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Number of cues influences the cost of remembering to remember

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A current focus in the prospective memory literature is the extent to which a prospective memory task (remembering to perform a future action) interferes with ongoing activities (defined in this study as lexical decision latencies). In the present study, participants had to detect one, two, three, four, five, or six prospective memory cues. Results showed no significant increase in lexical decision latencies with one or two targets; however, significant costs emerged with three or more targets. Furthermore, task interference showed a linear increase in task costs for word trial performance but not for nonword trial performance. Practical and theoretical implications of these findings are discussed.

To function successfully in everyday life, the average person must execute multiple intentions (e.g., remembering to submit a manuscript, keep an appointment with a student, and attend a meeting). Often these actions cannot be carried out immediately and must be postponed until an appropriate opportunity to perform them arises. The ability to encode an intention and then successfully remember to execute it is known as *prospective memory* (Brandimonte, Einstein, & McDaniel, 1996). The failure of a person's prospective memory is often attributed to his or her becoming absorbed in some other ongoing thought or activity, with the result that the opportunity to execute the intention passes. For example, remembering to turn off one's cell phone before an important meeting may be temporarily forgotten if one becomes engrossed in a conversation with a colleague prior to the meeting. This example underscores the key feature of prospective memory—that it is inherently effortful, since it requires that a person retrieve an intention while in the midst of some other competing activity (Cohen, Dixon, & Lindsay, 2005; Craik & Kerr, 1996; Einstein & McDaniel, 1996; Ellis, 1996; Maylor, 1996; West & Craik, 1999). Therefore, successful prospective memory requires that a person juggle multiple cognitive demands involving intermittent prospective memory responses while maintaining performance of an ongoing activity (Cohen, West, & Craik, 2001).

Recently, interest in examining how ongoing task performance is affected by the presence of an embedded intention has arisen. For example, several researchers (e.g., Kidder, Park, Hertzog, & Morrell, 1997; Marsh, Hancock, & Hicks, 2002; Marsh, Hicks, Cook, Hansen, & Pallos, 2003; Smith, 2003; Smith & Bayen, 2004) have explored how the demands of the ongoing task can decrease the resources available for prospective memory performance. Smith and colleagues (Smith, 2003; Smith & Bayen, 2004, 2006; Smith, Hunt, McVay, & McConnell, 2007) showed that reaction time (RT) performance on an ongoing task was significantly increased by the presence of an embedded intention. More interestingly, RTs were slower even on neutral trials in which no prospective memory target was present (Smith, 2003) and in cases in which the cue was particularly salient (Smith et al., 2007). Smith and colleagues interpreted these findings as support for the preparatory attentional and memory processes (PAM) theory. According to this theory, preparatory attentional processes require limited cognitive resources for successful event-based prospective memory performance. Therefore, successful performance on the prospective task will always come at some cost to the ongoing task. Smith et al. (2007) made the interesting point that a person need not constantly engage in preparatory attentional processing once an intention is formed. Rather, a person might not think of the intention until the actual *performance*

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interval—the period of time in which the intended action should be retrieved (Ellis, 1996).

Einstein et al. (2005) presented an alternative framework to PAM theory in which they suggested that some prospective memory tasks consume resource-demanding processes, but that under other conditions, the tasks can be performed in an automatic fashion. Einstein et al. presented findings from five experiments that support the idea that successful prospective memory performance can be achieved via multiple processes. They provided evidence showing that in some cases, prospective memory is supported by capacity-demanding monitoring of the environment for targets that trigger an associated intention, whereas in other cases, prospective memory is supported by more spontaneous processing, in which the intention seems to "pop" into mind, eliminating any need for capacity-demanding monitoring processes.

Einstein et al. explained the idea of spontaneous processing by considering the reflexive-associative theory (Einstein & McDaniel, 1996; Guynn, 2003; Guynn, McDaniel, & Einstein, 2001; McDaniel & Einstein, 2000; McDaniel, Guynn, Einstein, & Breneiser, 2004; McDaniel, Robinson-Riegler, & Einstein, 1998). According to this theory, during the planning stage of prospective memory, participants form an association between a target cue and an associated intended response. When the target appears at a later point, the associated intention is retrieved with no need for effortful, capacity-demanding resources. Whether or not retrieval is successful depends on the extent to which the cue is fully processed at the time of retrieval and the degree to which participants achieve sufficient encoding between the cue and the intended action (Einstein et al., 2005). Thematically similar ideas have been expressed in the social cognitive literature (see Cohen, Bayer, Jaudas, & Gollwitzer, in press; Gollwitzer, 1999; Gollwitzer & Sheeran, 2006). Other researchers (e.g., Marsh et al., 2003; Marsh, Hicks, & Cook, 2005) have reported experiments in which ongoing task performance incurred no significant costs from prospective memory activities.

The overall goal of the present experiment was to evaluate how the number of prospective memory targets contributes to ongoing task costs. Other experimenters have used number of targets as a manipulation (e.g., Einstein et al., 2005; Marsh et al., 2003); however, we wished to provide a more fine-grained analysis of this factor. In a pilot study, we conducted an experiment in the interest of replicating results observed by Smith (2003), using a slightly different paradigm and instructions. In the instructions, we emphasized the lexical decision task by telling participants to make their lexical decision first, before deciding whether or not a word was a prospective memory target. Encouraging participants to compartmentalize their processing resources in this way ensured that any observed costs to the lexical decision task were not due simply to participants' withholding their lexical decision response because they were trying to decide whether or not an item was a prospective memory target.

Pilot Study

In this study, participants were instructed that letter strings would appear on the computer screen one at a time and that they were to decide as quickly and as accurately as possible whether the letter string formed a word or a nonword. Participants performed two separate blocks of 252 lexical decision task trials, for a total of 504 trials. After the first block of trials, participants took a break, during which time they received instructions for either a retrospective memory task (control condition) or a prospective memory task (intention condition). Participants in the control condition memorized six target words for a later recall test. Participants in the intention condition also memorized six words but were instructed to press the F1 key if any of those six targets appeared during the second block of lexical decision task trials.

Our paradigm differed from the Smith (2003) and Smith et al. (2007) paradigms in several respects. First, we explicitly required participants to make their lexical decision on each trial *before* making a prospective memory response (if appropriate). This change to the protocol was also used by Marsh et al. (2003). By having participants make their lexical decision first, we ensured that any observed costs were not due to participants' withholding their lexical decision response because they were trying to decide whether an item was a prospective memory target. Second, our paradigm required participants to perform two separate blocks of lexical decision trials separated by a break. Although this was different from the paradigm used by Smith (2003), it was similar to the one used by Smith et al. (2007). Finally, in an effort to keep encoding as similar as possible to the intention condition, participants in the control condition were asked to memorize six target words for a later retrospective memory task. Thus, although participants in both conditions were aware that they would have to remember the six target words, the critical difference was that those in the intention condition had to detect the six targets during the lexical decision task, whereas those in the control condition did not. Without this feature of the paradigm, an observed difference between the control and the intention conditions could have been attributed to the additional instructions in the intention condition, rather than to the prospective memory element. Smith et al. (2007) employed a somewhat similar control condition manipulation in their Experiment 4, in which the ongoing task involved color matching.

Overall, this experiment replicated the results obtained by Smith (2003). Specifically, our results show increased RTs in the second block, which included the embedded prospective memory task, as compared with the control condition. However, there was one interesting exception: Whereas Smith found ongoing task costs on both word and nonword trials, we found that our manipulation of condition (control vs. intention) had no effect on nonword trials. Furthermore, the costs in the present research on trials with six target events measured around 150 msec or so, considerably smaller than the costs observed in Smith (2003), which were closer to 300–400 msec. The instructions in our design differed from those of Smith in several important respects, most notably in that we instructed participants to make their lexical decision task response before making a prospective memory response. This instruction would lead to faster responding in the lexical decision task because there would be less likelihood that participants would withhold their word or nonword response. In the next study, we used the pilot study paradigm described above to build upon earlier findings by Einstein et al. (Experiment 3, 2005, and Marsh et al. 2003, Experiment 2), who both varied cue set size to examine what effect the variation would have on ongoing task costs.

Our paradigm was designed to examine more specifically when the size of a set of prospective memory cues begins to interfere with ongoing task performance. We varied the number of prospective memory targets across seven conditions: no embedded prospective memory cues (the control condition) or one, two, three, four, five, or six cues. We were interested in determining the point at which processing resources became taxed. Each prospective memory target occurred 12 times; therefore, participants in the one-word condition had the target appear 12 times, those in the two-word condition had each target appear 6 times, those in the three-word condition had each target appear 4 times, and so on. The only aspect of the design that varied was the size of the prospective memory target set.

METHOD

Participants and Design

A total of 112 New York University undergraduates volunteered to participate in the experiment in exchange for optional course credit; 16 participants were assigned to each of the seven conditions. Each participant was tested individually in sessions that lasted approximately 35 min. The design was a 7×2 mixed factorial design with condition (control, one, two, three, four, five, or six targets) as a between-subjects manipulation and block (Block 1 or 2) as a within-subjects factor.

Materials and Procedure

Participants were tested on an IBM-compatible Pentium computer with a VGA graphics card using the Micro Experimental Laboratory professional software package (Schneider, 1988). The set of words used in our lexical decision paradigm was identical to that used by Smith (2003).[1] The six critical words, all with a medium level of frequency, were chosen from the Kučera and Francis (1967) norms. The lists in each block were matched with respect to frequency (mean frequency of 138 for both blocks), word length, and first letter. An additional 120 medium-frequency words with a mean frequency of 136 served as the words for the lexical decision task. Nonwords were created by moving the first syllable of each word to the end of each of the 126 total words (Hunt & Toth, 1990). The order of appearance was random for all string types. All strings were repeated in a different random order in the second half of the task. In all, participants made a total of 504 lexical decisions. Approximately every 20th trial involved a prospective memory target item.

Phase 1. In this phase of the experiment, participants filled out a consent form, and then instructions describing the experiment appeared on the computer screen. These instructions told participants that letter strings would appear one at a time on the computer screen and that they were to decide as quickly and as accurately as possible whether the letter string formed a word or a nonword. Participants were asked to position one index finger on the "F" key and one on the "J" key and to press "F" if the string on the screen was a word and "J" if it was not a word, or vice versa (assignment of the computer keys "F" and "J" to words and nonwords was counterbalanced across participants). Participants performed a first block of lexical decision trials consisting of 126 word trials and 126 nonword trials (252 in total). After the first block of trials, participants received instructions for the second portion of the lexical decision task and, if they were part of the intention condition group, for the embedded prospective memory task as well.

Phase 2. After the first block of lexical decision task trials, participants received different instructions depending on the condition to which they were randomly assigned. Participants in the control condition were given a retrospective memory task in which they were asked to memorize six target words. They were told that they would have to recall the six words and the associated response (by pressing the F1 key) at the end of the experiment as a memory check. This task served as the control condition because the participants assigned to it memorized words similar to the words in intention conditions but did not have to monitor for prospective memory cues during the lexical decision task component of the experiment. In other words, the prospective memory component of the task (i.e., detecting cues) was eliminated. Participants who were randomly assigned to the intention condition were instructed to press the F1 key on the computer keyboard (after first making their lexical decision) if they saw any one of the prospective memory targets during the experiment. For participants in all conditions, we emphasized the lexical decision task and instructed participants to respond as quickly and accurately as possible with their word/nonword decisions.

Of the participants in the intention condition, those in the one-word condition had 30 sec to memorize one word, and this target occurred 12 times during the second block of trials. Participants in the two-word condition had 30 sec to memorize two words, and these targets occurred 6 times each during the second block of trials, for a total of 12 target appearances. In the three-word condition, participants had 60 sec to memorize three words, and each of the three targets appeared 4 times in the second block for a total of 12 target occurrences. In the four-word condition, participants had 60 sec to memorize the words, and each word occurred 3 times in the second block for a total of 12 target appearances. In the five-word condition, participants had 75 sec to learn the five words and, since 12 is not divisible by 5, five of the words appeared twice (for a total of 10 target appearances) and two of the words then appeared 2 more times (for a total of 12 target appearances). We counterbalanced across participants which two words appeared an extra 2 times. In the six-word condition, participants had 120 sec to learn the words, and each of the six words appeared twice, for a total of 12 target appearances. In all conditions, participants had to learn the words to criterion level, and the experiment did not proceed until participants demonstrated perfect recall. If recall of the prospective memory targets was not perfect in any condition, participants were given 2 additional min and learning cycled through the same study–test procedure until it was perfect. Because prospective memory targets occurred 12 times for every condition (with the exception of the control condition), the only aspect of the design that varied was the number of different targets that participants had to detect in the second block of the lexical decision task.

As previously mentioned, participants were instructed to make their lexical decision on each trial before making a prospective memory response. This aspect of the design allowed participants to avoid the need to withhold their lexical decision response because they were trying to decide whether the word was a prospective memory target. After each lexical decision keypress, participants were told that they could make their prospective memory response (by pressing "F1") at any point. The experimenter explained that on each trial the message "Press the space bar" would appear, indicating that participants should press the space bar with one of their thumbs to initiate the next trial. After they had read the instructions, participants were asked to describe them (to check their comprehension), and then they were asked whether they had any questions. A postexperiment questionnaire was administered to test participants' recall of the prospective memory target items and the associated action (pressing "F1").

RESULTS

Incorrect lexical decision task responses were removed from the analyses, and latencies of less than 300 msec or more than three standard deviations from the cell mean were also deleted. An alpha level of .05 was used in all analyses unless otherwise specified. It is important to mention that the latencies used in our analyses of ongoing task costs in both experiments did not include any latencies from prospective memory trials. In fact, to reduce the likelihood that switch costs would inflate our measure of ongoing task latencies, we did not include the first three trials following a prospective response.

At the end of the experiment, participants had to recall the prospective memory targets as a memory check. Postexperiment recall of the prospective memory targets was high in this experiment—100% recall for the one- through four-word conditions. Recall was also high for the control, five-, and six-word conditions (control, $M = 5.16$ of six targets; five-word, $M = 4.68$; six-word, $M = 5.40$), with no significant difference between conditions ($p = .32$). All participants recalled the associated action of pressing "F1."

Prospective Memory Task

Surprisingly, there were no significant differences for prospective memory accuracy as a function of condition ($p = .62$). The proportion of prospective memory targets correctly detected ranged from a mean of .70 to a mean of .80. Thus, prospective memory was not significantly affected by our manipulation of cognitive load. In the next analysis, we were interested in analyzing prospective memory RTs (i.e., the time required to press the "F1" key). Results revealed no significant overall effect of condition ($p = .21$); however, planned pairwise comparisons revealed a significant difference between the one-word ($M = 1{,}687.46$ msec, $SD = 663.09$) condition and the five-word ($M = 2{,}124.25$ msec, $SD = 706.18$) and six-word ($M = 2{,}144.47$ msec, $SD = 484.12$) conditions (see Figure 1B). Presumably this difference reflects that longer RTs resulted from more extensive item checking in the five- and six-word conditions.

Ongoing Task

Our analysis of lexical decision task performance revealed an outcome very different from the outcome of analyses of prospective memory accuracy. Latencies on lexical decision task performance in Block 1 did not differ as a function of condition for word trials ($p = .20$) and nonword trials ($p = .29$). Therefore, ongoing task performance was analyzed by calculating difference scores by subtracting Block 1 latencies from Block 2 latencies. Performance was analyzed by conducting a two-way ANOVA on Block 2 − Block 1 RTs with condition (control, one-, two-, three-, four-, five-, or six-words) as a between-subjects factor and word type (word or nonword) as a within-subjects factor. Results show that there was a main effect of condition [$F(6,105) = 8.01$, $p < .001$, $\eta^2 = .34$]. Pairwise comparisons show that there was a significant difference between the control condition and the two-, three-, four-, five-, and six-word conditions. There was also a main effect of word type [$F(6,105) = 28.73$, $p < .001$, $\eta^2 = .34$], revealing that there was a greater practice effect for nonword trials ($M = -102.12$ msec) than for word trials ($M = -56.58$ msec). Importantly, this result reflects that participants treated word and nonword trials differently in that they benefited from practice to a greater extent for nonword items.

These effects were qualified by a significant interaction between condition and word type [$F(6,105) = 2.71$, $p < .05$, $\eta^2 = .15$], which reveals a different pattern of response across conditions for word and nonword trials. Inspection of the means shows that the practice effect decreased linearly for word trials (reflecting increasing costs) from the control condition to the six-word condition, whereas the pattern for nonword trials did not reflect this linear pattern of costs. Table 1 shows that although mean difference score latencies did vary as a function of condition for nonwords, these patterns of differences were much more variable across conditions. However, for word trial performance, the practice effect (reflected by negative difference scores) decreased linearly, reflecting increasing costs from the control condition to the six-word condition. In contrast, nonword trial performance showed more random patterns of responding, with RTs in the five- and six-word conditions showing practice effects.

To summarize, RTs for nonword trials were rather noisy and fluctuated between conditions, and their overall pattern did not reflect a systematic linear pattern of increasing costs as did the RT pattern observed for word trial performance. In fact, for nonword trials, there was a practice effect in every intention condition, even the five- and six-word conditions (see Table 1).

Word Trial Performance

Planned comparisons showed that there was no significant difference between ongoing task difference score latencies in the control condition and the one-word condition ($p = .61$). In fact, participants showed a numerically greater practice effect in the one-word condition relative to the control condition, reflecting no ongoing task costs for performance in the one-word condition. There was a marginally significant difference between difference score latencies in the control condition compared with the two-word condition ($p = .07$), and significant differences emerged between the control condition and the three-, four-, five-, and six-word conditions (see Figure 1A).

To further examine performance on lexical decision latencies for word trial performance, we conducted a regression model analysis in which we modeled ongoing task performance (difference scores) as a function of condition. In Fit 1, we entered a model to test the linear function, which was significant ($p < .05$), with a slope of 27. The slope can be interpreted to mean that difference score latencies decreased by 27 msec (signifying costs to ongoing task performance) with each unit increase of condition (see Figure 2). The linear function in Fit 1 shows that the line is generalizing across performance in the one-word condition—that is, a significant linear function implies that there is a decrease in the practice effect from the control condition to the one-word condition. As the means plotted in Figure 2 show, this was obviously not the case. Therefore, in Fit 2, we entered a model that takes into account performance in the one-word condition. This trend approached significance ($p = .09$), with a slope of 24. Al-

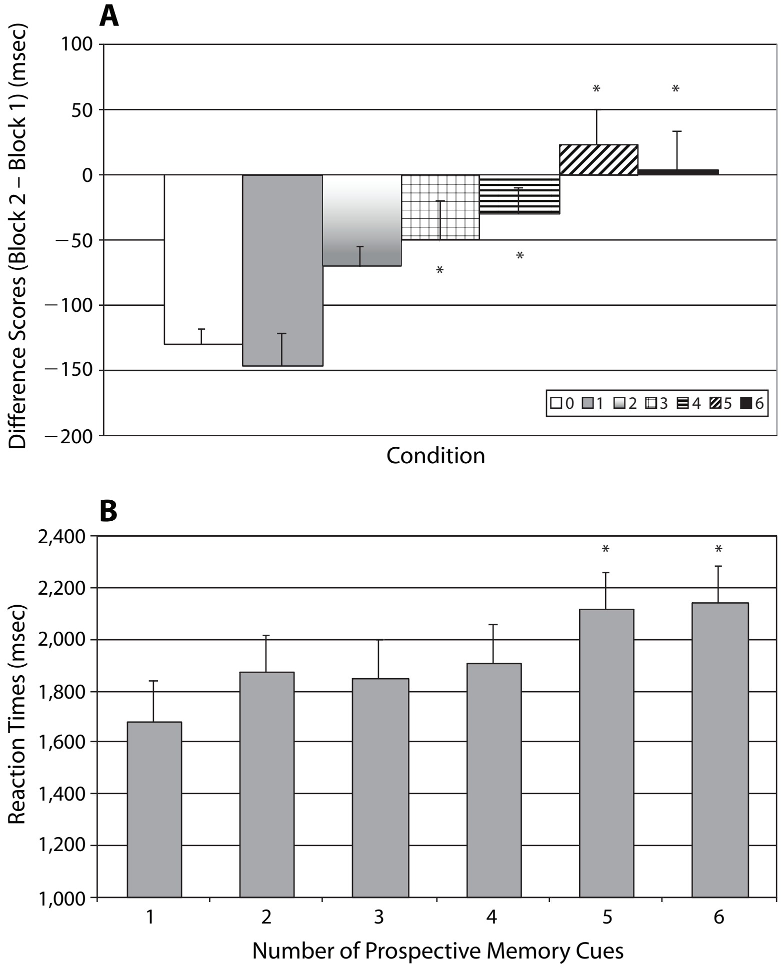

Figure 1. (A) Reaction time (RT) differences for word trials (Block 2 − Block 1) on ongoing lexical decision task trials as a function of condition (control [represented as 0], one-, two-, three-, four-, five-, or six-word). Asterisks reflect significant differences between the control condition and a prospective memory condition. (B) RTs (the time required to press the "F1" key) for prospective memory responses as a function of condition. Asterisks reflect significant differences between the one-word condition and the five- and six-word conditions. Bars represent standard errors.

though this second model was only marginally significant, it suggests that performance in the one-word condition may be best explained by a model with a J-type function.

To examine whether the relationship between task interference and prospective memory performance was functional, we conducted correlations between prospective memory performance (proportion correct) and ongoing task latencies for word trials collapsed across conditions and within each condition. However, correlations were not significant (all ps $>$ .50). This finding indicates that when speed on the ongoing task decreased, it was not accompanied by better prospective memory detection.

DISCUSSION

Our experiment provided an opportunity to examine more specifically how number of prospective memory targets contributes to ongoing task costs. Results from the regression analysis were important in helping to quantify costs to ongoing task performance as a function of each unit increase in the number of prospective memory targets. This analysis showed that there was no cost when participants had to detect one target; in fact, participants increased their speed from Block 1 to Block 2 in the one-word condition relative to the control condition. There were only marginal costs in the two-word condition, with significant costs emerging in the three-word condition and beyond.

One interpretation of our linear pattern of increased word latencies might be that participants held prospective memory targets in working memory while performing the lexical decision task, and that each added target usurped attentional resources and thus contributed to ongoing task costs. However, this explanation is implausible given working memory constraints and the demands of the lexical de-

Table 1
Raw Latencies and Difference Scores (Block 2 − Block 1) (in Milliseconds) As a Function of Word Type (Word or Nonword) and Condition

	Word Trials			Nonword Trials		
Condition	Block 1	Block 2	Difference Scores	Block 1	Block 2	Difference Scores
Control	671	542	−129	735	589	−146
One-word	715	569	−146	877	750	−127
Two-word	681	612	−69	775	711	−64
Three-word	788	738	−50	834	754	−80
Four-word	691	663	−28	731	657	−74
Five-word	693	716	+23	732	699	−33
Six-word	696	700	+4	823	717	−106

cision task. If we reject this notion of working memory load, then we are left with the need to explain how costs accumulated so gradually and consistently for word trials with each increase in the number of prospective memory targets. Another possible explanation is that attentional allocation policies were set by participants before they began the task, and that the policy adopted by participants was influenced by the number of targets (e.g., a high number of prospective memory targets led to a policy that diverted attention away from the ongoing task). However, if this were the case, then one would expect that nonword trial performance would have exhibited a similar linear pattern of increased task costs, revealing a general shift strategy.

Different Patterns of Latencies for Word and Nonword Trials

The finding of an interaction between word type (word vs. nonword) and condition reflects that participants treated word and nonword items differently. As previously mentioned, participants exhibited practice effects (speeding up from Block 1 to Block 2) in every condition on nonword trials, but not on word trials. This result implies that on some proportion of word trials, seeing a lexical decision task word may have acted as a prime, bringing to mind thoughts about the prospective memory task. Thus, participants engaged in a type of two-step response in the lexical decision task in which nonwords could be dismissed more easily as not being candidates for prospective memory target membership. As such, nonwords were less vulnerable to our manipulation or were at least less consistent in their pattern. In the first step, participants made a judgment about whether a string formed a word. When the string was identified as a nonword, no further scrutiny was required. However, if the string was identified as a word, then on some proportion of trials, participants may have engaged in a second step of analysis (i.e., "Is this word a prospective memory target?"). Thus, on some trials, participants may have been unable to sup-

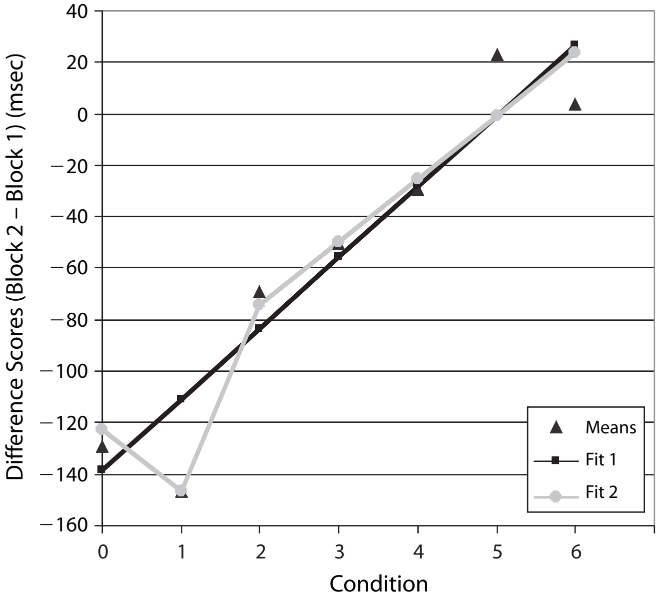

Figure 2. Regression model of ongoing task performance (difference scores) as a function of condition (control [represented as 0], one-, two-, three-, four-, five-, or six-word). Fit 1 was significant and Fit 2 showed a trend toward significance.

press intention-related processing due to the overlapping features between words and prospective memory targets. This notion of overlapping features is similar to ideas expressed by Kvavilashvili and Fisher (2005). Thus, words in the lexical decision task may have served to bring to mind prospective memory instructions. The linear pattern of increasing costs for word latencies suggests that participants cycled through prospective memory targets on some proportion of word trials and that this cycling process took longer as the number of prospective memory targets increased.

Explanation for Lack of Costs in the One-Word Condition

Our findings in the one-word condition are in line with Einstein et al.'s (2005) multiprocess framework and reflect that in certain circumstances, an intention can be realized automatically with no negative impact on ongoing task performance. The lack of costs in the one-word condition suggests that participants were able to juggle ongoing and prospective memory task requirements. One plausible explanation is that participants used an encoding strategy when they received the instructions. For example, they may have formed a spontaneous if–then plan in the one-word condition (e.g., "If I see the word 'member,' then I will press F1"). If sufficiently encoded, the cue "member" would reflexively elicit the associated response when it was encountered later. This idea of strategic automaticity achieved by if–then planning has been expressed in the social cognitive literature by Gollwitzer (1999) and Gollwitzer and Sheeran (2006), who argued that making if–then plans that link an anticipated situational cue (the "if" part) with an intended response (the "then" part) leads to the efficient initiation of the specified response once the critical cue is encountered, without the need for further controlled processing or a conscious intent. As the number of prospective memory targets increases, the ability to form such simple if–then plans may become disrupted, making the strategy less effective at automating response initiation (see Webb & Sheeran, 2004). With more complex prospective memory instructions, such as those for the two-word conditions and beyond, participants must employ some alternative strategy.

In contrast with our demonstrated lack of costs in the one-word condition, Smith et al. (2007) reported ongoing task costs in lexical decision latencies using one very salient prospective memory target. These conflicting results may be due to variations in experimental procedures, such as differences in task instructions. As mentioned previously, participants in the present experiment were specifically instructed to make their lexical decisions first, before making their prospective memory responses. In contrast, the instructions in the Smith et al. (2007) paradigm were more ambiguous:

> Participants were not explicitly instructed to press the tilde key [prospective memory response] before the Y or N key. If participants inquired about whether to make both responses, they were told that they could press the tilde key only, or they could press the tilde key after having pressed the Y or N key. All responses were recorded, regardless of whether they pressed the tilde key when the string was displayed or when the focus point for the next trial was displayed. (p. 737)

It may be that in Smith et al.'s paradigm, participants withheld their lexical decision task responses in order to verify whether an item was a prospective memory target, which, in turn, resulted in increased ongoing task costs.

Summary

The findings presented here demonstrate that participants' strategies appear to have differed according to the cognitive requirements of the prospective memory task (Einstein et al., 2005). In the one-word condition, participants employed strategies such as an if–then statement (e.g., "If I see 'member,' then I will press F1"), which freed up processing resources and resulted in no costs to ongoing task performance (see Gollwitzer & Sheeran, 2006). As the number of prospective memory targets increased, such an if–then plan no longer worked, and some other strategy had to be employed. The different pattern of results for word and nonword items suggests that on some proportion of word trials, participants periodically cycled through prospective memory items when these items were primed (more often by a word than by a nonword) and that this cycling process took longer as the number of prospective memory targets increased.

AUTHOR NOTE

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