourteen goal categories were listed, including "profession/occupation," "property/possessions," "your education," and "your health." Thus, for each of their five prospective memory tasks, participants first indicated whether the task was related to a personal goal they had for profession/occupation, then for property/possessions, and so on. In the questionnaire section that preceded this goal-category task, participants had listed up to four of their own specific personal goals. Two independent raters later categorized these listed goals into the same 14 goal categories.

We then categorized participants' listed five prospective memory tasks into two categories, "goal-related" and "not goal-related." We used a fairly conservative method for defining prospective memory tasks as "goal-related," requiring such tasks to meet two criteria. First, the participant must have indicated that the prospective memory task was related to a specific goal category (from the 14 goal categories listed). Second, that goal category had to be highly accessible for the participant. Goal categories were defined as highly accessible if the participant had listed a personal goal in that category in the section of the questionnaire that asked respondents to list four current goals. For example, the prospective memory task *go to Biology study group* would be classified as "goal-relevant" if (a) the participant had specified that that particular task was related to his or her goals for education, and (b) the participant had listed at least one current goal that was categorized as an education goal by the independent raters. Therefore, goal-relatedness of prospective memory tasks was a within-groups variable. The dependent variable was rated importance of the prospective memory task.

In short, we found that prospective memory tasks that were related to personal goals were rated as more important (see Figure 2). These results support our claim that prospective memory task importance is really measuring goal relevance. In other words, we argue that another way to think about important tasks is as tasks that are related to one's current goals. Goals can be self-chosen or assigned (e.g., when an experimenter assigns participants the goal of prioritizing the prospective memory task over the ongoing task) and can be short-term or long-term. Therefore, in the studies described in the remainder of this chapter, we equate prospective memory task importance with goal-relatedness.

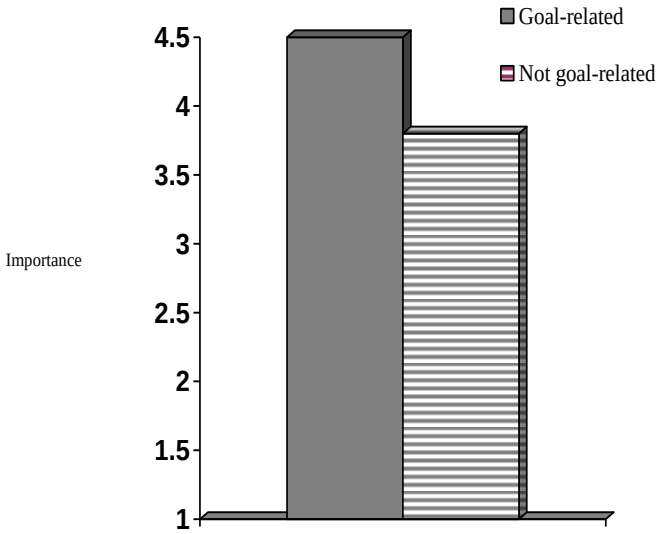

Figure 2. Mean Importance Ratings For Real Prospective Memory Tasks, By Goal-Relatedness. Note: Importance Ratings: 1 = Low, 2 = Low-Medium, 3 = Medium, 4 =Medium-High, And 5 = High.

5.4 INFLUENCES OF GOALS DURING EARLY AND MIDDLE PHASES OF THE PROSPECTIVE MEMORY TASK

5.4.1 TWO STUDIES TO TEST WHETHER PEOPLE USE STRATEGIES MORE FREQUENTLY FOR GOAL-RELEVANT PROSPECTIVE MEMORY TASKS

One way individuals try to increase remembering of prospective memories is to use external reminders or other strategies. Strategies can be used at the earliest phase of the prospective memory task, during intention formation. For example, an individual might form the intention to stop at an ATM after work and immediately create an external reminder by writing "cash" on his or her hand. Strategies can also be used at any time during the retention interval. For example, someone who is driving home might form the intention to get an oil change for the car on the next Saturday, but not record this intention as a written note on the calendar until after arriving home.

In a recent study (Penningroth, 2005b), we wanted to test whether people used strategies differently for two types of prospective memory tasks: prospective memory tasks related to their goals and prospective memory tasks not related to their goals. We operationally defined "goal-relatedness" for prospective memory tasks as perceived importance. That is, because we had found in a separate study that goal-relevant prospective memory tasks were perceived as more important, we used task importance as a measure of goal-relevance. We asked 197 college students about their use of strategies for real-life prospective memory tasks. Specifically, we assessed their use of 12 specific strategies, which fell into three categories: external strategies (e.g., placing something in a special place), internal strategies (e.g., using mental rehearsal), or conjunction strategies (e.g., tying the intention to another event). Participants reported on their strategy use separately for very important tasks and less important tasks. For instance, in the section on very important tasks, they were instructed to think about times when they have to remember to do things that are very important. Then, they rated the frequency of using each specific strategy (e.g., mental rehearsal) for important tasks using a 7-point Likert scale (*1 = never, 2 = up to two times in the last six months, 3 = two or fewer times in the last four weeks, 4 = two or fewer times in the*

last two weeks, 5 = three to five times in the last two weeks, 6 = six to ten times in the last two weeks, and 7 = 11 or more times in the last two weeks). In the section on less important prospective memory tasks, participants received the same instructions, but with the words *less important* substituted for *very important.*

We predicted that overall strategy use would be more frequent for very important prospective memory tasks than less important prospective memory tasks. We also predicted that people would use better strategies more frequently for important (versus less important) prospective memory tasks. External strategies are more effective than internal strategies (Maylor, 1990; West, 1988), and conjunction strategies appear to be more effective than external strategies (Maylor, 1990). Therefore, we predicted an interaction between importance and strategy type. Specifically, we predicted bigger "importance effects" for better strategies, that is, for external strategies, and possibly for conjunction strategies. We found support for the first prediction, but not for the second prediction. For important intentions, participants reported using strategies more frequently. However the type of strategy used did not differ for very important and less important prospective memory tasks.

In a second study, we attempted to replicate the results with a new sample of 91 college students. A specific purpose in this replication was to rule out a possible alternative explanation for importance effects in the first study. In the first study, the preliminary instructions required participants to think about times when they have to do things that are very important (or less important). It is possible that participants recalled more tasks in the *very important* condition than in the *less important* condition (Penningroth, 2006). Because the dependent measure of strategy frequency was assessed with an absolute scale (e.g., *11 or more times in the last two weeks*), participants may have reported higher frequencies of strategy use for important tasks simply because they had retrieved more instances of very important tasks than less important tasks. To rule out this possible alternative explanation, in the second study, we changed the frequency response options from an absolute scale to a relative scale (new response options included *never, 1/4 of the time, 1/3 of the time, etc.)*. The pattern of results replicated those found in the first study.

In summary, across two studies, participants reported using strategies more frequently for very important than for less important prospective memory tasks, but participants did not use better strategies for important tasks. Therefore, these studies provide some support for our motivational-cognitive model of prospective memory. Goal-related prospective memory tasks (important tasks) appear to benefit from more frequent use of mnemonic strategies during early phases of the task.

5.4.2 EVIDENCE FOR GOAL-RELATED INFLUENCES IN THE MIDDLE PHASE OF THE PROSPECTIVE MEMORY TASK

We predicted that goal-related prospective memory tasks would be more accessible in memory during the intention retention phase. We have conducted two studies and a pilot study to test this prediction. In the first two studies, we measured the goal-relevance of prospective memory tasks as rated importance. We defined accessibility in terms of earlier retrieval in a brief recall session. Thus, our specific prediction was that prospective memory tasks an individual considered to be more important would be retrieved earlier than prospective memory tasks considered to be less important.

In the first study, 87 college students performed a recall task in which they listed their real-life prospective memory tasks for the next day, week, or year (depending on condition). For example, in the "week" condition, they were instructed to spend four minutes listing appointments, tasks, and other things they intended to do in the next week. They summarized each item with one or two words to control for individual differences in

writing speed (Maylor, Chater, & Brown, 2001). After listing their prospective memory tasks, participants rated the importance of each task. Results showed that, as predicted, prospective memory tasks that were retrieved earlier (that were more accessible) were rated higher in importance (there were no differences between the different timeframe conditions—i.e., day, week, and year). These results support the conclusion that prospective memory task importance increases the accessibility of some prospective memory tasks during the retention interval.

In a second study, we wanted to replicate these results with a new sample (N = 49) and to control for a possible alternative explanation. We had found that intentions that were retrieved earlier were rated as more important. We interpreted this result as showing that prospective memory task importance caused heightened accessibility for select (i.e., important) prospective memory tasks. However, the design of the study was correlational, not experimental. Therefore, an alternative explanation is that the relationship was in the opposite direction with accessibility driving the importance ratings. That is, participants' importance ratings might have been biased by their knowledge of task retrieval order. In the second study, we controlled for this possible confound by having participants rate the importance of their prospective memory tasks after the tasks had been randomly ordered. With this procedural control, we replicated the results of the first study. Therefore, we are more confident in concluding that the importance (goal-relevance) of a prospective memory task increases accessibility, and not the other way around.

Finally, we have some preliminary data from a study in which we directly asked participants to identify which of their prospective memory tasks were related to their personal goals. Our prediction was that goal-related prospective memory tasks would be more accessible in memory than other prospective memory tasks. These data were collected with a mailed survey sent to a middle-aged sample. Respondents were instructed to list their personal strivings (e.g., Emmons, 1986, 1989), which are personal goals that represent what a person is typically trying to do every day (e.g., "be honest" or "look attractive"). They then listed their real-life intentions (prospective memory tasks) for the upcoming week. Finally, they indicated which intentions were related to specific goals. Each of a participant's prospective memory tasks was therefore categorized as goal-related or not goal-related, based on the participant's own categorization.

The outcome measure of interest was accessibility of the prospective memory, defined as order retrieved. Because we have only received data from five respondents so far, we pooled the intentions across participants, which resulted in 56 individual intentions. Results from this preliminary data set do support our predictions. That is, on average, prospective memory tasks that individuals perceived as related to their personal goals were retrieved earlier than other prospective memory tasks. These preliminary findings offer some support for the hypothesized link in our model between the goal-relatedness of a prospective memory task and greater accessibility in memory.

5.5 EFFECTS OF GOAL-RELATEDNESS IN LATER PHASES OF THE PROSPECTIVE MEMORY TASK

One approach to examining the effects of motivational factors in later phases of the prospective memory performance has been to experimentally manipulate importance in a computerized task. For example, Kliegel, Martin, McDaniel, and Einstein (2004) used a computerized prospective memory task (i.e., remembering to spot

target words or target letters in words that would be presented on a computer screen) with an ongoing task of simultaneously rating the words on four dimensions (e.g., pleasantness). One group of participants was told that the prospective memory task was more important and the other group was told that the ongoing task of rating the words on four dimensions was more important.

Results showed better prospective memory performance overall when the prospective memory task was perceived as more important than the ongoing task. In addition, other findings from the same study suggested one mechanism for importance effects on prospective memory performance. That is, task importance improved prospective memory performance more when cognitive resources were scarce (i.e., when participants were required to perform an auditory digit detection task while monitoring for prospective memory targets). Thus, one way that importance might benefit prospective memory performance is by causing a reallocation of limited attention resources to monitoring for the prospective memory target. In our motivational-cognitive model of prospective memory, we would interpret these task importance effects as effects of goal influence. That is, when participants were instructed to prioritize the prospective memory task over the ongoing task, they formed a goal to perform well on the prospective memory task.

VI. CONCLUSION

In summary, we have presented a motivational-cognitive model of prospective memory. Specifically, this model characterizes motivation in terms of goals, which we argue influence multiple phases of the prospective memory task. We have presented new evidence from our lab that supports some of the hypothesized links in the model. We have drawn on other investigators' findings that support our model, as well. We hope that the model also serves as a guide for future research on links between goals and cognitive processes in prospective memory.

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