

PLANNING FOR SUCCESS: MNEMONICS FOR PROSPECTIVE MEMORY

by

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## Abstract

Prospective memory (ProM) is the ability we have for forming intentions, retaining them, and carrying them out at the appropriate time or in the appropriate context. Although a large number of external aids are available for supporting ProM (e.g., day-timers, personal digital assistants, post-it stickers), very little is known about internal aids – mnemonics – that could be used to augment ProM. The present study focused on one class of mnemonics for ProM - planning strategies. Planning strategies are activities assumed to yield a clearer specification of intentions and of way-points to their attainment, as well as a more concrete articulation of the means required for their attainment.

In the present work, we explored the types of planning strategies that could be used for different kinds ProM tasks, the subject-rated frequency and likelihood of using each type of strategy, and whether training participants in the use of strategies would result in improved performance on ProM tasks. Planning strategies for time allocation, organizing task-relevant resources, and identifying and recording task-relevant information were revealed. Participants rated the strategies as effective and likely to be used for various time and event based ProM tasks. Participants who were trained in the use of task relevant planning strategies were significantly more likely to successfully execute three ProM tasks over the course of 1 week.

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*Thanks be unto the Lamb for a lesson in humility.*



## Introduction

While engaged in myriad daily activities, we often find ourselves forming plans and intentions which need to be carried out in the future. Whether we intend to relay a message to a colleague upon our next encounter, or keep a doctor's appointment scheduled for next week, a delay exists between intention formation and the context in which the intention should be executed. Successful performance of these future-oriented tasks is partially dependent on prospective memory (ProM), the ability we have for forming intentions, retaining them, and carrying them out at the appropriate time or in the appropriate context (Graf & Uttl, 2001; Kvavilashvili & Ellis, 1996).

Many distinctions have been made with respect to ProM, for example, between time based and event based tasks (Einstein & McDaniel, 1990; Kvavilashvili & Ellis, 1996), and episodic versus habitual tasks (Meacham & Leiman, 1982). The time-event distinction focuses on the retrieval context in which an intention has to be remembered and carried out. Whereas time based intentions must be executed at a specific time or after a specified amount of time has elapsed, event based intentions must be executed when an appropriate external cue or event is encountered. Moreover, episodic tasks are actions which are performed infrequently or on an irregular basis, while habitual tasks are carried out in a routine and regular manner. In the present series of experiments, I will focus on time and event based intentions which require execution once.

Experience reveals that failures to follow through on our intentions are quite common, and as Einstein and McDaniel (1996) have pointed out, constitute a significant proportion of the forgetting which occurs in everyday life. All memory failures have

consequences, and failures in ProM may result in anxiety, embarrassment, or even harm (Fleming, Shum, Strong, & Lightbody, 2005; Winograd, 1987). While the consequences of forgetting to buy groceries on the way home from work are trivial, forgetting to take medication or to turn off the stove can pose a serious threat health and safety. Poor ProM may also affect an individual's relationship with others. For example, Munsat (1966) has suggested that individuals who continually fail to keep promises and agreements are perceived as unreliable, irresponsible, and untrustworthy.

### *Previous Research*

Efforts to improve memory date back to the ancient Greek orators who developed the method of loci, a strategy to improve memory for facts and lists of data (Yates, 2001). The mnemonic works by creating associations between to-be-remembered information and a set of well rehearsed cues. For example, if the task is to remember a list of groceries consisting of milk, bread and eggs, a jug of milk could be imagined sitting by the front door, slices of bread laid out on the driveway, and several eggs splattered on the hood of the car. In order to retrieve the grocery list at a later time, the well-rehearsed path traversed from the front door to the car is recalled, facilitating the recall of items on the list.

Contemporary studies have focused on improving retrospective memory by using strategies such as semantic association, verbal elaboration and imagery (Derwinger, Neely, & Backman, 2005; Gaskill & Murphy, 2004; Hill, Backman, & Stigsdotter, 2000; McDougall & Gruneberg, 2002; Verhaeghen, Marcoen, & Goossens, 1992; West, 1995). Furthermore, the effectiveness of these memory strategies is well documented in educational and clinical settings for individuals who have difficulty recalling facts and

past events (see Brown, Bransford, Ferrara, & Campione, 1983; Paris, 1988 for reviews).

In comparison to what is known about improving retrospective memory, very little research has focused on what can be done to improve ProM. In spite of this, many products are available which support ProM. For example, alarms, post-it stickers, day planners and personal digital assistants are all capable of providing reminders of our previously formed intentions.

One characteristic shared by many retrospective memory aiding strategies is that they emphasize cognitive processes. However, little is known concerning similar strategies for ProM. This deficiency is underscored in the literature concerning medication adherence (see Ellis, 1998; Park & Kidder, 1996 for reviews), an often cited, ecologically valid ProM task (Einstein & McDaniel, 1990; Winograd, 1987). Overlooking cognitive strategies for enhancing the ProM component of medication adherence, the research focuses on the use of external aids such as pill organizers, tear-off calendars, check-off charts, voice mail systems, and electronic alarms (Azrin & Powell, 1969; Lerier, Morrow, Pariente, & Doksum, 1988; Lerier, Morrow, Tanke, & Pariente, 1991; Park, Morrell, Frieske, Blackburn, & Birchmore, 1991).

The inclination to focus on external aids for ProM may arise from perceptions about their effectiveness for facilitating performance on ProM tasks. Intons-Peterson and Fournier (1986) asked participants to rate the effectiveness of internal aids (e.g., mental rehearsal, imagery) and external aids (e.g., reminder notes, asking someone else for a reminder) for future remembering and remembering of past situations. Across three experiments, the authors found that external memory aids were rated as more

dependable, easier to use, more accurate, and more preferred than internal aids. Ellis (1988) arrived at similar conclusions. She found that intentions which had to be performed during highly specific intervals (e.g., keeping an appointment for 2:00 pm sharp) were associated with increased external memory aid use.

External memory aids place an emphasis on remembering that an intention has to be carried out. However, this is just one part of ProM. Supporting this claim are several authors who have remarked on the multidimensional nature of ProM performance (Dobbs & Reeves, 1996; Ellis, 1996; Marsh, Hicks, & Landau, 1998; Winograd, 1987). During the time that passes between forming intentions and executing them, much can change. Non-cognitive factors such as level of motivation, resource availability (e.g., time), unexpected circumstances, and newly formed intentions may preclude us from carrying out what we originally intended to do. We may come to view certain intentions as less important, fail to plan enough time for task completion, or capitalize on opportunities to carry out other intentions.

In one of the few naturalistic studies of ProM, Marsh et al. (1998) found that participants rarely attributed ProM failures occurring in the context of their everyday lives to forgetting. Instead, the majority of uncompleted intentions were attributed to reprioritization and realizing that many of intentions were simply impossible to carry out. Importantly, the number of completed intentions did not differ between participants who regularly used external memory aids and those who did not. This evidence is surprising in light of the fact that people rate the use of external memory aids to be one of the most dependable methods for ensuring success on ProM tasks (Ellis, 1988; Intons-Peterson & Fournier, 1986; Penningroth, 2005).

The results of Marsh et al. (1998) suggest that there is room for improvement in terms of everyday ProM and reinforce the position that the memory component of ProM is not the only factor which influences performance. Evidence suggesting that internal strategies may complement external memory aids for facilitating ProM comes from research on goal attainment. Gollwitzer and Brandstatter (1997) coined the term "implementation intention" to describe the process of defining when and where actions leading to goal attainment will be carried out. This kind of mental planning activity creates a commitment to oneself to respond to a certain situation in a specific manner. By forming implementation intentions, individuals identify and seize opportunities for performance, help prevent goal pursuit from distractions or competing goals, and promote the realization of goals in the midst of ongoing day-to-day activities. The benefits of forming implementation intentions have been shown to promote a variety of routine health related behaviours such as regular exercise, diet, and self examination (Gollwitzer & Oettingen, 1998; Orbell, Hodgkins, & Sheeran, 1997; Sheeran & Orbell, 1999) and show some promise as a technique for improving event based ProM in the elderly (Chasteen, Park, & Schwarz, 2001).

Forming implementation intentions - identifying a specific context for goal attainment and connecting the goal to situational cues which elicit behaviour – is representative of only a subset of the activities individuals engage in while planning. Planning also involves the predetermination of a course of action, involving the active, conscious construction or mental simulation of future action sequences intended to direct action and optimize the attainment of certain outcomes (Hayes-Roth & Hayes-Roth, 1979). Planning not only generates goals and intentions, but also specifies

strategies which must be employed to attain those goals and intentions (Berger & DiBattista, 1992; Das & Heemsbergen, 1983; Read, 1987).

Several authors have remarked that effective planning may be one method of improving performance on ProM tasks (Ellis, 1996; Mantyla, 1996; Maylor, 1990). Based on the evidence from the implementation intention literature, this hypothesis seems reasonable. However, what exactly is meant by the term “effective planning” is not immediately clear. Thus a more comprehensive examination of the planning process in relation to ProM is warranted.

### *Current Directions*

The focus of the current series of experiments is to identify an internal mnemonic for improving ProM; one which is presumed to be available in any situation and also addresses the non-cognitive factors associated with ProM performance (i.e., compliance, motivation, resource availability, competing intentions).

To explore whether planning facilitates ProM, I designed three separate experiments. In Experiment 1, my primary objective was to explore the different kinds of planning strategies which could be used to support ProM. In a series of semi-structured interviews, I asked undergraduate volunteers to describe how they planned to carry out several time and event based intentions. This was followed by a qualitative analysis performed on interview transcripts to determine if reliable and distinct categories of planning strategies could be identified.

In Experiment 2 I designed and used two questionnaires to determine the perceived effectiveness and likelihood of using the various planning strategies individuals reported for successful prospective remembering. On the basis of these

ratings, a cluster analysis was performed to identify individuals who were similar in terms of the strategies they rated as effective and were likely to use. In an attempt to validate these clusters, I compared the performance on two laboratory tests of event based ProM between the resulting clusters.

Finally, in Experiment 3 I explored the possibility of facilitating ProM task performance by training individuals to use planning strategies which were rated as effective in the context of the previous experiment. All participants were assigned three ProM tasks which had to be carried out in the context of their everyday lives. Half of the participants were provided with training in task relevant planning strategies before leaving the lab; the remaining participants engaged in a non-relevant computerized test of planning ability. I expected that individuals who received training would be more successful in carrying out the assigned ProM tasks than individuals who did not receive training.

## Experiment 1

The purpose of Experiment 1 was to explore the different kinds of planning strategies that individuals could use for successfully carrying out time and event based ProM tasks. The primary objective of this experiment was to generate distinct categories planning strategies from participant responses obtained in series of semi-structured interviews. Additionally, the reliability of these categories was ascertained using independent raters. A second objective of this experiment was to determine if there were differences in the strategies reported for time based versus event based ProM tasks.

### *Method*

#### *Participants*

Twenty-four undergraduate psychology students (14 females, 10 males) from the University of British Columbia participated for course credit. Participants' age ranged from 18 to 39 years,  $M = 20.75$ ,  $SD = 4.16$ . The experiment was conducted with the approval of the University of British Columbia's Behavioural Review and Ethics Board.

#### *Materials and Instruments*

*Vignettes.* Six vignettes, each describing a ProM task, were prepared for this experiment (see Appendix A). Vignettes were three to four sentences long and concerned an intention which had to be performed at a later time. Of the six vignettes, half described a time based intention and the other half described an event based intention. Each vignette was printed on a separate card.

*North American Adult Reading Test (NAART).* This is a commonly used standardized test of verbal intelligence (Blair & Spreen, 1989) and was included to



identify individuals with difficulties in English language ability. The NAART is administered using two sheets of paper with 61 phonetically irregular words arranged in order of increasing difficulty. Participants' pronunciation of each word is scored by the experimenter, and the number of incorrectly pronounced words is recorded. The NAART is reliable with a Cronbach's alpha ranging from .92 to .94, and interscorer reliability ranging from .93 to .99 (Blair & Spreen, 1989; Uttl, 2002).

### *Procedure*

I tested participants individually in a session that lasted approximately 60 minutes. After obtaining consent, I provided participants with an overview of the experiment and explained that I would present several vignettes describing an intention which had to be carried out at a later time. I then mentioned that I would carry out an interview to explore the types of planning strategies that could be used for successful performance of the intention described in the vignette. I asked participants to not only discuss strategies for remembering to perform the intention, but also the steps they could take to ensure that the intention was carried out.

The interview proceeded in a semi-structured fashion. I chose this method because it provided some flexibility in the wording of each question, but more importantly, allowed the use of probe questions targeted at specific responses offered by each participant. It allowed me to clarify interesting and relevant responses, provided an opportunity to explore certain strategies, solicit more complete information from withdrawn individuals, and refocus participant responses if they started to stray from the objective of the interview.

All participants proceeded through the same sequence of events. First, I asked participants to discuss the planning strategies they could use to successfully carry out the intentions described in the first three vignettes. Next, in order to create a separation and encourage participants to think about their responses anew, I administered the NAART. Finally, participants described the planning strategies they could use to successfully carry out the intentions described in the remaining three vignettes.

I randomly selected the first vignette for the experiment, and noted whether it was time based or event based. The remaining vignettes were separated into these categories (i.e., time based, event based) and shuffled. Each successive vignette always alternated between the two categories.

After presenting the vignette to the participant, I provided participants 2 to 3 minutes to formulate a response before starting the interview. At the end of that time, I asked participants if they understood each vignette and provided them with an opportunity to ask questions if anything was unclear. Following this step, I started the tape recorder and proceeded with the interview.

Each participant started by describing what steps they would take to ensure that they were successful in carrying out the intention. After participants' initial response, several additional prompts (e.g., "when you make your plan, what kinds of things do you think about?", "what else would you have to consider?", "what would you do differently next time if you weren't successful?", "are you sure that strategy would guarantee success?") were used to elicit a richer description. When participants mentioned the resources they would require to carry out their intentions, I asked them to provide details about the manner in which they would access and ensure the availability of

those resources when needed. Throughout the interview, whenever participants described the methods, actions, or means by which they would carry out their intentions, I encouraged them to elaborate. The interview for each vignette ended when participants stated they were unable to think of anything else, or when additional probe questions did not elicit any new responses.

After participants discussed the planning strategies they would use for all six vignettes, participants were informed that the experiment was over and received a verbal debriefing and course credit.

### *Data Preparation*

All interviews were transcribed by trained volunteers. The transcripts were independently checked and corrected for transcription errors.

## *Results*

### *NAART*

The NAART was scored in the standardized manner by recording the total number of mispronunciations to obtain each participant's score. An outlier analysis revealed that no scores were 3 or more standard deviations away from the mean NAART score. The mean number of mispronunciations,  $M = 28.54$ ,  $SD = 10.43$ , for our participants was significantly higher than that reported in Uttl (2002),  $M = 22.54$ ,  $SD = 9.29$ , for a similar age group,  $t(74) = 2.24$ ,  $p < .05$ . The low NAART performance may be attributed to English being a second language for a large proportion of undergraduate students at the University of British Columbia. In contrast, 98% of the participants included in the Uttl (2002) study were native English speakers.

### *Qualitative Analysis*

Qualitative analysis is a research tool used to identify certain words, content, or phrases in text. It has been defined as a search through data to identify content for taxonomies (Strauss & Corbin, 1997). The research is often guided by initial concepts about the data, while allowing for the possibility that they may be shifted as data analysis is underway (Marshall & Rossman, 1999). In the context of Experiment 1, a qualitative analysis was used to identify distinct planning strategies that individuals could use for successfully carrying out time and event based ProM tasks.

Initially, I read through all of the transcripts searching for statements that were indicative of planning, that is specifically, for the action sequences and the methods that participants would use to carry out the intention described in the vignette. Statements related to planning often followed phrases such as: "I would have to...", 'I would need...', 'I would check...', 'I would get...', and 'I would make sure that...'"

In order to identify distinct types of planning strategies, I began by creating relatively large category labels to ensure that I could score as much of the interview transcript as possible. The first two categories identified were: memory aids and assembling resources. I then sought to identify further subcategories in the kinds of statements belonging to the assembling resources category. An analysis of those statements revealed that some resources which were mentioned related to time, others specified physical resources or tools required, and another class consisted of obtaining information type resources. I found that statements belonging to the time resource category could be further divided into strategies for: estimating the amount of time required, ensuring that an appropriate amount of time remained available, and

rearranging previous plans and commitments in order to have an adequate amount of time to carry out a new intention. Finally, in every resource category, some participants mentioned it would be beneficial to have alternative resources available (e.g., having an alternate form of transportation, choosing two or three times during the day to carry out an intention in case of the unexpected), and thus a category of backup planning was created.

A scoring manual (see Appendix B) was developed which contained a specific description of the kinds of statements to include and exclude from the analysis. Also included was a description of a numeric system whereby points were allotted for the mention of each planning strategy. The planning strategies which were identified are described in the results section and summarized in Table 1.1. Independent raters were used to determine the reliability of the planning strategies. Three trained volunteers individually scored all of the interviews using the scoring manual I created. A Pearson correlation was then computed between raters for the points assigned to the planning strategies identified in participants' interview transcripts.

### *Planning Strategies*

*Defining time.* Many participants mentioned the necessity of estimating the amount of time required to carry out an intention. Participant responses varied, with some providing a detailed break down of the time required to carry out different aspects of their intention and others simply responding that they would require a block of time. Comparing the following two statements: "I'd leave enough time" and "I'd make sure to think about the time it would take me to get ready, to get everything I needed, and then

drive down there” shows that the latter participant has engaged in more thought with regard to the time required for each step of their plan.

*Reserving time.* This strategy involves selecting an appropriate time to carry out elements of an intention, and ensuring that the time set aside remains available (e.g., “I’d find out the exact time my friend’s flight would be arriving, and then set aside that time in my agenda so I don’t plan anything else”). Especially interesting was the use of this planning strategy for event based tasks. Participants suggested that one way to ensure an event based intention would be completed was to first identify a time when conditions are likely to allow successful performance of that intention and then ensure that nothing else was planned for that time. For example, if the intention is to deliver a message to a colleague when they meet next, one way to increase the probability of success is to predict when they might cross paths again, and set aside that time to deliver the message. By using this kind of planning strategy, one has effectively transformed an event based task into a time based task.

*Rearranging plans.* This planning strategy involves considering plans and intentions which have already been committed to, and if necessary, making amendments to those activities in order to commit to a newly formed intention. Participants admitted that they would have to consult their schedules and rearrange work shifts as well as other pre-existing intentions in order to ensure that the newly formed intention could be completed.

*Locating.* I discovered statements concerning the gathering of information about the location of certain objects, places, or things which may be required to carry out an intention (e.g., “I’d have to find out the exact address of the clinic”). Additionally some

responses suggested that finding directions, or planning an optimal route was essential to successful performance. In everyday situations, planning a route becomes important when we find ourselves with multiple errands to run all over town, or when we want to avoid rush hour traffic at certain times of the day. An efficient route may dictate whether we end up keeping or breaking an appointment. Furthermore, the planning of routes may serve as one type of memory aid. Participants suggested that incorporating an intention alongside a typical route would be one way to ensure that they remembered to carry out that task.

*Collecting resources.* These responses contained a discussion of accessing resources or tools which are required to successfully carry out an intention. Collecting resources refers to physical kinds of resources (e.g., a car) or implying that such a resource is required (e.g., a method of transportation).

*Backup planning.* There was some discussion of backup planning throughout the interview transcripts. In most cases these statements referred to having alternative resources on hand in case the originally planned for resources were not available.

*Memory aids.* During the interviews, it quickly became evident that participants believed using a memory aid such as a daily planner or an alarm would result in successful prospective remembering. In fact, I found it quite difficult to prompt participants to discuss planning strategies *other* than those which would be classified under memory aids. Some of the identified memory aids were internal (e.g., making a mental list of things to do) and some were external (e.g., writing it down on a post-it sticker or diary). There was some mention of creative and idiosyncratic memory aids such as writing a reminder on their shoelace and writing on the bathroom mirror.

Approximately half of the entire transcript,  $M = 3259$  words,  $SD = 747$ , could be scored (see Appendix C for sample excerpts from interviews). There are several reasons for this. First, describing planning strategies which were pertinent to carrying out the intention seemed to be a difficult task for certain participants despite the prompts given by the experimenter. For example, some participants described dinner plans and other social commitments which they might attend to before carrying out the intentions. These statements were not scored. Second, some statements related to plans and intentions that would have to be carried out *after* completing the intention described in the vignette. These responses were not scored. Third, some participants were in the habit of placing this responsibility on someone else. Statements such as "I'd get my parents to do it if I was really busy" were not scored. Fourth, participants often repeated identical statements. Repeated statements were not included in the analyses. Finally, in some cases it seemed that participants did not understand or forgot the intention described in the vignette. When it was obvious that participants were mentioning strategies for an intention that was not related to the vignette, those statements were ignored. Such statements could easily be identified in the transcripts as the interviewer would interrupt the participant and clarify the vignette before continuing.

The seven planning strategies were reliably scored by independent raters (see Table 1.2 for correlations). The reported correlations represent a range from the lowest to highest correlations obtained between two independent raters for each of the seven planning strategies.

In total, Experiment 1 included 24 participants which is consistent with other studies using similar qualitative procedures (Linton & Hedstrom, 2006; Messecar,



Archbold, Stewart, & Kirschling, 2002). In order to ensure that a sample of this size was capable providing an adequate range of planning strategies, I compared the strategies identified in the transcripts of the first 12 participants to those of the last 12 participants. This examination of interview responses revealed that participants did not mention additional strategies which had not already been described in the responses from the first 12 participants.

#### *Strategies reported for Time vs. Event Based ProM Tasks*

To explore the differential use of planning strategies for time and event based ProM tasks, I analyzed the proportion of the interview responses containing the use of each strategy. If an identified planning strategy was mentioned in a response, I assigned a score of 1 point for the use of that particular strategy, otherwise, I assigned a score of 0 points. As shown in Figure 1.1, a chi-square analysis performed on the seven strategies indicated that for time based ProM tasks, participants were more likely to consider the use of the following planning strategies: defining time,  $\chi^2(1, N = 106) = 11.20, p < .01$ , reserving time,  $\chi^2(1, N = 133) = 32.03, p < .01$ , and rearranging plans,  $\chi^2(1, N = 114) = 8.17, p < .01$ . Differences in the use of the remaining strategies between time and event based ProM tasks did not reach significance.

#### *Discussion*

Few studies have examined the planning strategies individuals use for carrying out ProM tasks. Of those studies, the majority have focused on how to increase ProM performance by using external memory aids (Hart, Hawkey, & Whyte, 2002; Kim, Burke, & Dowds, 2000; Meacham & Colombo, 1980; Van den Broek, Downes, Johnson, Dayus, & Hilton, 2000; Wilson, Emslie, & Quirk, 2001).

In Experiment 1 participants acknowledged the use of memory aids to help remember that an intention had to be performed, but they also reported that carrying out ProM tasks would require the use of planning strategies other than those related to memory. For example, participants mentioned that it was important to garner various resources such as time and physical tools to ensure that intentions would be successfully carried out. With respect to time resources, an analysis of participant responses revealed strategies for identifying time requirements, freeing up previous plans to create time, and ensuring that additional activities were not planned for the time set aside to carry out the intention. Participants also reported the possibility of using backup plans which would ensure access to alternative resources if the originally planned-for resource was unavailable.

It became obvious during the scoring process that individuals varied considerably in the quality of the planning strategies which they described. For example, responses that were categorized under the collecting resources strategy ranged from simple statements (e.g., "I would need a car") to those which were more elaborate (e.g., "Since I need a car, and know that someone else in my family might take it, I'd be sure to let them know well in advance of my plans, and also maybe remind them the night before of when I need to have it). The latter response is well thought out and demonstrates better strategy use than the simple statement "I would need a car." Although an analysis pertaining to the quality of planning strategy use may prove interesting, reliable scoring of this characteristic is extremely difficult. Moreover, for the purposes of Experiment 1, I was mainly interested in identifying a range of planning strategies to set

the stage for the following experiments reported in this paper. For these reasons, the quality of planning strategy use was not evaluated.

An analysis of participants' interview responses revealed differences in the proportion of strategies which were mentioned for time based and event based ProM tasks. Strategies relating to time management (defining time, reserving time, rearranging plans) were identified in significantly more responses to time based than event based ProM tasks. However, it could be argued that the interview approach may not be the best method of analyzing differences in strategy use. In particular, because participants were asked to describe as many strategies as possible, it is difficult to interpret whether participants would actually use such strategies or perceive them to be effective. Therefore, one of the primary objectives of Experiment 2 was to develop and use questionnaires which could assess strategy effectiveness and likelihood of use in a more accurate manner.

## Experiment 2

The primary objective of Experiment 2 was to assess the perceived effectiveness and likelihood that participants would use planning strategies for time and event based ProM tasks. I used a questionnaire approach to obtain effectiveness and likelihood of use ratings in order to validate and extend the results of the previous experiment. In the process of designing the questionnaires for Experiment 2, I realized that three of the planning strategies (defining time, locating, memory aids) from Experiment 1 included a broad range of participant responses. For example, responses scored under the category of defining time included those which considered the amount of time required for accomplishing an intention, as well as responses which suggested incorporating an extra amount of time in case unexpected circumstances arose. Therefore, on the basis of the seven original strategies from Experiment 1, I created four additional categories to ensure the entire domain of each planning strategy could be assessed (see Appendix D for a description of the strategies).

A secondary objective was to determine whether clusters of individuals could be identified with regard to the planning strategies they rated as effective and reported that they were likely to use. From the ratings obtained using the questionnaires there is no information regarding distinct strategies or combinations of strategies which some individuals perceived as more or less effective and likely to be used than other individuals. On the basis of the cluster analysis, I also wanted to determine if ProM performance on two laboratory tests of ProM differed depending on the strategies that individuals rated as effective and reported as likely to be used.

## *Method*

### *Participants*

141 undergraduate psychology students (85 females, 56 males) from the University of British Columbia participated for course credit. Participants' age ranged from 17 to 48 years,  $M = 20.32$ ,  $SD = 3.97$ . The experiment was conducted with the approval of the University of British Columbia's Behavioural Review and Ethics Board.

### *Materials and Instruments*

*Effectiveness Questionnaire (EQ)*. This computerized questionnaire was programmed in the E-Prime psychology software and used to assess the effectiveness of different planning strategies for time and event based ProM tasks. Eight vignettes, four to five sentences long, each described a promise to carry out an intention (i.e., a ProM task) at a later time. Half of the vignettes described a time based intention, and the other half described an event based intention. A paper version of the EQ is included in Appendix E.

The EQ consisted of eight blocks (one block for each vignette), each with 11 trials. In each block, one vignette was presented in the upper half of the display and remained there for the duration of the entire block (an illustration of the EQ is offered in Figure 2.1). During each trial, the following sequence of events occurred. First, a description of a planning strategy was displayed below the vignette. After a 2 second delay, the statement: "This is an effective strategy for ensuring that I successfully carry out this task" appeared below the planning strategy. Finally, participants had to rate how strongly they agreed or disagreed with this statement. Ratings were made on a 1 to 7 scale with scale points marked: strongly disagree, disagree, somewhat disagree,

neutral, somewhat agree, agree, strongly agree. There was no time limit to make responses. All blocks and trials were presented in random order.

*Likelihood of Use Questionnaire (LiQ).* This computerized questionnaire was programmed in the E-Prime psychology software and used to assess the likelihood of using different planning strategies for time and event based ProM tasks. I informed participants that the LiQ was similar to the EQ, and that the only difference concerned the rating statement which appeared below each planning strategy. For the LiQ, participants were asked to respond to: "I would use this strategy to ensure that I successfully carried out this task." Ratings were made on a 1 to 7 scale with scale points marked: strongly disagree, disagree, somewhat disagree, neutral, somewhat agree, agree, strongly agree. A paper version of the LiQ is included in Appendix F.

*North American Adult Reading Test (NAART).* This is a commonly used standardized test of verbal intelligence (Blair & Spreen, 1989) and was included to identify individuals with difficulties in English language ability. The test is described in detail in the method section of Experiment 1.

*Plug-in the Phone Task.* This test of event based ProM designed by Kvavilashvilli (1987), was adapted for use in this study. I informed each participant that the phone in the lab room was disconnected to prevent any interruptions during the test session. I then provided the following instruction: "At some point during the experiment I will ask you to read a list of words into a tape recorder. After reading the last word, I want you to immediately remind me to plug the phone back in." If participants provided this reminder at the appropriate time (i.e., before the next questionnaire was given),

they received 1 point for success. If participants forgot to provide the reminder, they received a score of 0.

*Personal Belonging Task.* For this test of event based ProM, I collected a personal belonging from each participant at the beginning of the experiment, most often a set of keys or cell phone. I instructed participants to "immediately ask me to return your [personal belonging] after I tell you that the experiment is now over." If participants remembered to ask for their personal belonging after being told that the experiment was over, but before being given the debriefing form, they received 1 point for success. If they forgot to ask for their belonging, they received a score of 0.

#### *Procedure*

I tested participants individually in a session that lasted approximately 45 minutes. After obtaining consent, I assigned the Plug-in the Phone and Personal Belonging Tasks. The participant's personal belonging remained out of sight during the retention interval. Next, participants completed the EQ and then the NAART. The NAART was administered after the EQ, but before the LiQ to create a separation between the two questionnaires.

The NAART provided an opportunity to assess participants' performance on the Plug-in the Phone Task. After participants finished reading all the words on the list, the test materials were collected and organized into a folder. At the same time, I scored the first test of ProM by noting whether the participant remembered to inform me that the phone needed to be plugged-in.

Immediately following the NAART, I administered the LiQ. After completing the LiQ, I provided the ProM retrieval cue for the Personal Belonging Task by informing the

participants that the experiment was now over, and proceeding to pick up a debriefing form from a nearby bookshelf. At the same time, I noted whether the participant remembered to ask for the return of his/her personal belonging. If they forgot, I returned the item after giving participants a complete verbal debriefing of the experiment.

#### *Data Preparation*

I examined the questionnaire data for univariate outliers, defined as a score falling 3 or more standard deviations away from the mean variable score. In total, 17 univariate outliers were discovered and replaced with the nearest non-outlying value.

For the EQ, participants rated each of the 11 planning strategies once during each block. In order to compare the perceived strategy effectiveness with regard to time and event based intentions, a final score for each planning strategy was derived by computing an average of the agreement ratings separately for the four blocks concerning time based intentions, and for the four blocks concerning event based intentions. Scores for the LiQ were computed in the same way. There were no missing values on either of the questionnaires.

To prepare the data for carrying out a cluster analysis, the rating scores from the EQ and LiQ were transformed into ipsative factor z scores. Ipsative factor z scores represent the profile shape of participants' responses to each of the 11 planning strategies, while at the same time controlling for profile elevation. The transformed data helped to ensure that the cluster analysis was maximally sensitive to the perceived effectiveness, or likelihood of use of the planning strategies as opposed to individual differences in rating style (e.g., a tendency to provide consistently high or low ratings). The ipsative factor z score transformation was accomplished for each participant's data



by calculating a mean agreement rating and standard deviation across the 11 trials in each block. Next, the mean agreement rating was subtracted from the participant's raw agreement rating, and the resulting value was divided by the computed standard deviation.

### *Cluster Analysis*

A series of cluster analyses were performed on the ipsative factor z scores to group individuals on the basis of their ratings on the EQ and LiQ (an overview of cluster analysis is provided in Appendix G). The goal of cluster analysis is to form groups with minimal within group variance and maximal between group variance. Following recommendations by Hair, Anderson, Tatham, and Black (1998), the cluster analysis proceeded in two steps. Initially, a hierarchical cluster analysis was conducted on the rating data using Ward's method with squared Euclidian distance as the clustering algorithm. Ward's method is effective in minimizing within cluster differences and is biased towards combining clusters with a small number of individuals. This ANOVA-type approach calculates the sum of the squared Euclidian distances from each case in a cluster and merges remaining clusters on the basis of the cluster that increases the sum of squares the least.

Using the results of the first-pass hierarchical analysis, a large change in the agglomeration coefficient was used to estimate the optimal cluster solution. Similar to the scree test in factor analysis, a large percentage change in the agglomeration coefficient provides an estimate of the number of clusters present. The percentage change in the agglomeration coefficient going from the 10 cluster solution and proceeding down to the 2 cluster solution was determined, and the first large increase

was used as a stopping rule. Milligan and Cooper (1985) have shown this stopping rule to be an accurate algorithm. Following the hierarchical analysis, a nonhierarchical analysis was performed using the k-means method, specifying the number of clusters on the basis of the hierarchical analysis. Separate cluster analyses were performed on the time based and event based portions of the EQ and LiQ.

### *Results*

#### *NAART*

An outlier analysis revealed that no scores were 3 or more standard deviations away from the mean NAART score. The mean number of mispronunciations,  $M = 28.00$ ,  $SD = 10.36$ , for our participants was significantly higher than that reported in Uttl (2002),  $M = 22.54$ ,  $SD = 9.29$ , for a similar age group,  $t(191) = 6.39$ ,  $p < .05$ . The low NAART performance may be attributed to English being a second language for a large proportion of undergraduate students at the University of British Columbia. In contrast 98% of the participants included in the Uttl (2002) study were native English speakers.

#### *EQ*

To determine which strategies were rated as effective for time and event based ProM tasks, ratings from the EQ were analyzed using one sample  $t$  tests with a rating of 5 (i.e., "somewhat agree") as the test value. Next, a two-way repeated measures ANOVA was performed on the EQ data with strategy as one factor, and type of ProM task (time based, event based) as the second to determine whether there were significant differences in the rated effectiveness of strategies between time and event based ProM tasks.

As shown in Table 2.1 participants agreed (provided ratings significantly higher than 5) that the majority of the planning strategies were effective for time based ProM tasks. However, participants rated only three strategies (route planning, collecting resources, external memory aids) as effective for event based ProM tasks.

The ANOVA revealed a main effect for the rated effectiveness of strategies between time based and event based ProM tasks,  $F(1, 140) = 107.54$ ,  $MSE = 1.37$ ,  $p < .01$ . The results of a follow-up analysis using paired samples  $t$  tests revealed that participants rated the majority of planning strategies more effective for time based than event based ProM tasks (see Table 2.1).

#### LiQ

The analyses for the LiQ was similar to that for the EQ. First, ratings from the LiQ were analyzed using one sample  $t$  tests with a rating of 5 (i.e., "somewhat agree") as the test value. Next, a two-way repeated measures ANOVA was performed on the LiQ data with strategy as one factor, and type of ProM task (time based, event based) as the second.

As shown in Table 2.2 participants agreed (provided ratings significantly higher than 5) that approximately half of the strategies were rated as likely to be used for time based ProM tasks. For event based ProM tasks, only one strategy (collecting resources) was rated as likely to be used.

The ANOVA revealed a main effect for the reported likelihood of strategy use between time based and event based ProM tasks,  $F(1, 140) = 64.81$ ,  $MSE = 2.38$ ,  $p < .01$ . The results of a follow-up analysis using paired samples  $t$  tests revealed that

participants agreed they were more likely to use the majority of planning strategies for time based than event based ProM tasks (see Table 2.2).

### *ProM Performance*

The mean level of performance on the Plug-in the Phone and Personal Belonging Tasks was .62 and .43, respectively. Participants' performance across the two tasks was significantly correlated,  $r(139) = .25, p < .05$ .

To determine if the self-reported likelihood of using planning strategies was related to objective ProM task performance, ratings from the event based portion of the LiQ were correlated with success or failure on both event based laboratory tests of ProM. The analysis revealed that the self-reported likelihood of planning strategy use was not significantly correlated with participants' success on the Plug-in the Phone Task or the Personal Belonging Task.

### *Cluster Analysis*

*EQ-time based.* Examination of the agglomeration schedule pointed to a two cluster solution. The percent change in the agglomeration coefficient going from one to two clusters was 20.89%, more than double the magnitude of the change in the preceding agglomeration steps. An examination of the cluster profiles revealed two groups distinguished by individuals' perception about the effectiveness of memory strategies (see Figure 2.2). The Memory group (Cluster 1) consisted of 51 individuals (36.17% of the sample) who rated memory strategies (i.e., external and internal memory aids, reviewing plans) to be significantly more effective for ensuring the successful performance of time based ProM tasks compared to the Non-memory group. The Non-memory group (Cluster 2) consisted of 90 individuals (63.83% of the sample) who

showed an opposite profile, rating planning strategies other than memory strategies to be significantly more effective than the Memory-group. The only exception was the strategy of rearranging plans, which both groups rated equally effective.

*EQ-event based.* Examination of the agglomeration schedule pointed to a two cluster solution. The percent change in the agglomeration coefficient going from one to two clusters was 17.58%, almost double the magnitude of the change in the preceding agglomeration steps. As shown in Figure 2.3, an examination of the cluster profile centres suggested a Memory and Non-memory group. The Memory group (Cluster 1) consisted of 44 individuals (31.21% of the sample), while the Non-memory group (Cluster 2) consisted of 97 individuals (68.79% of the sample). For event based ProM tasks, both groups perceived collecting resources and backup planning strategies to be equally effective. A comparison of cluster membership between the time and event based portions of the EQ revealed that only 19% of individuals switched cluster membership. The results suggest that the same individuals consistently perceive a similar strategy set as being effective for time and event based ProM tasks.

*LiQ-time based.* Examination of the agglomeration schedule pointed to a four cluster solution. The percent change in the agglomeration coefficient going from three to four clusters was 12.22%, one and a half times the magnitude of the change in the preceding agglomeration steps. As shown in Figure 2.4, profiles for the Memory-group and Non-Memory group resurfaced. The Memory group (Cluster 2) consisted of 22 individuals (15.60% of the sample) while the Non-memory group (Cluster 4) consisted of 24 individuals (17.02% of the sample). As shown in Table 2.3, the Memory-group was more likely to use memory strategies than the Non-memory-group, and less likely to use

the other planning strategies. Similar to the time based portion of the EQ, both the Memory group and the Non-memory group were equally likely to use the rearranging plans strategy. In addition, both groups were also equally likely to use the locating strategy. The remaining two clusters were similar to the Non-Memory group, with two notable exceptions. Cluster 3 consisted of 49 individuals (34.57% of the sample) who were likely to use all of the planning strategies of the Non-memory group, plus external memory aids, while Cluster 1 consisted of 46 individuals (32.62% of the sample) who were also likely to use external memory aids but less likely to use backup planning.

*LiQ-event based.* Examination of the agglomeration schedule pointed to a three cluster solution. The percent change in the agglomeration coefficient going from two to three clusters was 12.36%, almost double the magnitude of the change in the preceding agglomeration steps. Again, profiles for the Memory group and Non-Memory group resurfaced (see Figure 2.5). The Non-Memory-group (Cluster 3) consisted of 42 individuals (29.79% of the sample) while the Memory-group (Cluster 2) consisted of 39 individuals (27.66% of the sample). As shown in Table 2.4, both groups were likely to use strategies of backup planning and reviewing plans. The remaining 60 individuals (42.55% of the sample) were assigned to Cluster 1, and were noted for being the most likely to use the locating strategy and least likely to use internal memory aids (subsequently called the Locating-group) compared to both the Memory group and Non-memory group. The remainder of the strategy ratings for the Locating-group fell between those of the Memory and Non-memory groups.

*Cluster Validation.* The Personal Belonging and Plug-in the Phone Tasks provided an opportunity to assess the usefulness of the cluster analysis above and

beyond the mere description of data from the clustering variables. Specifically, I wanted to know if cluster membership on the event based portion of the EQ and LiQ could predict performance on either of the two event based ProM tasks assigned during the course of Experiment 2. For the event based portion of the EQ, a chi-square analysis of cluster membership and ProM performance on both the Personal Belonging Task and Plug-in the Phone Task was not significant,  $\chi^2(1, N = 141) = 0.03, p > .05$ ,  $\chi^2(1, N = 141) = 0.02, p > .05$ . The analysis was repeated on the event based portion of the LiQ, and again, no significant differences were found on either the Personal Belonging Task or the Plug-in the Phone Task,  $\chi^2(2, N = 141) = 0.33, p > .05$ ,  $\chi^2(2, N = 141) = 1.94, p > .05$ .

### *Discussion*

#### *EQ and LiQ*

Results from the EQ reveal that for time based ProM, the majority of the planning strategies were perceived as effective for ensuring that intentions would be successfully carried out. The only strategy that participants disagreed with in terms of effectiveness (i.e., provided a rating lower than neutral) was using internal memory aids. This finding is in line with previous research on the perceived effectiveness of memory aids supporting ProM (Ellis, 1988; Intons-Peterson & Fournier, 1986; Penningroth, 2005).

For event based tasks, strategies related to the management of time resources (defining time, reserving time, rearranging plans, updating plans) were not rated as effective. This finding reinforces the low proportion of interview responses describing these strategies for event based ProM tasks in Experiment 1.

The same strategies which were rated as effective were also rated as likely to be used for time based tasks, with the exception of updating plans and locating. For event based tasks, external memory aids and route planning were not likely to be used even though they were rated as effective. These results are difficult to interpret. One would assume that if an individual perceives a strategy to be effective, they would also be likely to use that particular strategy. However, the results of the LiQ are not in line with this reasoning. One possible explanation for differences between the EQ and LiQ concerns participants' interpretation of the questionnaire. When asked to rate how likely they were to use a particular strategy, they may have been inclined to reframe the question in terms of how often they have used that strategy in the past, as opposed to a willingness to use this strategy in the future. Alternatively, they could have used the frequency of strategy use in the past, as an indicator of how likely they were to use it in the future. In either case, both may explain the decreased likelihood of use ratings on the questionnaires.

Overall, on both the EQ and LiQ, the majority of planning strategies were rated as more effective and likely to be used for time based than event based ProM tasks. One possible explanation for this finding relates to the appropriateness of the strategies for these two classes of ProM tasks. Time based intentions require execution at the appropriate time or after an appropriate amount of time has elapsed, whereas event based tasks are to be executed when an event occurs. Therefore, because there is little question about the context in which a time based task is carried out (e.g., meet a friend at 2:00 pm), strategies for estimating the amount of time required and rearranging plans to ensure that one is available to carry out the intention at that time would be



highly effective. Similarly, strategies such as locating and route planning would also be important for ensuring that time based intentions were executed in a timely manner (e.g., finding directions on a map so one does not get lost; planning a more efficient route to avoid rush hour traffic). Finally, the common use of day planners, schedules and agendas may explain why individuals rated external memory aids as more effective for time based intentions. Because these external aids create temporal specificity by linking appointments and commitments to a specific time (e.g., recording a doctor's appointment for Tuesday at 2:00 pm), individuals may have perceived these tools to be more effective for time based intentions than event based intentions. In contrast, these strategies may be less effective for event based tasks which are less predictable and not linked to a specific time.

The results also imply that individuals may be more aware of the strategies which could be used for time based as opposed to event based intentions. The strategies I presented participants in the current experiment were taken from the interviews in Experiment 1. If participants were indeed more aware of planning strategies for time based ProM, those strategies would have been more easily articulated and would have been the ones identified by the qualitative analysis. Because the strategies presented in the EQ and LiQ were carried over from the interview responses, there may have been an overrepresentation of time based ProM strategies on these questionnaires. This may explain why individuals rated the majority of strategies to be more effective and likely to be used for time based intentions.

Finally, the results may also be in agreement with the assumption that time based tasks are more difficult than event based tasks (Einstein, McDaniel, Richardson,

Guynn, & Cunfer, 1995). The argument stems from the fact that the environment does not provide ProM retrieval cues for time based intentions (with the exception perhaps of clocks). Therefore, self-initiated retrieval of these intentions is paramount for successful performance. To the extent that participants believe time based intentions are in fact more difficult, they may be more likely to use planning strategies to augment their performance.

### *ProM Performance*

A secondary objective of Experiment 2 was to determine whether participants' self reported likelihood of planning strategy use was related to event based ProM performance in the lab. A correlational analysis did not reveal any of the strategies to be significantly related to performance on either of the ProM tasks. In hindsight, the lack of significant findings may be attributed to several factors. First, the vignettes used for the EQ and LiQ described intentions which were significantly more complex than the ProM tasks used in the lab. Successful performance on the Personal Belonging Task, and the Plug-in the Phone task only required that participants provide a reminder to the experimenter. Therefore, strategies such as route planning, locating, and backup planning were not likely to be useful for facilitating performance on these simple ProM tasks. Second, although participants rated external memory aids to be effective and likely to be used for event based ProM tasks, they were not allowed to make notes or written reminders for either task. Third, since the ProM tasks were event based and did not require more than a second or two for performance, strategies for defining time, reserving time, rearranging plans, and updating plans may not have been useful or effective. To address these issues, a future study could determine how the reported

likelihood of using planning strategies relate to objective performance on time and event based ProM tasks which are more demanding and similar to the intentions described in the vignettes.

### *Cluster Analysis*

The results of the cluster analysis are important because they reveal differences in the perceived effectiveness and likelihood of strategy use not apparent in the averaged questionnaire data. The cluster analysis identified two distinct groups of individuals in terms of how effective they perceived certain planning strategies to be and how likely they were to use them. The profiles of the Memory-group, and Non-memory group were conserved for both time and event based tasks, on both the EQ and LiQ. The results imply that individuals belonging to the Memory-group view successful performance of ProM tasks to be a function of remembering that an intention has to be completed. Unfortunately, the results of this study can not directly speak to why these individuals place memory strategies in such high regard, but does create avenues for further research. For example, one hypothesis would be that individuals belonging to the Memory-group also report subjective impairments in their ProM and thus feel compelled to use memory aids. Even more interesting would be an analysis of how individuals in the Memory-group and Non-memory group fared on objective tests of ProM which had to be carried out in the context of their everyday lives.

In summary, the results of the current experiment extend those of Experiment 1. In Experiment 1, participants described strategies which they *could* use for successfully carrying out time and event based ProM tasks. Thus, participants were encouraged to describe as many strategies as possible regardless of whether they actually intended to

use them. In the current experiment, I assessed not only the kinds of strategies participants *would* use, but also the strategies which they believed were effective. A logical follow-up study which forms the basis of Experiment 3, is designed to determine whether training individuals to use certain planning strategies will facilitate ProM performance.

### Experiment 3

As mentioned in the introduction, external memory aids are common tools used to facilitate ProM. While these external aids have been shown to be effective for remembering intentions (Ellis, 1998, Maylor, 1990; Park & Kidder, 1996), there is still room for improvement. For example, placing a post-it sticker near the dining table to remind oneself to take medication at noon would be effective if the note is visible at the appropriate time. However, personal experience suggests our usual day-to-day activities often cause these kinds of reminders to go unnoticed (e.g., we may be busy carrying out errands away from home or decide to have lunch at a later time). Alternatively, during a lunch break at work we might remember to take our medication only to realize that it was left in the medicine cabinet at home (e.g., committing a planning failure).

In Experiment 3, I wanted to explore the possibility that using the planning strategies identified in the previous experiments would constitute an effective mnemonic for ProM. Planning represents an internal aid for facilitating ProM that is presumed to be available in any situation, creates a clearer specification of task requirements, and helps to identify necessary resources required to complete intentions. Of the four strategies that I trained participants to use, none stressed the use of external memory aids.

#### *Method*

##### *Participants*

44 undergraduate psychology students, (30 females, 14 males) from the University of British Columbia participated for course credit. They ranged in age from

18 to 29 years,  $M = 20.47$ ,  $SD = 2.31$ . I excluded the data of four participants (3 females, 1 male) because they did not return for the second experimental session. The experiment was conducted with the approval of the University of British Columbia's Behavioural Review and Ethics Board.

### *Materials and Instruments*

*North American Adult Reading Test (NAART).* This is a commonly used standardized test of verbal intelligence (Blair & Spreen, 1989) and was included to identify individuals with difficulties in English language ability. The test is described in detail in the method section of Experiment 1.

*Book Task.* For this time based test of episodic ProM, participants were required to borrow a book from the Main Campus library and were asked to select a specific time between 10:00 am and 6:00 pm to carry out the task. To verify performance of the task, participants were required to bring the book receipt issued by the library to the second experimental session. I scored performance as successful if it occurred within a 30 minute window of the time participants originally agreed to carry out the task. Participants were not informed of this interval when the task was assigned.

*Stamp Task.* For this second test of time based episodic ProM, participants were required to purchase a stamp from the Campus Post Office and were asked to select a specific time between 10:00 am and 6:00 pm to carry out the task. Before leaving the lab, the experimenter reimbursed the participant for the stamp and asked that the cashier's receipt be brought to the second experimental session to verify performance of the task. Like the Book Task, participants were scored as having succeeded on this

task if it was carried out within a 30 minute window of the time participants had originally selected. Participants were not informed of this interval when the task was assigned.

*Confirmation Call.* This test of event based ProM, inspired by Cuttler and Graf (2004) and Maylor (1990), was adapted for use in this study. Participants were instructed to call the lab the evening before returning for the second part of the experiment. Specifically, they were asked to make this call right before going to bed. When calling the lab, all participants were greeted by a voice message and asked to leave their name. The time and date of the call was digitally recorded by the answering machine. Participants' performance on this task was scored as successful if the call was placed after 7:00 pm on the evening before they were scheduled to come back for the second experimental session.

*Planning Activity Sheets.* Planning activity sheets were created for the purpose of training individuals to use four planning strategies which were rated as effective in the context of Experiment 2. Activity sheets were designed for four strategies: defining time, reserving time, rearranging plans and updating plans (an example of a planning activity sheet is included in Appendix H). Each activity sheet had a description of the planning strategy followed by several questions that participants were required to answer. These questions encouraged the task-relevant use of each strategy for three tests of ProM which had to be carried out in the context of participants' everyday activities.

*Plan a Day Task (PAD).* The PAD task is a computerized diagnostic tool used to assess an individual's general planning ability (Kliegel, Martin, McDaniel, & Einstein, 2002). Participants are required to make a schedule for completing a number of

errands in a fictitious city, constrained by the time window when errands must be completed and the priority of the different errands. The task required participants to take into consideration the length of time required to travel between locations where errands are carried out, and to plan an optimal route through the city. A maximum of 20 minutes is allotted for making a plan.

*Memory Questionnaires.* This set of questionnaires included the Martin and Park Environmental Demands Questionnaire (EDQ), the Prospective Memory Questionnaire (PMQ), and the Prospective Retrospective Memory Questionnaire (PRMQ) (Hannon, Adams, & Harrington, 1995; Martin & Park, 2002; Smith, Della Sala, Logie, & Maylor, 2000). The EDQ is a self report inventory used to assess the level of day-to-day busyness as well as the routine nature of daily activities, while the PMQ and PRMQ are self report inventories which probe the frequency that individuals experience everyday kinds of prospective and retrospective memory failures. I developed and used a fourth questionnaire, the Task Motivation Questionnaire (TMQ) which assessed participants' level of motivation for completing the assigned ProM tasks (i.e., Book Task, Stamp Task, Confirmation Call), attributions for successful/unsuccessful task performance, and whether failures were attributed to prospective or retrospective memory failures. The questionnaires were included to create a sense of purpose for returning to the lab, as well as create avenues for future research. Since the data resulting from these questionnaires are not the main focus for the present research, they will not be discussed in this paper.



## *Design*

The overall design of the experiment consisted of a 2 x 3 mixed factorial manipulation that had Planning Condition (Training, No-training) as a between subjects factor, and ProM Task (Book Task, Stamp Task, Confirmation Call) as a within subjects factor. In the Training condition, I provided participants with training in the use of task relevant planning strategies for all three ProM tasks by asking participants to complete the Planning Activity Sheets. In the No-training condition participants performed task irrelevant planning for a similar length of time by completing the PAD. Participants were randomly assigned to one of the two conditions (Training, No-training) by the flip of a coin. There was an equal number of participants in the Training and No-training conditions.

## *Procedure*

*Session 1.* I tested participants individually in a session that lasted approximately 45 minutes. After obtaining consent, I asked participants to complete the EDQ and then administered the NAART. At this point, I provided verbal instructions for the ProM tasks. A description of each task was also shown on a cue card placed on the table in front of the participant. While explaining each task, I informed participants of what day the task should be carried out. Task completion dates were predetermined for the two time based tests of ProM, which I always assigned in the same order. The Book Task was to be carried out two to four days after Session 1, and the Stamp Task was to be carried out two to four days following the Book Task. If participants indicated that they were not able to carry out the task on that day (e.g., because of a job), I

randomly assigned the task to be completed either a day before or day after the target day.

*Planning strategy Training group.* After providing the ProM task instructions, I asked participants assigned to the Training condition to complete each of the four planning activity sheets. I explained that the activity sheets were designed to train participants in the use of planning strategies which had been previously rated as effective for different kinds of ProM tasks. The four activity sheets were always presented in the same order.

The first strategy I trained participants to use was defining time. I mentioned that sometimes our plans and intentions are not completed because we have failed to consider the amount of time necessary to complete tasks. I provided examples such as estimating the amount of time that it would take to get to the library from home or a previous class, and the amount of time which would be required to locate the book in the library. I encouraged participants to break down each intention into a series of smaller steps, to write down those steps, and provide an estimation of the amount of time required to carry out each step.

Closely related to defining time was the strategy of updating plans. I explained that sometimes events outside of our control may get in the way of completing tasks, and provided the example of slow traffic during rush hour. Then, I asked participants to list some things that might get in the way of task completion, and to think about and describe what they might do to ensure that those events would not hinder them from carrying out the three assigned ProM tasks (i.e., Book Task, Stamp Task, Confirmation Call).

The third strategy which participants were trained to use was reserving time. For this strategy, I explained that we often accidentally schedule other intentions during the time we set aside to carry out our original intention. I asked participants to think about and describe what they would do to make sure that the time needed to carry out the ProM tasks would not be occupied by another activity.

Finally, the last planning activity sheet concerned rearranging plans. I first asked participants to think about and write down the intentions which they already committed to for the days that each of the ProM tasks were assigned. I asked them to indicate which intentions could and could not be rescheduled. If intentions could be rescheduled, participants described what steps they would take to do so.

*No-training group.* Participants who were assigned to the No-training condition did not complete any of the planning activity sheets. Instead, I gave them instructions concerning the PAD task, and provided them with 20 minutes to complete the test. I placed a stopwatch on the table and told participants to monitor the time as I would stop the test promptly after 20 minutes had elapsed.

The PAD task was used to help ensure that participants in the Training and No-training groups remained in the lab for approximately the same amount of time. Consequently, by completing the PAD task instead of the planning activity sheets, participants utilized their planning skills in a ProM task irrelevant manner.

After completing the planning activity sheets, or the PAD, I gave participants the following instructions: "Before leaving today, I would like you to tell me what time you plan to carry out the Book Task and Stamp Task which we discussed earlier. I want you to treat them like you would an appointment and therefore you should carry out the

tasks at the exactly time that you tell me, not earlier or later.” After participants selected a time for both the Book and Stamp Tasks, I provided the lab phone number for completing the Confirmation Call. If participants requested, I allowed them to consult their completed planning activity sheets. Finally, before leaving the lab, I scheduled participants for the second experimental session and provided a reminder to bring the receipts from completing the Book Task and the Stamp Task.

*Session 2.* Upon returning to the lab for the second session, I collected the receipts obtained from the Book task and the Stamp task to score participants' performance. Next, I asked participants to complete the PMQ, PRMQ, and TMQ. I explained that the PMQ and PRMQ consisted of statements about everyday memory failures that individuals experience from time to time and instructed participants to read each statement carefully and provide a rating. For the TMQ, I explained that I wanted to learn about why participants may or may not have completed each task and explore their motivations regarding task completion. I emphasized that they should be completely honest about answering each question and that I would not be offended in any way by their responses. After completing all of the questionnaires, participants were given a verbal debriefing and course credit.

## *Results*

### *NAART*

An outlier analysis revealed that no individual score was 3 or more standard deviations away from the mean NAART score. The mean number of mispronunciations,  $M = 27.71$ ,  $SD = 8.29$  for participants was similar to that reported in Uttl (2002),  $M = 22.54$ ,  $SD = 10.36$ ,  $t(90) = 1.63$ ,  $p > .05$ .

### *ProM Performance*

Overall performance on the three tests of ProM was .65, .56, and .68 for the Book Task, the Stamp Task, and the Confirmation Call, respectively. As shown in Figure 3.1, participants who were given training in task relevant planning strategies were more likely to succeed on the Book Task and the Stamp Task than those who did not receive training,  $\chi^2(1, N = 40) = 3.96, p < .05$ ,  $\chi^2(1, N = 40) = 8.12, p < .05$ .

Planning did not significantly facilitate performance on the Call the Lab Task,  $\chi^2(1, N = 40) = 1.76, p > .05$ .

The data for the two time based tests of ProM were also analyzed according to a lenient criterion to determine if ProM failures could be attributed to remembering to carry out the task, but simply failing to do so at the appropriate time. For this analysis, ProM task performance was considered successful if it was attempted at any time on the appropriate day. Using the lenient criterion, overall performance on the Book Task and Stamp Task was .80 and .63, respectively.

A chi-square analysis did not reveal a significant effect for task relevant planning on the Book Task according to the lenient criterion,  $\chi^2(1, N = 40) = 0.65, p > .05$  (see Figure 3.2). Therefore, participants in the No-training condition were just as likely as individuals in the Training condition to remember that the Book Task had to be carried out. Comparing these results to those using the original performance criterion (i.e., +/- 30 minute interval) suggests that failures on the Book Task were due to a failure in keeping the agreed upon appointment time, or perhaps forgetting the appropriate time the task was supposed to be carried out.

When using the lenient criterion to analyze performance for the Stamp Task, participants in the Training condition were significantly more likely to succeed than participants in the No-training condition,  $\chi^2(1, N = 40) = 5.23, p < .05$ . Comparing these results to those using the original performance criterion would suggest that participants in the No-training condition were more likely to fail the Stamp Task because they did not attempt the task (e.g. they forget, were too busy, found task impossible to complete) and not because they completed the task outside of the 30 minute performance interval.

### *Discussion*

The purpose of the current experiment was to bring together the results of the previous experiments reported in this paper. In Experiment 1, several kinds of planning strategies were identified for time and event based ProM tasks. Experiment 2 was designed to validate the results of Experiment 1 by asking participants to rate the effectiveness and likelihood of using the strategies. Finally, in Experiment 3, I selected four planning strategies and trained participants to use them in an effort to improve ProM performance.

The results show that participants who received training were significantly more likely to succeed in carrying out two tests of time based ProM in the context of their everyday lives (i.e., the Book Task and the Stamp Task). However, for the event based task (i.e., the Confirmation Call) training did not result in a significant increase in ProM performance. The possibility exists that training participants to use the four selected planning strategies may not have facilitated performance on the Confirmation Call to the same extent as the other two time based tests of ProM. Since making a phone call to the lab did not place a high demand on time management, the four planning strategies

(defining time, updating plans, rearranging plans, reserving time) may not have resulted in as large of a performance difference between the Training and No-Training conditions compared to the Book Task and the Stamp Task. If this hypothesis is correct, it reinforces the results of Experiment 1, as well as the results of the questionnaire data in Experiment 2. Specifically, these time management strategies appeared in significantly less interview responses for event based tasks, were not rated as effective, and were not reported as likely to be used. Future research should consider the kinds of planning strategies which are most beneficial for event based prospective remembering. As previously discussed, individuals may have found it difficult to describe planning strategies for event based prospective remembering. Therefore it may be necessary to develop planning strategies which focus on manipulating variables such as cue distinctiveness and familiarity which have been shown to influence event based ProM performance (Brandimonte & Passolunghi, 1994; McDaniel & Einstein, 1993).

When ProM performance on the two time based tasks was analyzed using the lenient criterion, an interesting pattern of results surfaced. For the Book Task, there were no differences between the Training condition and the No-training condition in terms of ProM performance. However, for the Stamp Task the results of the analysis were consistent with those based on the original +/- 30 minute criterion. Although these findings appear to conflict with each other, I believe that they are consistent with one of the ways in which planning facilitates ProM. Planning is assumed to not only help individuals with the memory component of ProM tasks, but also influence the non-cognitive factors of ProM performance. For example, planning is assumed to help with the identification of resources required for performance. In the case of the Book Task

and Stamp Task, one important resource is time. While our participants were engaged in the many activities of university life, not planning an appropriate amount of time to carry out the Book Task probably did not result in forgetting to carry out a task, but it may have led to task reprioritization. As students were on their way to classes, meeting friends, and participating in extracurricular activities, not setting aside an appropriate amount of time for task completion would have caused performance to fall outside of the strict  $\pm 30$  minute performance interval. For the Stamp task, which was to be performed almost one week after the first experimental session, ProM performance was significantly higher for the Training group than the Non-training group according to both the lenient and strict criterion. This would suggest that participants who did not receive training in task relevant planning strategies failed the task because of a combination of memory and non-cognitive factors (e.g., they forgot, were too busy, found task impossible to complete).

In summary, the results of Experiment 3 show that when participants were given training in task relevant planning strategies, ProM performance increased. This supports the hypothesis that engaging in the use of planning strategies is an effective mnemonic for ProM. Several explanations concerning the means by which planning facilitates ProM are mentioned in the General Discussion.



## General Discussion

The overall goal of this thesis was to develop an internal mnemonic for facilitating ProM performance. To achieve this goal, I used several approaches. The first approach was to identify and describe the kinds of planning strategies that individuals could use for successfully carrying out various time and event based intentions. The second approach was to validate these planning strategies by asking participants to provide ratings about their effectiveness and likelihood of use. The third approach was to determine whether individuals who were more or less likely to use certain strategies varied in terms of objective ProM performance on laboratory based tests of ProM. Finally, the fourth approach was to determine if training individuals to use a subset of these planning strategies would lead to increased ProM performance. The main findings of the these four approaches were discussed in Experiments 1 through 3, and will be briefly summarized here. The implications of these findings will be discussed, followed by limitations and directions for future research.

### *Summary of Research Findings*

The first approach towards achieving the goal of this thesis was to explore how individuals planned to carry out various kinds of time and event based intentions. This approach forms the investigation reported in Experiment 1. Using a series of semi-structured interviews followed by a qualitative analysis, several distinct categories of planning strategies were revealed. These strategies, by definition, consisted of the action sequences that people would take to follow through on their intentions. Strategies for time allocation, organizing task relevant resources, and recording task relevant information were often described as methods for ensuring that intentions would

be successfully carried out. Additionally, significant differences existed in the kinds of strategies that individuals reported for time based and event based intentions.

The results reported in Experiment 1 were followed up in Experiment 2 by using two questionnaires to obtain participant ratings concerning the effectiveness and likelihood of using these strategies. The majority of the strategies were rated as effective and likely to be used for time based intentions, but not for event based intentions. A cluster analysis identified two groups of individuals on the basis of planning strategies which they perceived as effective and reported that they were likely to use. The two dominant clusters consisted of a Memory-group and Non-memory group. Individuals in the Memory-group consistently rated the use of memory strategies to be the most effective and likely to be used strategies for successfully carrying out intentions. Conversely, individuals in the Non-memory group provided higher ratings for virtually all planning strategies unrelated to memory strategies. In an attempt to validate these clusters, individuals' performance on two laboratory tests of event based ProM was compared between the two groups. Differences in ProM performance were not significant between the Memory-group and Non-memory group.

In an investigation which forms the basis of Experiment 3, I provided individuals with training in the use of four strategies which had been rated effective in the context of the previous study. Compared to a control group who did not receive training, performance on two time based tasks of ProM was significantly higher for individuals in the training group. However, on an event based ProM task, training was not found to produce significant differences in ProM performance.

### *Theoretical Implications of Findings*

As pointed out in the introduction, successful prospective remembering is multidimensional in nature and depends on knowledge about task demands, the formulation of a plan to facilitate performance, recalling the action that has to be carried out, and compliance, or one's willingness to carry out the task (Dobbs & Reeves, 1996; Einstein & McDaniel, 1996; Harris, 1984; Levy & Loftus, 1984; Meacham, 1982). The planning component of ProM has been studied in previous research as one means by which ProM performance can be improved (Ellis, 1988; Meacham & Singer, 1977). However, these studies have focused on external aids to boost the memory or monitoring component of prospective remembering. The experiments contained in my thesis have extended this work by taking the focus off the use of external memory aids. The results demonstrate that the use of planning strategies which create a clearer specification of task requirements and ensure the availability of resources for task performance, are an effective means for improving ProM performance. From a theoretical viewpoint, engaging in ProM task relevant planning may impact both the cognitive and non-cognitive factors which are essential for ProM performance. In this section, I will discuss how my findings converge with and extend the previous research as well as speculate on some of the mechanisms by which planning facilitates ProM performance.

In terms of ProM retrieval, Mantyla (1996) has argued that there are at least three factors: the activation level concerning the mental representation of an intention (the trace-dependent component), the characteristics of the cue for triggering the intention (the cue-dependent component), and an individual's attentional resources for

task monitoring and self-initiated retrieval (the capacity-dependent component). Most research in ProM has focused on the latter two aspects of ProM retrieval. For example, the capacity-dependent component has been studied in the context of aging (Maylor, 1993; McDaniel & Einstein, 1990; Park, Hertzog, Kidder, Morrell, & Mayhorn 1997), while studies exploring the optimal characteristics of ProM retrieval cues have addressed the cue-dependent component (Brandimonte & Passolunghi, 1994; Ellis & Milne, 1992). The results of this thesis contribute to our understanding of the less studied, trace-dependent component of ProM retrieval.

A study by Mantyla (1993) suggests that the mental activities associated with planning may facilitate ProM by increasing both the activation level and number of retrieval cues related to intentions. In his study, explicit priming activities (assumed to mirror the planning stage of ProM) were used to increase the activation of ProM cues which ultimately resulted in a subsequent increase in ProM performance. The current series of experiments expands upon the previous work in two important ways. First, I have extended the ecological validity of the priming manipulation used in the Mantyla (1993) study by asking participants to engage in planning activities which are more similar to those which would be used in day-to-day life. Second, I have shown that planning can facilitate ProM not only in a laboratory setting with a retention interval of 15 to 20 minutes, but also in the context of individuals' everyday lives where the retention interval spanned several days.

Another way in which planning may increase ProM performance concerns the effect it has on one's compliance to carry out an intention. Delving into the domain of social cognition, individuals who have committed themselves to a position or course of

action by making a decision, are also less likely to renege on that choice in the future. In a classic study by Freedman and Fraser (1966), the effects of making commitments are shown to be quite powerful and long lasting. In their study, the authors asked individuals to make a small commitment to place a "safe driving" sign in the corner of a household window. Several weeks later those individuals who complied with this request were also more likely to comply with a further request to place a massive, poorly lettered "DRIVE CAREFULLY" billboard on their front lawn. This process of attaining compliance to a sizeable request by first making a smaller one has become known as the "foot-in-the-door-technique." In the context of ProM, planning – generating and executing a course of action to help ensure realization of an intention – is presumed to be analogous to the process of making a decision or commitment to oneself to carry out an intention. Thus, by making a commitment and taking the first mental steps towards carrying out the intention, an individual's compliance to follow through is presumed to subsequently be increased.

A third manner in which planning may increase ProM is to make the retrieval of an intention more automatic. Logan (1991) has defined an automatic process to be one requiring little or no focused attention. In other words, automatic processes, once developed do not place a high demand on conscious control. With respect to ProM, intentions must be retrieved in the context of ongoing thoughts or actions which can often be attention demanding (e.g., remembering to pick up dry cleaning on the way home while paying attention to driving). However, by engaging in planning activities, the mental simulation of actions required to carry out an intention is presumed to make their subsequent retrieval more automatic, requiring less conscious control, and thereby

resulting in an increase in ProM retrieval in the midst of an ongoing activity. As several authors have previously suggested, this automaticity is achieved by connecting specific situational cues and contexts to behaviour (Chasteen, Park & Schwarz, 2001; Gollwitzer, 1999; Gollwitzer & Brandstatter, 1997).

Concerning the Gollwitzer and Brandstatter (1997) study, the current research makes two important contributions. In their experiment, participants were asked to come to the lab before going away for Christmas holidays. The ProM task was to write a brief essay about how they spent Christmas eve, one to two days afterwards. Half of the participants engaged in planning by identifying the context (i.e., when and where) they were going to write the essay. Then all participants received an envelope, and were asked to return the essay by mail. Three weeks later, the number of essays received was used to determine the proportion of individuals who were successful on the task. The results demonstrated that the participants who identified a context were more likely to have completed the ProM task. However, the problem with this approach is that the authors were unable to determine when exactly the essay was written. Therefore some participants may not have adhered to the time guidelines, but nevertheless received a successful score due to the imprecise method of ascertaining when the essay was written. In contrast, all of the ProM tasks assigned in Experiment 3 included a means to identify the exact time each task was carried out. This rules out the possibility that individuals carried out the task before or after the appropriate time and still were considered successful in task performance.

Secondly, many time based tasks require execution at a specific time (e.g., appointment keeping, remembering to take cupcakes out of the oven). In contrast,

Gollwitzer and Brandstatter (1997) used a relatively large 48 hour time interval for task performance. It is often the case that when forming a time based intention, the "when" and "where" contexts are already defined (e.g., picking up your friend from the airport at 2:00 pm). This raises a question regarding the usefulness of their methods for increasing the performance of tasks with a specific interval for performance. Thus, the planning methods used in Experiment 3 augment the previous work by identifying a means to improve performance on episodic ProM tasks which must be carried out at a specific time.

Finally, engaging in planning may help individuals to garner resources which are required for successfully carrying out intentions. As described in the introduction, Marsh et al. (1998) report that individuals rarely attributed uncompleted intentions to forgetting. Instead individuals claimed that intentions were cancelled, reprioritized or impossible to complete. It is unfortunate that the authors did not further speculate on, or explore the circumstances which led to these attributions. However it is possible that these attributions stem from a failure to plan. Forming an intention without regard to an analysis of resources, unexpected circumstances or competing intentions may very well have contributed to participants' uncompleted intentions. In the context of the current experiments, participants who received training in planning strategies were compelled to consider these aspects of their intentions, and this may have contributed significantly to ProM task performance.

#### *General Limitations of Study*

There are several limitations to the experiments reported in my thesis. First, all of the participants were undergraduates and may not be representative of the general

population (especially older adults). This is a main concern for two of the three experiments reported in my thesis. Concerning the kinds of planning strategies identified during the interviews of Experiment 1, several authors have reported that older adults use different strategies than younger adults and may know how to use them more effectively (Cavanaugh, Grady, & Perlmutter, 1983; Lovelace & Twohig, 1990; Maylor, 1996). Therefore, it may have been possible that the range of strategies identified in the context of Experiment 1 may not accurately reflect those which older individuals would have considered using. Consequently, differential strategy use may also have affected the results of Experiment 2. Specifically, older adults may have rated the effectiveness and likelihood of using the 11 strategies differently than the younger individuals included in our sample. As a result, caution must be taken when generalizing the results of this study to an older population.

A second limitation concerns the results of the cluster analysis reported in Experiment 2. Ideally, I would like to have validated the cluster solution by repeating the analysis on a replication sample. However, obtaining a second sample of the same size was not feasible during the course of the academic year. An alternative method which would require less participants and could be easily accomplished in the near future, involves performing a cluster analysis on each half of the sample to determine if the two analyses yielded similar results. Therefore, instead of having to match the sample size of the current experiment, the total sample size would only have to be increased by approximately 60 individuals to ensure an adequate number of observations in each half.



Finally, a third limitation concerns the method of training used in Experiment 3. The main purpose for the design and use of the planning activity sheets was to ensure that all participants assigned to the training condition engaged in task relevant planning in a similar manner and to help ensure an equal amount of social interaction with the experimenter in both conditions (i.e., Training verses No-training conditions). However, it could be argued that the actual process of writing down intentions may have contributed to individuals' performance on the assigned tasks in addition to planning. For example, Intons-Peterson and Fournier (1986) reported that a group of students who wrote down a list of items to purchase at a department store recalled significantly more of those items compared to a group who only listened to the list. Similar research on retrospective memory facilitation is reviewed in West (1995). In the context of the current study, it is difficult to rule out the possibility that filling out the planning activity sheets may have benefited at least the retrospective component of ProM by helping individuals remember what the requirements of the task were (e.g., purchase a stamp from the Post Office).

#### *Future Directions*

The current research has inspired several theoretical and applied questions. For example: What are the most effective strategies for facilitating event based ProM tasks? How might planning strategies for ProM differ between older and younger adults? Will individuals continue to use the planning strategies learned in the lab in the context of their everyday lives? Does planning affect the number of intentions individuals make over the course of a week and attributions for incomplete intentions? Will planning promote health related behaviours such as medication compliance? Can

planning be used as an intervention for individuals with mild cognitive impairment?

Although all of these are valid questions, I will focus and elaborate on two which I believe to be the most fruitful avenues for future work.

An understanding of the intentions that individuals commit to in their everyday lives is lacking. Personal experience tells us that we tend to commit to more intentions than can be realistically completed given environmental demands and/or constraints. We may find ourselves engaged in processes of updating, abandoning, and revising our plans as we begin to realize that we have overestimated the amount of resources available to carry out our intentions. The overall result is that a significant proportion of intentions may be left uncompleted. In the context of my research, it would be beneficial to explore how planning affects the kinds of plans we make, the quantity of those plans, and the reasons that we give for not completing them. This research might reveal that one important characteristic of planning is that it compels individuals to paint a more realistic picture of what they can and can not accomplish, enabling them to devote resources to the plans which are most important.

A second line of research involves creating a ProM training intervention for individuals with mild cognitive deficit. Early techniques focused on behavioural interventions which required individuals to carry out intentions over successively longer retention intervals (Sohlberg, White, Evans, & Mateer, 1992). More recent interventions are technological in nature and have focused on the development and use of specialized electronic alarm devices which remind individuals of intentions which need to be carried out (Fleming, Shum, Strong, & Lightbody, 2005; Van den Broek et al., 2000; Wilson, Evans, Emslie, & Malinek, 1997).

In terms of behavioural interventions, there are two noteworthy weaknesses. First, the training program is relatively lengthy, and can typically range from 6 to 20 weeks in duration. The time commitment for this kind of training is staggering and the cost-effectiveness of implementing these programs remains to be determined. Second, the nature of this training focuses on specific intentions and thus introduces a degree of inflexibility. Whether or not the gains associated with these techniques can be generalized to intentions outside the scope of training is uncertain. Electronic interventions address these issues, but have their own drawbacks. The use of an electronic aid such as NeuroPage (Van Den Broek et al., 2000) provides flexibility in the number of intentions which it can provide reminders for, but deprives users of their independence as trained caregivers are required to program the device on a weekly basis. Furthermore, individuals relying on NeuroPage are not able to independently rearrange and enter reminders for new intentions as their week progresses.

In contrast, providing training in the use of planning strategies for improving ProM may overcome the limitations of the previous techniques. Since the training would place an emphasis on the strategies and not on particular intentions, there is less of an issue concerning generalization. Secondly, to the extent that individuals become self-sufficient with respect to using planning strategies, the need for trained caregivers to setup reminders would not be required.

## Conclusion

The results of my thesis confirm that engaging in the use of planning strategies is an effective method for improving ProM. The use of these strategies constitute an internal mnemonic for ProM which does not rely on an external tool for performance. In this respect, the originality of this work centres on the identification of a truly portable and effective aid for naturalistic kinds of ProM tasks. As discussed in the introduction, ProM performance is multidimensional in nature and does not simply rely on the recollection of intentions. Planning is assumed to not only contribute to the memory component of ProM, but also to other non-cognitive factors which are crucial for successful prospective remembering. The exact manner in which this occurs represents one important avenue for future research. An understanding of the mechanisms by which planning facilitates ProM will have implications for the development of training interventions and provide a greater understanding of ProM performance in general.

Table 1.1

*Planning Strategies Identified in Interview Responses*

Planning strategy	Description
Defining time	The process of considering the amount of time required to carry out an intention (e.g., "making sure to think about the time it takes to get ready and prepared and drive there", "if I'm going to go after work, thinking about how much time I would need to get all of my work done before leaving the office", "plan how long it would take to get there").
Reserving time	The process of selecting a time frame to carry out an intention, and ensuring that the time remains available (e.g., "I would start off my marking off the exact date and time in my planner, so that I wouldn't plan anything else", "I would call the store to find out their hours of operation so they're not closed when I go", "I would pick one time during the week to go and do it").
Rearranging plans	The process of identifying, rearranging, rescheduling, or canceling previous commitments or prior intentions in order to commit to a newly formed intention (e.g., "because I work a part time job, I would request to either have the afternoon off, or whatever time I need", "if it's too close to school, the I'll have to skip my class", "I'd see if I could get someone else to fill my shift").
Locating	The process of determining the whereabouts of resources required to carry out an intention, and planning a route to locations which are essential to that intention (e.g., "I'd find out which bus routes I could take to get there", "I'd have to look at a map and get directions to the store if I didn't know", "if the store was close to where I lived, I would just pick it up on the way home").
Collecting resources	The process of identifying the physical resources which are required to carry out an intention (e.g., "I'd have to make sure that I had enough change for the parking meter", "If would need to have access to a car or some other form of transportation", "I would probably need to have some form of ID with me").

**Backup planning**

The process of making alternative resources available should the originally planned for resource become unavailable (e.g., "In case I missed my bus, I'd make sure that I know when another one was coming, or if there was some other way I could get there", "if I couldn't get my parent's car that day for some reason, I'd make sure to ask my friend for a ride", "I'd set aside a couple of times when I could go and get it, in case something else came up").

**Memory aids**

The process of using an external tool or internal mnemonic to remind oneself of a previously formed intention (e.g., "I'd get my friend to remind me", "I'd put it on my list of things to do", "I'd set an alarm on my cell phone", "I'd make a rhyme to help me remember").

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Table 1.2

*Inter-rater Reliability Correlations for Planning Strategies Identified in Interviews*

Planning strategy	Range (Pearson's r)
Defining time	.69 - .77
Reserving time	.86 - .92
Rearranging plans	.72 - .78
Locating	.72 - .78
Collecting resources	.80 - .87
Backup planning	.74 - .82
Memory aids	.84 - .91

For each planning strategy, a range of correlations was calculated by computing the correlation between scores given by each of the independent raters. The low score is representative of the lowest correlation obtained between two raters. The higher score represents the highest correlation obtained between two raters. There were n=144 (6 vignettes X 24 participants) observations for each planning strategy.

Table 2.1

*Ratings Concerning the Effectiveness of Planning Strategies*

Planning Strategy	Time Based		Event Based		Mean Difference <sup>ψ</sup>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>
Defining Time	5.59*	1.08	4.94	1.26	.65 <sup>†</sup>
Reserving Time	5.85*	1.11	4.91	1.36	.94 <sup>†</sup>
Rearranging Plans	5.72*	1.03	5.03	1.23	.69 <sup>†</sup>
Updating Plans	5.33*	1.09	4.86	1.23	.47 <sup>†</sup>
Route Planning	5.75*	1.08	5.37*	1.22	.38 <sup>†</sup>
Locating	5.34*	1.42	4.71	1.56	.63 <sup>†</sup>
Collecting Resources	5.68*	1.09	5.37*	1.23	.31 <sup>†</sup>
Backup Planning	5.02	1.43	4.72	1.40	.30 <sup>†</sup>
Memory Aids (External)	6.03*	1.19	5.65*	1.36	.38 <sup>†</sup>
Memory Aids (Internal)	3.61	1.57	3.64	1.58	-.03
Reviewing Plans	4.69	1.47	4.63	1.41	.06

\* Indicates that the mean agreement rating is significantly higher than 5.00, the rating that signifies "somewhat agree." All were examined using a two tailed *t* test with an alpha < .05.

<sup>ψ</sup> Mean difference scores were calculated for each strategy by subtracting the mean rating for Event Based tasks from the mean rating for Time Based Tasks.

<sup>†</sup> Indicates that the mean strategy rating differs significantly between Time and Event Based tasks. All were examined using a two tailed paired samples *t* test with an alpha < .05.



Table 2.2

*Ratings Concerning the Self-Reported Likelihood of Using the Planning Strategies*

Planning Strategy	Time Based		Event Based		Mean Difference <sup>ψ</sup>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>
Defining Time	5.59*	1.05	4.84	1.29	.75 <sup>†</sup>
Reserving Time	5.96*	1.02	4.67	1.36	1.29 <sup>†</sup>
Rearranging Plans	5.74*	1.08	4.63	1.36	1.11 <sup>†</sup>
Updating Plans	5.07	1.17	4.69	1.20	.38 <sup>†</sup>
Route Planning	5.79*	1.13	5.22	1.31	.57 <sup>†</sup>
Locating	5.09	1.61	4.30	1.71	.79 <sup>†</sup>
Collecting Resources	5.72*	1.09	5.33*	1.18	.39 <sup>†</sup>
Backup Planning	4.45	1.60	4.18	1.39	.27 <sup>†</sup>
Memory Aids (External)	5.77*	1.55	5.25	1.77	.52 <sup>†</sup>
Memory Aids (Internal)	3.04	1.77	3.00	1.70	.04
Reviewing Plans	4.72	1.65	4.52	1.61	.20 <sup>†</sup>

\* Indicates that the mean agreement rating is significantly higher than 5.00, the rating that signifies "somewhat agree." All were examined using a two tailed *t* test with an alpha < .05.

<sup>ψ</sup> Mean difference scores were calculated for each strategy by subtracting the mean rating for Event Based tasks from the mean rating for Time Based Tasks.

<sup>†</sup> Indicates that the mean strategy rating differs significantly between Time and Event Based tasks. All were examined using a two tailed paired samples *t* test with an alpha < .05.

Table 2.3

*Self Reported Likelihood of Using the Planning Strategies for Time Based Tasks ( Clustering Variable Profiles for the Four-Cluster Solution from the k-means Nonhierarchical Cluster Analysis)*

	Cluster 1 (n=46)		Cluster 2 (n=22)		Cluster 3 (n=49)		Cluster 4 (n=24)	
Strategy	M	SD	M	SD	M	SD	M	SD
Defining Time	.44 <sup>c</sup>	.33	-.17 <sup>a</sup>	.54	.17 <sup>b</sup>	.39	.39 <sup>bc</sup>	.38
Reserving Time	.54 <sup>b</sup>	.37	.23 <sup>a</sup>	.50	.42 <sup>ab</sup>	.38	.68 <sup>b</sup>	.38
Rearranging Plans	.40 <sup>a</sup>	.33	.18 <sup>a</sup>	.52	.31 <sup>a</sup>	.35	.45 <sup>a</sup>	.29
Updating Plans	-.10 <sup>ab</sup>	.59	-.40 <sup>a</sup>	.41	-.03 <sup>b</sup>	.43	.14 <sup>b</sup>	.48
Route Planning	.49 <sup>b</sup>	.44	.02 <sup>a</sup>	.51	.39 <sup>b</sup>	.37	.52 <sup>b</sup>	.42
Locating	.14 <sup>b</sup>	.63	-.65 <sup>a</sup>	.95	.14 <sup>b</sup>	.53	-.14 <sup>ab</sup>	.82
Collecting Resources	.34 <sup>abc</sup>	.42	.09 <sup>a</sup>	.47	.27 <sup>ab</sup>	.44	.56 <sup>bc</sup>	.52
Backup Planning	-1.22 <sup>a</sup>	.46	-.47 <sup>b</sup>	.48	.04 <sup>c</sup>	.44	.08 <sup>c</sup>	.71
Memory Aids (External)	.64 <sup>b</sup>	.50	.77 <sup>bc</sup>	.73	.65 <sup>bc</sup>	.47	-.97 <sup>a</sup>	.54
Memory Aids (Internal)	-1.15 <sup>bc</sup>	.68	-.07	.83	-2.08 <sup>a</sup>	.54	-1.18 <sup>b</sup>	.73
Reviewing Plans	-.53 <sup>a</sup>	.77	.46	.57	-.28 <sup>ab</sup>	.77	-.53 <sup>a</sup>	.78

Means not sharing a common superscript are significantly different from each other at  $p < .05$  (adjusted by Bonferroni correction).

Table 2.4

*Self Reported Likelihood of Using the Planning Strategies for Time Based Tasks ( Clustering Variable Profiles for the Four-Cluster Solution from the k-means Nonhierarchical Cluster Analysis)*

Strategy	Cluster 1 (n=60)		Cluster 2 (n=39)		Cluster 3 (n=42)	
	M	SD	M	SD	M	SD
Defining Time	.16 <sup>b</sup>	.54	-.11 <sup>a</sup>	.47	.33 <sup>b</sup>	.48
Reserving Time	-.03 <sup>a</sup>	.48	-.07 <sup>a</sup>	.53	.28	.48
Rearranging Plans	-.04 <sup>a</sup>	.47	-.04 <sup>a</sup>	.51	.18	.43
Updating Plans	.08 <sup>b</sup>	.41	-.25 <sup>a</sup>	.44	.23 <sup>b</sup>	.34
Route Planning	.55 <sup>b</sup>	.40	.01 <sup>a</sup>	.49	.47 <sup>b</sup>	.51
Locating	.14	.59	-.61 <sup>a</sup>	.75	-.25 <sup>b</sup>	.82
Collecting Resources	.41 <sup>ab</sup>	.45	.25 <sup>a</sup>	.55	.60 <sup>b</sup>	.48
Backup Planning	-.23 <sup>a</sup>	.68	-.48 <sup>a</sup>	.51	-.14 <sup>a</sup>	.72
Memory Aids (External)	.81 <sup>b</sup>	.45	.93 <sup>b</sup>	.67	-.61 <sup>a</sup>	.71
Memory Aids (Internal)	-1.56 <sup>a</sup>	.60	.06 <sup>c</sup>	.78	-1.01 <sup>b</sup>	.66
Reviewing Plans	-.29 <sup>a</sup>	.80	.31 <sup>b</sup>	.60	-.07 <sup>ab</sup>	.77

Means not sharing a common superscript are significantly different from each other at  $p < .05$  (adjusted by Bonferroni correction).

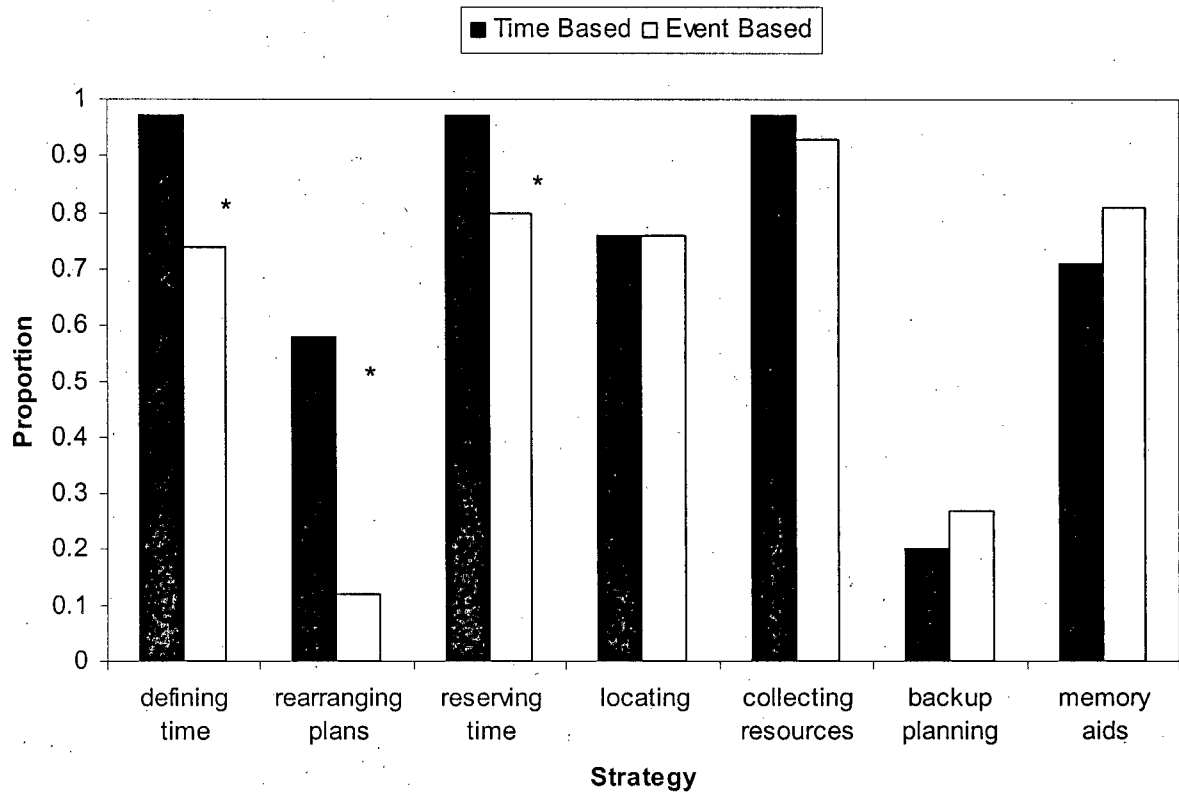


Figure 1.1. Proportion of time and event based responses which cited a description of each planning strategy.

\* Indicates that the proportion differed significantly between time and event based tasks at the  $p < .01$  level.

## Effectiveness

### Vignette:

Your friend's dog is getting old, and visits a vet regularly for medication. Your friend has to be out of town and has asked you to help her out by bringing her dog to the clinic. You agree to do this. The appointment is scheduled for next Wednesday at 2 pm.

### Strategy

I would routinely think about the things that I need to do, so that I would remember that I need to carry out my plan (e.g., I might make a habit of doing this when I wake up, or before I go to bed).

This is an effective strategy for ensuring that I successfully carry out the task

Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

Figure 2.1. Illustration of the Effectiveness Questionnaire displaying a vignette, a description of a planning strategy, and rating statement and scale.

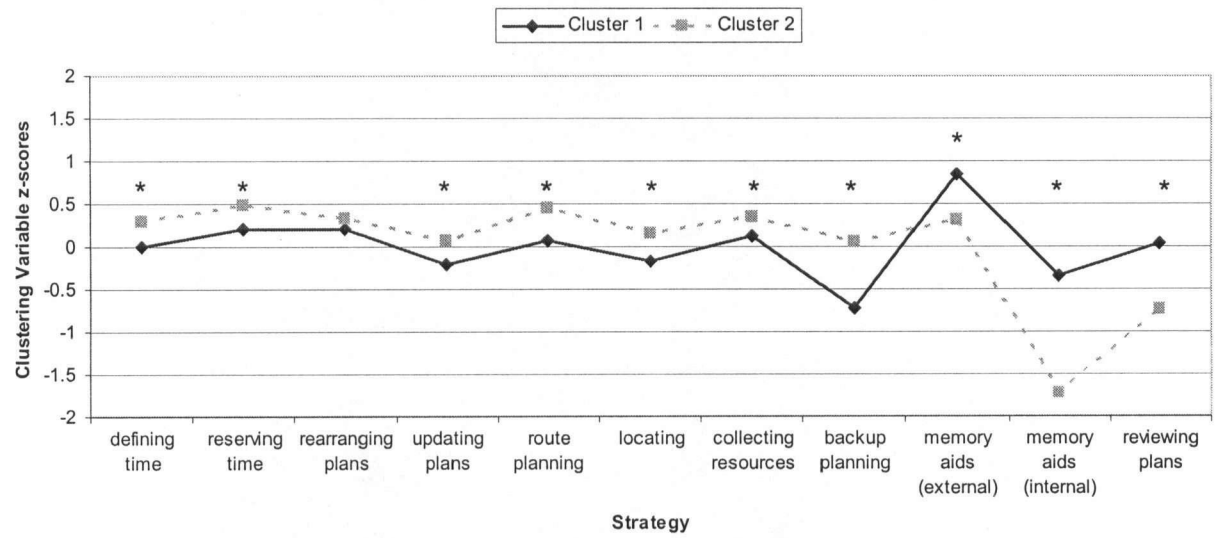


Figure 2.2. Strategy effectiveness profiles for Time Based ProM Tasks.

\* Indicates that the clustering variable mean values differ significantly at  $p < .05$ .

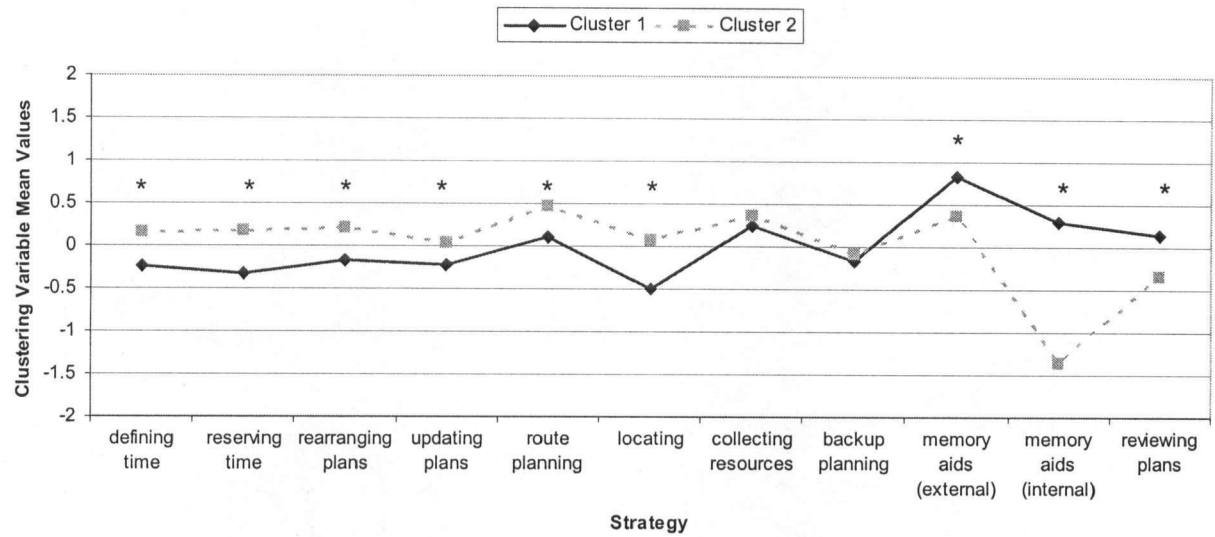


Figure 2.3. Strategy effectiveness profiles for Event Based ProM Tasks.

\* Indicates that the clustering variable mean values differ significantly at  $p < .05$ .

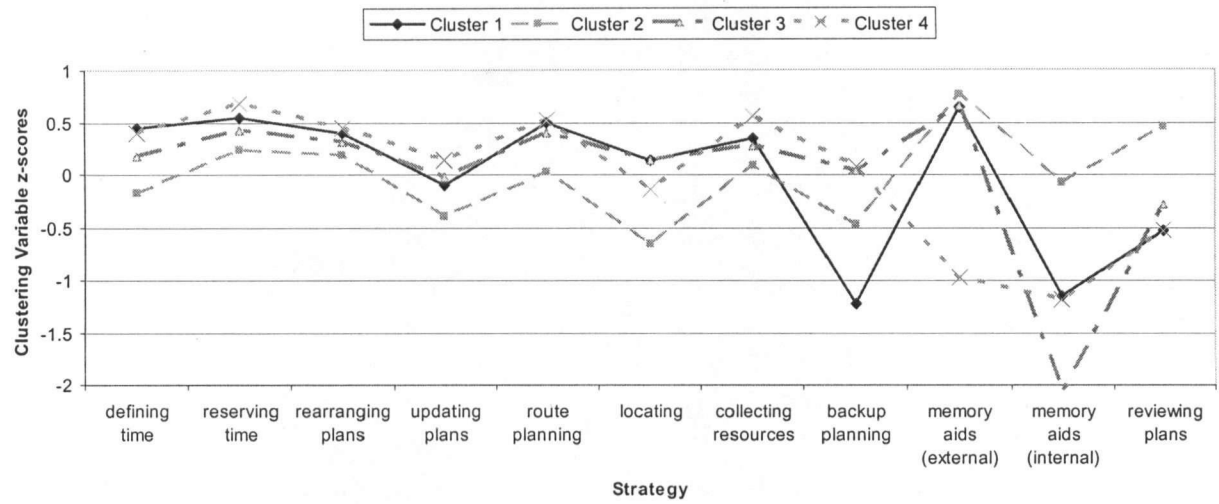


Figure 2.4. Likelihood of strategy use profiles for Time Based ProM Tasks.



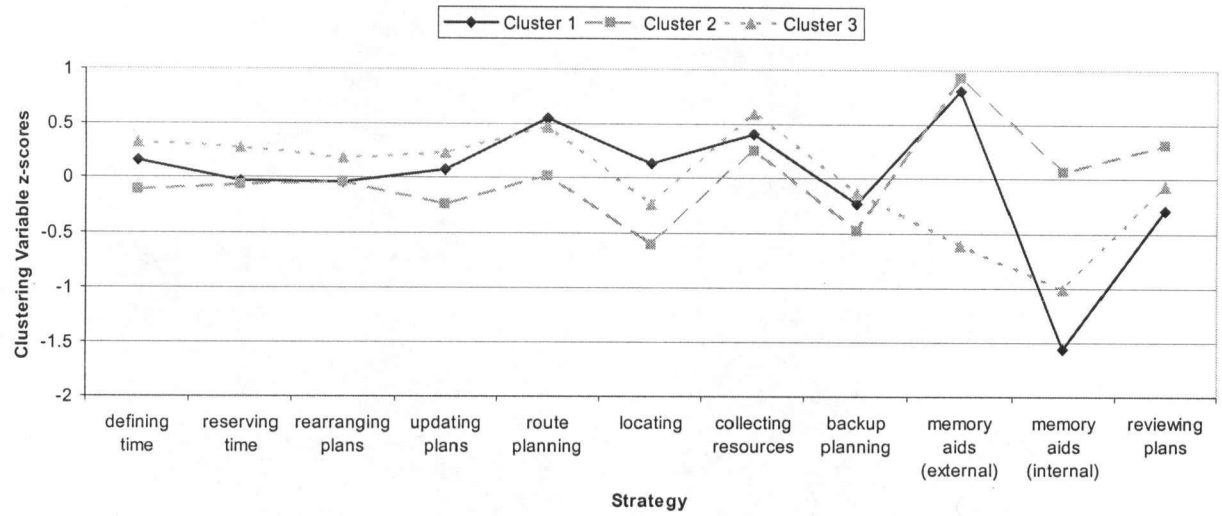


Figure 2.5. Likelihood of strategy use profiles for Event Based ProM Tasks.

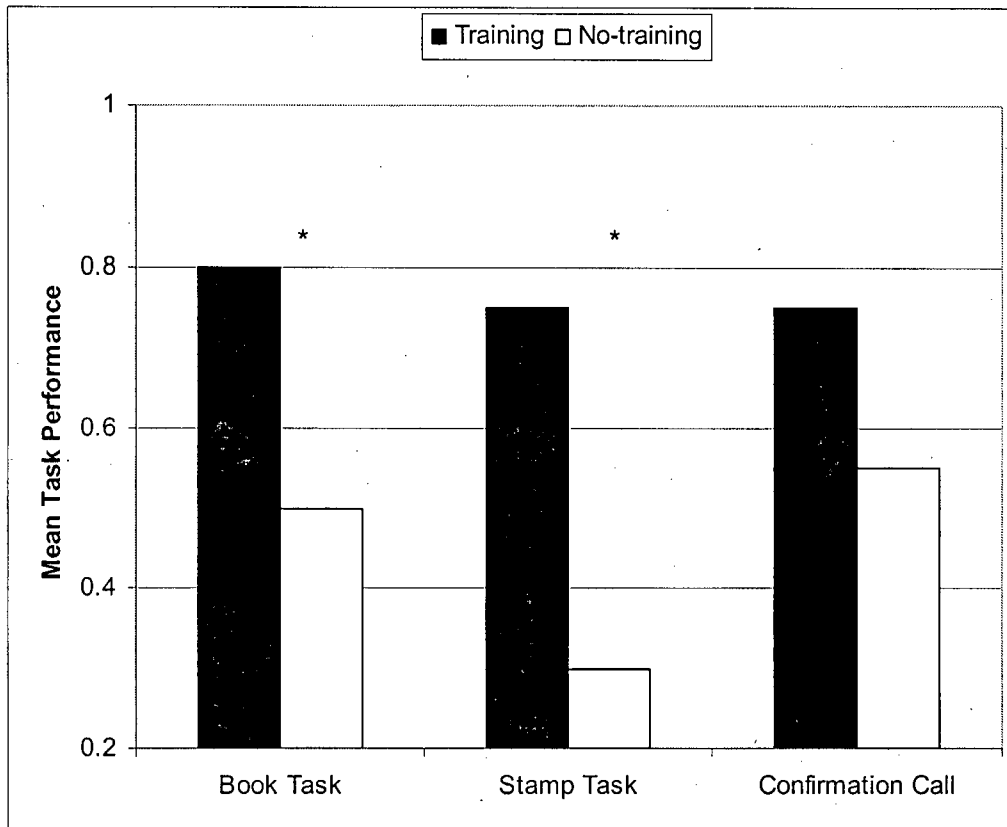


Figure 3.1. Training condition x ProM task. Mean task performance for Training and No-training conditions on three tests of ProM.

\* Indicates that performance between the Training and No-training conditions is significant at the  $p < .05$  level.

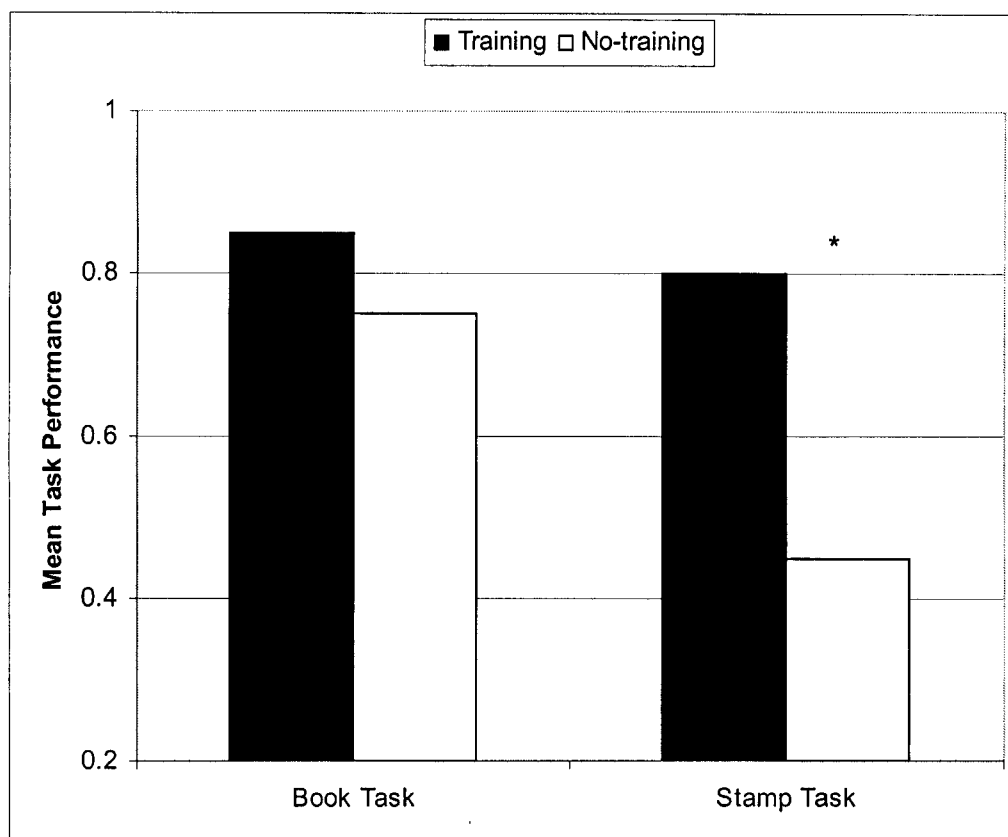


Figure 3.2. Training condition x ProM task. Mean task performance for Training and No-training conditions on two tests of time based ProM according to the lenient criterion.

\* Indicates that performance between the Training and No-training conditions is significant at the  $p < .05$  level.

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## Appendix A

*Vignettes used for Successful Prospective Remembering Interview.*

Time/Event Based	Vignette
Time Based #1	Your friend has been working overseas for the summer and informs you that he will be flying back in two weeks. He has asked if you would be willing to pick him up. You agree to do this. The flight is scheduled to arrive on Saturday at 2:00 pm.
Time Based #2	Your friend's dog is getting old and visits a vet regularly for medication. Your friend has to be out of town and has asked you to help her out by bringing her dog to the clinic. You agree to do this. The appointment is scheduled for next Wednesday at 3:00 pm.
Time Based #3	Your brother is having wisdom teeth surgery next week. The dentist has informed him that someone will have to pick him up after the surgery is performed. You agree to pick up your brother after the appointment.
Event Based #4	While you are on vacation, you promise your friend that you will bring home a local souvenir. You know about a store that carries the souvenir. Although you have many places and friends to visit, you would like to fulfill your friend's request.
Event Based #5	Your friend is having a dinner party next week. He is looking for a rare wine to serve with the meal, but can't find it at the local wine store. You know of a store that carries a wide range of wines and offer to check for it the next time you are in the area.
Event Based #6	You are on a committee which represents the interests of your local neighbourhood. On your way to work, one of your neighbours tells you that their mailbox has been broken into. You promise that you will bring this issue up when you see the safety representative at next week's meeting.

## Appendix B

### *Planning Strategy Interview Scoring Manual.*

#### **I. Overview:**

The participant responses in the following package were transcribed from tape recorded interviews. Participants were asked to respond to 6 different vignettes that were presented to them in random order. In each vignette, a promise was made to carry out an intention in the future. The intentions were either time based or event based. Participants were asked to discuss the planning strategies that they would use to ensure that they were successful in carrying out the intention. Vignettes 1-3 contain a description of a time based task, and vignettes 4-6 contain a description of an event based task. During the interview, presentation of the vignettes always alternated between these two categories.

#### **#1 (Time Based) "Picking up a friend from the airport"**

"Your friend has been working overseas for the summer and informs you that he will be flying back in two weeks. He has asked you if you would be willing to pick him up. You agree to do this. The flight is scheduled to arrive on Saturday at 2:00 pm."

Task: Ensure that you pick up your friend at the airport at the appropriate time.

#### **#2 (Time Based) "Taking your friend's dog to the vet"**

"Your friend's dog is getting old and visits a vet regularly for medication. Your friend has to be out of town and has asked you to help her out by bringing her dog to the clinic. You agree to do this. The appointment is scheduled for next Wednesday at 3:00 pm."

Promise/Intention: Ensure that the dog is brought to this appointment on time.

#### **#3 (Time Based) "Picking up your brother from the dentist"**

"Your brother is having wisdom teeth surgery next week. The dentist has informed him that someone will have to pick him up after the surgery is performed. You agree to pick up your brother after the appointment. ."

Promise/Intention: Ensure that you pick up your brother at the appropriate time.

#### **#4 Event Based "Bringing home a souvenir"**

"While you are on vacation, you promise your friend that you will bring home a local souvenir. You know about a store that carries the souvenir. Although you have many places and friends to visit, you would like to fulfill your friend's request."

Promise/Intention: Purchase the souvenir when you pass by the store.

### **#5 Event Based "Checking for a rare wine"**

"Your friend is having a dinner party next week. He is looking for a rare wine to serve with the meal, but can't find it at the local wine store. You know of a store that carries a wide range of wines and offer to check for it the next time you are in the area."

Promise/Intention: Ensure that you check the store for the wine the next time you are in the area.

### **#6 Event Based "Reporting mailbox break-ins"**

"You are on a committee which represents the interests of your local neighbourhood. On your way to work, one of your neighbours tells you that their mailbox has been broken into. You promise that you will bring this issue up when you see the safety representative at next week's meeting."

Promise/Intention: Bring up the mailbox break-ins with the safety representative.

## II. Scoring

A point system is used to score participant responses. It is important that the entire response is read once before any scoring takes place. This will allow you to evaluate the response with respect to the guidelines stipulated below.

### A. Introduction

You will receive a set of interviews. All interviews have been coded to ensure anonymity. At the top of each response will be an identifier which provides information about the participant, date, and vignette. For example, 002-041201-6, would be read as participant 002, interviewed on yy/mm/dd, giving their response to vignette 6. The responses are transcribed from interview tapes, and include all of the participant's words, utterances, and hedges.

Each response should be scored according to the 7 different strategy categories presented below. Each strategy has been assigned a different color. When scoring the interviews, you should highlight the strategy statements in their respective color.

When deciding what to include in a strategy, use the following guideline: include enough of the participant's response so that if the response was presented in isolation, another rater would be able to assign a comparable score. Indicate the point value for each statement directly above it, and at its onset (a discussion of how to allocate points will be covered in the next section).

#### Example

003-041125-3

**Describe what steps you might take to ensure that you do as you promised?**

1

Ahead of time I would take the day off, and then perhaps I would drive my brother to the

hospital myself, so that I would remember to pick him up. In order to remember the day of, I will

see my brother, and he'll be like I have to take my wisdom teeth out, and <sup>1</sup> I could always set an

alarm using a cell phone.

In certain cases, a response may consist of 1 or 2 words. Often this occurs after the interviewer has asked a prompt question. In this case, highlight the statement representing the strategy, and in order to aid in clarification, place a "#" sign beside the shortened response, and square brackets "[.....]" around the question which lead to that response.

#### Example

[What might you do so that nothing prevents you from getting to the appointment?]

1#

1#

To ensure I'm there when I said I'd be, I'd check the traffic, the weather...

## B. Complex responses

Participants may also refer to multiple strategies in the same sentence. In this situation, highlight the portions of the statement which represent each strategy. In cases where there is overlap, or where the entire sentence represents two strategies which if separated, would lose meaning, highlight one strategy on the lower half of the statement, and the other on the upper half. In this latter case, place the points either above or below the sentence representing the strategy.

### Example

For that one, <sup>1</sup> I would have to make sure that I knew where <sup>1</sup> and what time the appointment was at.

### Example

<sup>1</sup> I'd make sure that I wrote down in my agenda when and where the appointment was, so that I don't forget. <sup>1</sup> <sup>1</sup>

## C. Non-intention related responses

When scoring participant responses, disregard those which are not central and/or related to carrying out the intention described in each vignette. To help you decide whether or not a response is relevant, think about the intention and ask yourself whether the absence of the actions implied in the response would prevent one from accomplishing the goal. If the answer is "no", then that response is most likely unrelated, and therefore should not be scored. An example is provided to assist in this decision making process.

Compare the following two responses given by a participant to vignette #1 "Picking up a friend from the airport":

"I would need to have a car so that I could get to the airport"

Vs.

"I might bring a book to read so that I do not get bored while waiting."

In this case, the first statement would be scored, while the second statement would be disregarded.

#### **D. "After the fact" responses**

These responses consist of strategies for intentions after the main task is accomplished. Do not score these responses. To help you decide whether or not a strategy is considered "after the fact", examine the response and determine if the response is related to events that would occur after the main goal in each scenario has been accomplished.

Compare the following two responses given by a participant to vignette #3 "Picking up your brother from the dentist":

"I would need to know what time his appointment would be over"

Vs.

"After I pick him up, the I will see if he needs to get medication from the pharmacy."

In this case, the first statement would be scored, while the second statement would be disregarded.

#### **E. Responses suggesting that the scenario is not understood**

Although, participants were asked if they fully understood each vignette before the interview began, occasionally, their responses suggest otherwise. After reading the response once through, pay particular attention to any aspect of the response which would imply that a participant is unsure of the intention to be carried out in the vignette.

During the interview, whenever this occurred, the participant was allowed to finish the current response. If successive responses still indicated that the vignette was not understood, clarification about the intention would be provided. An example is provided to assist in this decision making process.

In vignette #6 “reporting mailbox break-ins” a participant responded with the following:

“I’d be more likely to fit it in during the day that, um, uh, when I was less busy, when I didn’t have many things occupying on mind and probably in the morning would be better because, um, if the meeting was in the morning, I am more likely to wake up, um, with my planner and go right to the meeting at that time. So that might help with the success of it and plus there isn’t that many things that um, I’d be thinking about.”

The problem with this reply is that, the participant has failed to recognize that s/he does not determine when the meeting occurs. Therefore, this response would not be scored.

## F. Repeated Responses

Participants may repeat their responses several times during the interview for each vignette. For example, participants may repeatedly state that they need to record their intention on a piece of paper. Repeated responses should be categorized and assigned a point value. However, no additional points should be added to the *overall* score for each category after the first. When tallying the points for each category, make sure that the final total is based on unique contributions. Place an “R” beside the repeated response.

### Example

1	Leaving myself enough time in advance	1	even writing that kind of thing on my calendar saying
	leave at this time in order to get to the airport	1	estimating how long it would probably take to get
	to the airport	2	Um, making sure, um, that everything you need is with you and in your car, um,
		R	example, like the amount of gas, if I have to go really far away and uh, yah, probably a lot to do
			with the alarms and the calendar

In this example, “R” implies that the use of a calendar was previously stated (evident in the first sentence).



### III. Strategies

The method of scoring participant responses is described below. Bear in mind that the total number of points allotted should reflect unique instances of strategy use.

#### A. Defining time

Time is an essential resource when it comes to carrying out intentions. One must consider the time required to accomplish an intention, and any number of tasks related to an intention. The timing of previous obligations must also be considered. Responses representing this strategy include those which consider the amount of time required to accomplish a task. This strategy also involves considering exceptional external events beyond one's control, which may affect allocation of time. Sometimes you will have to carefully consider what the participant is implying by his or her response.

For example, if a participant states that "[s/he] will check the weather forecast", we are left to anticipate why. In this situation, it is up to your discretion whether or not the response is related to leaving an extra amount of time. Look at the overall response and decide on whether or not the participant made this response to take time into consideration, or whether it was for another reason (e.g., so that s/he will know the appropriate kind of clothing to wear).

#### 1. Scoring

Give one point for every response that demonstrates the participant is considering the amount of time required to carry out tasks related to their intention.

The following responses are intended to provide you with a guideline of assigning a point value to interview responses.

"I would estimate the amount of time required to get to the airport." **1 point**

"Book off some extra time just in case there's traffic." **1 point**

"I would estimate the amount of time required to get the dog ready, and add that to the amount of time that it would take to get to the dentist's appointment." **2 points**

"Make sure to check the weather forecast, and the traffic conditions so that I'm not slowed down." **2 points**

"If you're going to be leaving it to the last possible time to get the wine before the dinner party, you would have to know how long it would take you to get to the store, and how long it would take you to find the wine, and then make sure that you won't be late getting to the dinner party itself." **3 points**

"I'll leave an extra bit of time, because I do not know if there will be flight delays, and then there might be unexpected problems with the baggage, so I'd have to factor that in too, keeping in mind that I might not be able to get a taxi right away, so leaving some time for that." **3 points**

## B. Reserving Time

This is the process of selecting a time frame to carry out tasks related to an intention (or the intention itself), and ensuring that the time that has been set aside remains available.

Often, an event based task may be transformed into a time based task by selecting a time to perform that action. However, only score a response under the category of **Reserving Time** if there is some understanding that a reasonable interval of time has been appropriated for task performance. This can be inferred from the participant's response. For example, in vignette #4 "Bringing home a souvenir", if a participant states that the task will be done when s/he arrives in the morning, then that response will be scored. However, if a participant states that it will be done at some point during the trip, that response would not be scored. The time interval in the latter case is much too broad.

In a second example, let us assume that the participant states that s/he will perform the task when s/he passes by the store. This response might be scored if a participant has made it clear that there is intent to visit the store at some point in time. This information might be inferred from the overall response. For example, s/he might state that while on vacation, they have an itinerary, and therefore they will slot in a time to visit that store. In this case, we would score this response as **Reserving Time**. On the other hand if there is no mention in the overall response that the participant is trying to choose a time, then we would not score this response.

### 1. Scoring

Give one point for every response that demonstrates the participant has chosen to perform an event based task at a certain time.

The following responses are intended to provide you with a guideline of assigning a point value to interview responses.

"I will do it first thing in the morning so that I can get it out of the way and have the rest of my day to visit or shop." **1 point**

"Because it is really important, I'd pick a specific time to go even if I wasn't going to ordinarily be in that area." **1 point**

"Because I know that my friend will be at the airport waiting for me, I'll write it in my planner so that I don't do anything else at that time." **1 point**

### C. Rearranging plans

In order to accommodate a newly formed intention, often one must rearrange, reschedule, or cancel previous commitments or prior intentions. This strategy differs from the previous two in that the emphasis here is on *prior* commitments. It includes all responses suggesting that the participant will rearrange, reschedule, or cancel previous commitments or prior intentions (e.g., I would tell my boss that I needed time off work).

#### 1. Scoring

Give one point for every response that demonstrates the participant is rearranging, rescheduling, or canceling, a previous commitment or prior intention.

The following responses are intended to provide you with a guideline of assigning a point value to interview responses.

"I'd clear out my schedule for that day so I would have enough time to do this." **1 point**

"I'd would have to change my work schedule for that day." **1 point**

### D. Locating

Often one may require knowledge pertaining to the whereabouts of intention related elements, or resources needed to accomplish their intentions. Participants using this strategy are gathering this information. This resource may be physical (e.g., a map) or intangible, (e.g., asking for location information). This strategy may include activities which involve planning a route.

#### 1. Scoring

Give one point for every response that demonstrates the participant has collected information about the whereabouts of intention related elements, or for the intention itself.

The following responses are intended to provide you with a guideline of assigning a point value to interview responses.

"Find out where I should meet my brother." **1 point**

"Find out where the parking lot is." **1 point**

"Find out where the airport is, and what gate he will be at." **2 points**

## E. Collecting resources

Often, there are physical resources which are required for attainment of intentions. These resources have been termed "physical" to differentiate them from other types of resources such as time or information. When scoring responses under this category, participants may either state that a concrete object is required (e.g., a car, money, or a kennel) or they may imply that one is required by stating that the function that object performs is required (e.g., a method of transportation or conveyance). Keep in mind that if a participant first implies that a physical resource is required, and then later on specifies an example of that resource, both responses would be underlined, however the final score would only include **1 point** for responding that a car would be needed. In this example, "transportation" and a "car" refer to the same thing

### 1. Scoring

Give one point for every response that demonstrates the participant is considering what physical resources are required for carrying out their intention.

The following responses are intended to provide you with a guideline of assigning a point value to interview responses.

"Make sure that I have access to the car." **1 point**

"Make sure that I get the leash, and something to carry the dog in." **2 points**

"See if my friend will give me money in advance, and then make sure that I could get there, and then also, I would have to have ID because they might mistake me for a minor." **3 points**

## F. Backup planning

Often, when considering what types of resources are required to accomplish an intention, alternative resources exist (e.g., different times, or physical tools). This strategy consists of making alternative resources or times available should the original resource or time become unavailable. When scoring these responses, one should not include those which imply complete abandonment of the task. For example, the following response would not be scored: "if I couldn't pick him up, I'd get someone else to do it."

\*Scoring this category is not as straightforward as the other categories. Take the following into consideration:

- 1) In the most straightforward circumstance, a participant may state in their response that they would use this strategy. For example they might say "I will have an alternative route." In this case, **1 point** would be allotted for the participant's response.
- 2) In other situations, you will have to scan the entire response for alternatives. For example, if the participant initially states that "I will need a car" and later on in the response says "I might have a cab ready just in case I don't have the car", then this latter statement would be scored as **Backup planning**. In this situation, the alternatives are all related to a method of conveyance. Therefore, the first means of conveyance (e.g., a car) would not count as an alternative. However, every additional means of conveyance would contribute to the score.

### 1. Scoring

Give one point for every response that demonstrates the participant has made an alternative resource available.

The following responses are intended to provide you with a guideline of assigning a point value to interview responses.

"if I couldn't have my car for some reason, I would call my friend to see if she could give me a ride." **1 point**

"Maybe have two times that I could go, just in case I couldn't go the first time." **1 point**

"If I couldn't drive, I would take the bus or call a cab." **2 points**

## G. Memory aiding

Because individuals rely on prospective memory to carry out intentions, it is reasonable that participants will want to make sure that they remember to perform the task or elements related to the task. A variety of methods may be used to enhance their prospective memory. This strategy consists of using an external aid or internal aid to remind oneself that a task related to the goal must be performed. \*In all circumstances, participants must state the object that they are using to enhance their prospective memory (e.g., it is not sufficient to say that I will write it down." The "what" or "where" it will be written down must be specified). This will facilitate scoring.

It is common for this particular category to overlap with other categories. For example, consider the following response:

"If it's in a place like a hospital, writing down the room number on my calendar so that you're not at the hospital trying to find where the room is."

Here, the response involves two strategies: **Memory aiding** and **Locating**. 1 point would be allotted for each strategy.

### 1. Scoring

Give **1 point** for every response that demonstrates the participant has made use of a memory aid to enhance their prospective memory. These aids may include, but are not limited to:

- a. a simple written note
- b. a list
- c. another person
- d. a planner
- e. a calendar
- f. a schedule
- g. a personal digital assistant (e.g. a Palm Pilot, or PocketPC)
- h. a song
- i. a rhyme
- j. a mental list
- k. rehearsal
- l. regularly reviewing their plans

The following responses are intended to provide you with a guideline of assigning a point value to interview responses.

"I would write it on a post it note." **1 point**

"I make a list of things that I have to get done." **1 point**

"I would call my friend so that she can remind me." **1 point**

"Before going to bed, I would think about what I have to do tomorrow." **1 point**

"I would keep on telling myself that I had to get this done." **1 point**



## Appendix C

*Two Participants' Responses to Vignettes Presented in Experiment 1.***Vignette:**

**Your brother is having wisdom teeth surgery next week. The dentist has informed him that someone will have to pick him up after the surgery is performed. You agree to pick up your brother after the appointment.**

Experimenter (E): What strategies would you use to ensure that you were successful in carrying out this task?

Participant (P): Um, the surgery um, is a week away so, because I would have a part time job, I would, request to not... either... have the afternoon off, or whenever time it is, or discuss it with my employer, and if that can't happen at some point or if it's just not that kind of job I would probably inform my employer a good time ahead to say uh, um, that at this time I will probably be leaving, or to leave myself enough time to pick up my brother from his surgery.

(E): What else would you have to consider?

(P): Um, I would find out where the, this surgery is going to be performed, again leaving myself enough time before to go and find out so that you're not late. Um so driving yourself there to see where it's taking place if you're not sure.

(E): What kinds of things would you do when you make this plan?

(P): Again writing it on my calendar. Um even setting, an...a daily calendar. If you have kind of an alarm that will be on you, like a watch alarm or a phone alarm, setting that so

that cause you're going to be busy, cause it might slip your mind, the time or something, so setting an alarm would help. Um, give you kind of an auditory reminder of when you need to be leaving so that they can't really miss it.

(E): So when your brother asks you to go pick him up next week, what are some of the things that you think about before promising that you could do it?

(P): Asking the time that the surgery's going to take place, the place.

(E): So when you do get all the information, what else do have to do after you find out the time, place, and where the dentist's appointment is?

(P): That I would need to ask him? Um so I guess on the calendar, after he had, after my brother had told me where the time, and place everything, um, writing the time that his surgery is for and the time that would be necessary to leave in order to get there on time, um, if it's in a place like a hospital, writing down the room number so that you're not at the hospital trying to find where the room is and kind of scattered like that. Um, writing the same thing and then reminding yourself to set that um, kind of auditory alarm for the time that you would need to be leaving from the office, which might be um different from what you put on the calendar, because that might have been at home. So making sure that um, if you're leaving from your job, that you have enough time to get um, to go and um, and get to the place that your brother's getting the surgery. Um, making sure that uh, I guess, nothing comes up at your job, like a meeting ensuring that you know, your employer knows that you have this very specific thing that you need done at this time, so little things that come up that don't let it interfere.

(E): Can you think of anything else?

(P): Um, modes of transportation, how would you like to get there if you don't have access to a car, would the bus or the train, or getting a cab, that kind of thing, calling the cab, the weather, um, the traffic, kind of thing.

(E): OK, good, so you need to consider and think about what you need to get to the clinic. Anything else?

(P): Um, sorry, that's all I can think of.

(E): Thank you.

### **Vignette:**

**Your friend is having a dinner party next week. He is looking for a rare wine to serve with the meal, but can't find it at the local wine store. You know of a store that carries a wide range of wines and offer to check for it the next time you are in the area.**

(E): What strategies would you use to ensure that you were successful in carrying out this task?

(P): The first step I would take is to ask my friend again when the party is and which time, mark that on my calendar. Um, for the time I would need to leave and the time of the party and things like that,

(E): Good, what else would you have to consider after thinking about what time the party was?

(P): Um, in terms of the wine, I would um, after I suggested finding the place that I know a place that would carry the wine, that I would make a note in my daily calendar or

just kind of a place that I would know I would check really often, like the fridge, that I would have suggested that I would do this so that I would ensure that I would remember to get this wine before coming to the party.

(E): OK, so you think that you will need a reminder. Besides reminders what else might you consider?

(P): Um, beforehand thinking of, calling the wine store I think, um, seeing their hours of operation that kind of thing, asking them if they have the wine. Um, even asking if there is someone that I could talk to about it, a connoisseur kind of thing, and then um. Um, picking a day after you've found out the hours and everything, picking a day that would be of best use for you. Like a Saturday, but enough time to leave yourself to get it for the party, especially if you're not successful in not getting, if they end up not having it for some reason, finding a different place that might carry it so, um, picking on the calendar that might um, be a good time that you're not busy with other events happening, especially that it would be a good day for you to do that, that you're free, that if they don't have it, there's time to run around and find it. So calling, going down there on that day and ensuring that they uh, someone will be able to help you and um, and especially if you're going to be leaving it until almost before the dinner party, if they said that yes they had it, leaving yourself enough time to go down there and pick it up on the way.

(E): Good, so you would think about the time requirements of carrying out the task. Anything else?

(P): Again setting up a reminder, leaving yourself a note, um, saying like I need to leave at the point, time, picking up this wine, and making it to the party by this time. Um, again with the traffic and the weather, and um, find that out that might slow you down.

(E): So how do you remember that the next time you're in the area that you have to go pick up the wine? How do you make sure that you go into that store when you're in that area?

(P): Hmm, I think, I think, the idea of writing it in, I'm a big believer of the daily calendars, of writing it in um, writing the idea down at some point and saying um, u know.

(E): But would you always be checking your calendar?

(P): No I know what you mean, but um, OK. How about um, so when you take down, you told your friend that you had the idea of getting the wine, you think you know where, when you have like little pieces of paper like that, putting them on a tack board or bulletin that has all these things that needs to remind you and not for any specific day or anything and that you've kind of brought into your routine, everyday before you go out, just check the board and see if there is anything that could apply to today, and then checking that um that morning, having the idea of I looked at this and this wine, or whatever at the dinner party, and that would probably help if you saw the wine store, triggering it, cause you had seen it in the morning, um, if you haven't, if you didn't have something like that, driving um, around in your immediate area, can they I don't know getting into the routine of thinking about is there anything else I need to do while I'm in this area, have I done this, have I gotten my groceries, is there anything else that I need, and stop and get. Things like that, um,

(E): Anything else you might do?

(P): ...um...um...no besides reminders... no

## Appendix D

*Planning strategies identified in interview responses.*

Planning strategy	Description
Defining time	The process of considering the amount of time required to carry out an intention.
Updating plans	The process of considering external events which may affect the timing of one's intentions.
Reserving time	The process of selecting a time frame to carry out an intention, and ensuring that the time remains available.
Rearranging plans	The process of identifying, rearranging, rescheduling, or canceling previous commitments or prior intentions in order to commit to a newly formed intention.
Locating	The process of determining the whereabouts of resources required to carry out an intention.
Route planning	The process of planning a route to locations which are essential to carrying out an intention.
Collecting resources	The process of identifying the physical resources which are required to carry out an intention.
Backup planning	The process of making alternative resources available should the originally planned for resource become unavailable.
Memory aids (external)	The process of using an external aid to remind oneself of a previously formed intention.
Memory aids (internal)	The process of using an internal mnemonic to remind oneself of a previously formed intention.
Reviewing plans	The process regularly considering one's upcoming intentions.

## Appendix E

### EQ.

This questionnaire contains 8 vignettes each concerning an intention to carry out a task at a later time. Please read each vignette carefully and imagine yourself being responsible for carrying out the intention. Several strategies listed below each vignette may be useful for ensuring that you are successful. Indicate how effective each strategy is by making an agreement rating using the scale below.

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Somewhat Disagree
- 4 = Neutral
- 5 = Somewhat Agree
- 6 = Agree
- 7 = Strongly Agree

Your friend has been working overseas for the summer and informs you that he will be flying back in two weeks. He has asked you if you would be willing to pick him up. You agree to do this. The flight is scheduled to arrive on Saturday at 2:00 pm.

Strategy Description	Rating (This is an effective strategy)
I would think about the amount of time that I need to carry out my plan, considering how long it takes me to get ready and travel to the airport.	1 2 3 4 5 6 7
I would make sure that I don't schedule anything else during the time I have reserved for my plan.	1 2 3 4 5 6 7
I would check my previous plans/commitments for the day I have to be at the airport, and rearrange them so nothing prevents me from carrying out my plan.	1 2 3 4 5 6 7
I would think about or check for any last minute changes that may affect my plan (e.g., weather or traffic conditions that may slow me down).	1 2 3 4 5 6 7
I would plan out the route I would take to arrive at my destination (e.g., the airport).	1 2 3 4 5 6 7
I would think about locations where I would have to be at in order to carry out my plan.	1 2 3 4 5 6 7
I would think about and assemble the means and/or tools necessary to carry out my plan. (e.g., a vehicle, money for parking).	1 2 3 4 5 6 7
I would have an alternative plan available, in case my original plans failed (e.g. call a taxi if I don't have access to a car).	1 2 3 4 5 6 7
I would use an external reminder to help me remember that I need to carry out my plan (e.g., an agenda, PDA, cell phone organizer, friend, etc.).	1 2 3 4 5 6 7
I would use an internal reminder to help me remember that I need to carry out my plan (e.g., a song, rhyme, memory mnemonic, etc.).	1 2 3 4 5 6 7
I would routinely think about the things that I need to do, so that I would remember that I need to carry out my plan (e.g., I might make a habit of doing this when I wake up, or before I go to bed).	1 2 3 4 5 6 7



Your friend's dog is getting old and visits a vet regularly for medication. Your friend has to be out of town and has asked you to help her out by bringing her dog to the clinic. You agree to do this. The appointment is scheduled for next Wednesday at 3:00 pm.

Strategy Description	Rating (This is an effective strategy)
I would think about the amount of time that I need to carry out my plan, considering how long it takes me to get ready and travel to the clinic.	1 2 3 4 5 6 7
I would make sure that I don't schedule anything else during the time I have reserved for my plan.	1 2 3 4 5 6 7
I would check my previous plans/commitments for the day I have to be at the clinic, and rearrange them so nothing prevents me from carrying out my plan.	1 2 3 4 5 6 7
I would think about or check for any last minute changes that may affect my plan (e.g., weather or traffic conditions that may slow me down).	1 2 3 4 5 6 7
I would plan out the route I would take to arrive at my destination (e.g., the clinic).	1 2 3 4 5 6 7
I would think about locations where I would have to be at in order to carry out my plan.	1 2 3 4 5 6 7
I would think about and assemble the means and/or tools necessary to carry out my plan. (e.g., a vehicle, money for parking).	1 2 3 4 5 6 7
I would have an alternative plan available, in case my original plans failed (e.g. call a taxi if I don't have access to a car).	1 2 3 4 5 6 7
I would use an external reminder to help me remember that I need to carry out my plan (e.g., an agenda, PDA, cell phone organizer, friend, etc.).	1 2 3 4 5 6 7
I would use an internal reminder to help me remember that I need to carry out my plan (e.g., a song, rhyme, memory mnemonic, etc.).	1 2 3 4 5 6 7
I would routinely think about the things that I need to do, so that I would remember that I need to carry out my plan (e.g., I might make a habit of doing this when I wake up, or before I go to bed).	1 2 3 4 5 6 7

You are applying for a job and would like to have an application letter mailed by the end of the week. Realizing that you don't have any stamps, you decide to purchase them at the post office. You decide that you will go next Friday at 4:00 pm.

Strategy Description	Rating (This is an effective strategy)
I would think about the amount of time that I need to carry out my plan, considering how long it takes me to get ready and travel to the post office.	1 2 3 4 5 6 7
I would make sure that I don't schedule anything else during the time I have reserved for my plan.	1 2 3 4 5 6 7
I would check my previous plans/commitments for the day I have to be at the post office, and rearrange them so nothing prevents me from carrying out my plan.	1 2 3 4 5 6 7
I would think about or check for any last minute changes that may affect my plan (e.g., weather or traffic conditions that may slow me down).	1 2 3 4 5 6 7
I would plan out the route I would take to arrive at my destination (e.g., the post office).	1 2 3 4 5 6 7
I would think about locations where I would have to be at in order to carry out my plan.	1 2 3 4 5 6 7
I would think about and assemble the means and/or tools necessary to carry out my plan. (e.g., a vehicle, money for parking).	1 2 3 4 5 6 7
I would have an alternative plan available, in case my original plans failed (e.g., call a taxi if I don't have access to a car).	1 2 3 4 5 6 7
I would use an external reminder to help me remember that I need to carry out my plan (e.g., an agenda, PDA, cell phone organizer, friend, etc.).	1 2 3 4 5 6 7
I would use an internal reminder to help me remember that I need to carry out my plan (e.g., a song, rhyme, memory mnemonic, etc.).	1 2 3 4 5 6 7
I would routinely think about the things that I need to do, so that I would remember that I need to carry out my plan (e.g., I might make a habit of doing this when I wake up, or before I go to bed).	1 2 3 4 5 6 7

You will be traveling overseas this summer and need to have a passport photo taken. You call the photography studio and set up an appointment for 12:00 noon next Wednesday. You would like to have your photo taken at that time.

Strategy Description	Rating (This is an effective strategy)
I would think about the amount of time that I need to carry out my plan, considering how long it takes me to get ready and travel to the photography studio.	1 2 3 4 5 6 7
I would make sure that I don't schedule anything else during the time I have reserved for my plan.	1 2 3 4 5 6 7
I would check my previous plans/commitments for the day I have to be at the photography studio, and rearrange them so nothing prevents me from carrying out my plan.	1 2 3 4 5 6 7
I would think about or check for any last minute changes that may affect my plan (e.g., weather or traffic conditions that may slow me down).	1 2 3 4 5 6 7
I would plan out the route I would take to arrive at my destination (e.g., the photography studio).	1 2 3 4 5 6 7
I would think about locations where I would have to be at in order to carry out my plan.	1 2 3 4 5 6 7
I would think about and assemble the means and/or tools necessary to carry out my plan. (e.g., a vehicle, money for parking).	1 2 3 4 5 6 7
I would have an alternative plan available, in case my original plans failed (e.g. call a taxi if I don't have access to a car).	1 2 3 4 5 6 7
I would use an external reminder to help me remember that I need to carry out my plan (e.g., an agenda, PDA, cell phone organizer, friend, etc.).	1 2 3 4 5 6 7
I would use an internal reminder to help me remember that I need to carry out my plan (e.g., a song, rhyme, memory mnemonic, etc.).	1 2 3 4 5 6 7
I would routinely think about the things that I need to do, so that I would remember that I need to carry out my plan (e.g., I might make a habit of doing this when I wake up, or before I go to bed).	1 2 3 4 5 6 7

While you are on vacation, you promise your friend that you will bring home a local souvenir. You know about a store that carries the souvenir. Although you have many places and friends to visit, you would like to fulfill your friend's request.

Strategy Description	Rating (This is an effective strategy)
I would think about the amount of time that I need to carry out my plan, considering how long it takes me to get ready and travel to the souvenir store.	1 2 3 4 5 6 7
I would make sure that I don't schedule anything else during the time I have reserved for my plan.	1 2 3 4 5 6 7
I would check my previous plans/commitments for the day I plan to be at the souvenir store, and rearrange them so nothing prevents me from carrying out my plan.	1 2 3 4 5 6 7
I would think about or check for any last minute changes that may affect my plan (e.g., weather or traffic conditions that may slow me down).	1 2 3 4 5 6 7
I would plan out the route I would take to arrive at my destination (e.g., the souvenir store).	1 2 3 4 5 6 7
I would think about locations where I would have to be at in order to carry out my plan.	1 2 3 4 5 6 7
I would think about and assemble the means and/or tools necessary to carry out my plan. (e.g., a vehicle, money for parking).	1 2 3 4 5 6 7
I would have an alternative plan available, in case my original plans failed (e.g. call a taxi if I don't have access to a car).	1 2 3 4 5 6 7
I would use an external reminder to help me remember that I need to carry out my plan (e.g., an agenda, PDA, cell phone organizer, friend, etc.).	1 2 3 4 5 6 7
I would use an internal reminder to help me remember that I need to carry out my plan (e.g., a song, rhyme, memory mnemonic, etc.).	1 2 3 4 5 6 7
I would routinely think about the things that I need to do, so that I would remember that I need to carry out my plan (e.g., I might make a habit of doing this when I wake up, or before I go to bed).	1 2 3 4 5 6 7

Your friend is having a dinner party next week. He is looking for a rare wine to serve with the meal but can't find it at the local wine store. You know of a store that carries a wide range of wines and promise to check for it the next time you are in the area.

Strategy Description	Rating (This is an effective strategy)
I would think about the amount of time that I need to carry out my plan, considering how long it takes me to get ready and travel to the wine store.	1 2 3 4 5 6 7
I would make sure that I don't schedule anything else during the time I have reserved for my plan.	1 2 3 4 5 6 7
I would check my previous plans/commitments for the day I plan to be at the wine store, and rearrange them so nothing prevents me from carrying out my plan.	1 2 3 4 5 6 7
I would think about or check for any last minute changes that may affect my plan (e.g., weather or traffic conditions that may slow me down).	1 2 3 4 5 6 7
I would plan out the route I would take to arrive at my destination (e.g., the wine store).	1 2 3 4 5 6 7
I would think about locations where I would have to be at in order to carry out my plan.	1 2 3 4 5 6 7
I would think about and assemble the means and/or tools necessary to carry out my plan. (e.g., a vehicle, money for parking).	1 2 3 4 5 6 7
I would have an alternative plan available, in case my original plans failed (e.g. call a taxi if I don't have access to a car).	1 2 3 4 5 6 7
I would use an external reminder to help me remember that I need to carry out my plan (e.g., an agenda, PDA, cell phone organizer, friend, etc.).	1 2 3 4 5 6 7
I would use an internal reminder to help me remember that I need to carry out my plan (e.g., a song, rhyme, memory mnemonic, etc.).	1 2 3 4 5 6 7
I would routinely think about the things that I need to do, so that I would remember that I need to carry out my plan (e.g., I might make a habit of doing this when I wake up, or before I go to bed).	1 2 3 4 5 6 7

You borrowed a book from the library several days ago. Yesterday you just finished reading it. It won't be due for several weeks, but you would like to return it the next time you pass by the library.

Strategy Description	Rating (This is an effective strategy)
I would think about the amount of time that I need to carry out my plan, considering how long it takes me to get ready and travel to the library.	1 2 3 4 5 6 7
I would make sure that I don't schedule anything else during the time I have reserved for my plan.	1 2 3 4 5 6 7
I would check my previous plans/commitments for the day I plan to be at the library, and rearrange them so nothing prevents me from carrying out my plan.	1 2 3 4 5 6 7
I would think about or check for any last minute changes that may affect my plan (e.g., weather or traffic conditions that may slow me down).	1 2 3 4 5 6 7
I would plan out the route I would take to arrive at my destination (e.g., the library).	1 2 3 4 5 6 7
I would think about locations where I would have to be at in order to carry out my plan.	1 2 3 4 5 6 7
I would think about and assemble the means and/or tools necessary to carry out my plan. (e.g., a vehicle, money for parking).	1 2 3 4 5 6 7
I would have an alternative plan available, in case my original plans failed (e.g. call a taxi if I don't have access to a car).	1 2 3 4 5 6 7
I would use an external reminder to help me remember that I need to carry out my plan (e.g., an agenda, PDA, cell phone organizer, friend, etc.).	1 2 3 4 5 6 7
I would use an internal reminder to help me remember that I need to carry out my plan (e.g., a song, rhyme, memory mnemonic, etc.).	1 2 3 4 5 6 7
I would routinely think about the things that I need to do, so that I would remember that I need to carry out my plan (e.g., I might make a habit of doing this when I wake up, or before I go to bed).	1 2 3 4 5 6 7

You recently started a new job and have been working for several weeks. At the end of the month your employer has written you a cheque for the work that you have done. You would like to cash it the next time you are at the bank.

Strategy Description	Rating (This is an effective strategy)
I would think about the amount of time that I need to carry out my plan, considering how long it takes me to get ready and travel to the bank.	1 2 3 4 5 6 7
I would make sure that I don't schedule anything else during the time I have reserved for my plan.	1 2 3 4 5 6 7
I would check my previous plans/commitments for the day I plan to be at the bank, and rearrange them so nothing prevents me from carrying out my plan.	1 2 3 4 5 6 7
I would think about or check for any last minute changes that may affect my plan (e.g., weather or traffic conditions that may slow me down).	1 2 3 4 5 6 7
I would plan out the route I would take to arrive at my destination (e.g., the bank).	1 2 3 4 5 6 7
I would think about locations where I would have to be at in order to carry out my plan.	1 2 3 4 5 6 7
I would think about and assemble the means and/or tools necessary to carry out my plan. (e.g., a vehicle, money for parking).	1 2 3 4 5 6 7
I would have an alternative plan available, in case my original plans failed (e.g. call a taxi if I don't have access to a car).	1 2 3 4 5 6 7
I would use an external reminder to help me remember that I need to carry out my plan (e.g., an agenda, PDA, cell phone organizer, friend, etc.).	1 2 3 4 5 6 7
I would use an internal reminder to help me remember that I need to carry out my plan (e.g., a song, rhyme, memory mnemonic, etc.).	1 2 3 4 5 6 7
I would routinely think about the things that I need to do, so that I would remember that I need to carry out my plan (e.g., I might make a habit of doing this when I wake up, or before I go to bed).	1 2 3 4 5 6 7

## Appendix F

*LiQ.*

This questionnaire contains 8 vignettes each concerning an intention to carry out a task at a later time. Please read each vignette carefully and imagine yourself being responsible for carrying out the intention. Several strategies listed below each vignette may be useful for ensuring that you are successful. Indicate how likely you are to use each strategy by making an agreement rating using the scale below.

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Somewhat Disagree
- 4 = Neutral
- 5 = Somewhat Agree
- 6 = Agree
- 7 = Strongly Agree



Your friend has been working overseas for the summer and informs you that he will be flying back in two weeks. He has asked you if you would be willing to pick him up. You agree to do this. The flight is scheduled to arrive on Saturday at 2:00 pm.

Strategy Description	Rating (I would use this strategy)
I would think about the amount of time that I need to carry out my plan, considering how long it takes me to get ready and travel to the airport.	1 2 3 4 5 6 7
I would make sure that I don't schedule anything else during the time I have reserved for my plan.	1 2 3 4 5 6 7
I would check my previous plans/commitments for the day I have to be at the airport, and rearrange them so nothing prevents me from carrying out my plan.	1 2 3 4 5 6 7
I would think about or check for any last minute changes that may affect my plan (e.g., weather or traffic conditions that may slow me down).	1 2 3 4 5 6 7
I would plan out the route I would take to arrive at my destination (e.g., the airport).	1 2 3 4 5 6 7
I would think about locations where I would have to be at in order to carry out my plan.	1 2 3 4 5 6 7
I would think about and assemble the means and/or tools necessary to carry out my plan. (e.g., a vehicle, money for parking).	1 2 3 4 5 6 7
I would have an alternative plan available, in case my original plans failed (e.g. call a taxi if I don't have access to a car).	1 2 3 4 5 6 7
I would use an external reminder to help me remember that I need to carry out my plan (e.g., an agenda, PDA, cell phone organizer, friend, etc.).	1 2 3 4 5 6 7
I would use an internal reminder to help me remember that I need to carry out my plan (e.g., a song, rhyme, memory mnemonic, etc.).	1 2 3 4 5 6 7
I would routinely think about the things that I need to do, so that I would remember that I need to carry out my plan (e.g., I might make a habit of doing this when I wake up, or before I go to bed).	1 2 3 4 5 6 7

Your friend's dog is getting old and visits a vet regularly for medication. Your friend has to be out of town and has asked you to help her out by bringing her dog to the clinic. You agree to do this. The appointment is scheduled for next Wednesday at 3:00 pm.

Strategy Description	Rating (I would use this strategy)
I would think about the amount of time that I need to carry out my plan, considering how long it takes me to get ready and travel to the clinic.	1 2 3 4 5 6 7
I would make sure that I don't schedule anything else during the time I have reserved for my plan.	1 2 3 4 5 6 7
I would check my previous plans/commitments for the day I have to be at the clinic, and rearrange them so nothing prevents me from carrying out my plan.	1 2 3 4 5 6 7
I would think about or check for any last minute changes that may affect my plan (e.g., weather or traffic conditions that may slow me down).	1 2 3 4 5 6 7
I would plan out the route I would take to arrive at my destination (e.g., the clinic).	1 2 3 4 5 6 7
I would think about locations where I would have to be at in order to carry out my plan.	1 2 3 4 5 6 7
I would think about and assemble the means and/or tools necessary to carry out my plan. (e.g., a vehicle, money for parking).	1 2 3 4 5 6 7
I would have an alternative plan available, in case my original plans failed (e.g. call a taxi if I don't have access to a car).	1 2 3 4 5 6 7
I would use an external reminder to help me remember that I need to carry out my plan (e.g., an agenda, PDA, cell phone organizer, friend, etc.).	1 2 3 4 5 6 7
I would use an internal reminder to help me remember that I need to carry out my plan (e.g., a song, rhyme, memory mnemonic, etc.).	1 2 3 4 5 6 7
I would routinely think about the things that I need to do, so that I would remember that I need to carry out my plan (e.g., I might make a habit of doing this when I wake up, or before I go to bed).	1 2 3 4 5 6 7

You are applying for a job and would like to have an application letter mailed by the end of the week. Realizing that you don't have any stamps, you decide to purchase them at the post office. You decide that you will go next Friday at 4:00 pm.

Strategy Description	Rating (I would use this strategy)
I would think about the amount of time that I need to carry out my plan, considering how long it takes me to get ready and travel to the post office.	1 2 3 4 5 6 7
I would make sure that I don't schedule anything else during the time I have reserved for my plan.	1 2 3 4 5 6 7
I would check my previous plans/commitments for the day I have to be at the post office, and rearrange them so nothing prevents me from carrying out my plan.	1 2 3 4 5 6 7
I would think about or check for any last minute changes that may affect my plan (e.g., weather or traffic conditions that may slow me down).	1 2 3 4 5 6 7
I would plan out the route I would take to arrive at my destination (e.g., the post office).	1 2 3 4 5 6 7
I would think about locations where I would have to be at in order to carry out my plan.	1 2 3 4 5 6 7
I would think about and assemble the means and/or tools necessary to carry out my plan. (e.g., a vehicle, money for parking).	1 2 3 4 5 6 7
I would have an alternative plan available, in case my original plans failed (e.g., call a taxi if I don't have access to a car).	1 2 3 4 5 6 7
I would use an external reminder to help me remember that I need to carry out my plan (e.g., an agenda, PDA, cell phone organizer, friend, etc.).	1 2 3 4 5 6 7
I would use an internal reminder to help me remember that I need to carry out my plan (e.g., a song, rhyme, memory mnemonic, etc.).	1 2 3 4 5 6 7
I would routinely think about the things that I need to do, so that I would remember that I need to carry out my plan (e.g., I might make a habit of doing this when I wake up, or before I go to bed).	1 2 3 4 5 6 7

You will be traveling overseas this summer and need to have a passport photo taken. You call the photography studio and set up an appointment for 12:00 noon next Wednesday. You would like to have your photo taken at that time.

Strategy Description	Rating (I would use this strategy)
I would think about the amount of time that I need to carry out my plan, considering how long it takes me to get ready and travel to the photography studio.	1 2 3 4 5 6 7
I would make sure that I don't schedule anything else during the time I have reserved for my plan.	1 2 3 4 5 6 7
I would check my previous plans/commitments for the day I have to be at the photography studio, and rearrange them so nothing prevents me from carrying out my plan.	1 2 3 4 5 6 7
I would think about or check for any last minute changes that may affect my plan (e.g., weather or traffic conditions that may slow me down).	1 2 3 4 5 6 7
I would plan out the route I would take to arrive at my destination (e.g., the photography studio).	1 2 3 4 5 6 7
I would think about locations where I would have to be at in order to carry out my plan.	1 2 3 4 5 6 7
I would think about and assemble the means and/or tools necessary to carry out my plan. (e.g., a vehicle, money for parking).	1 2 3 4 5 6 7
I would have an alternative plan available, in case my original plans failed (e.g. call a taxi if I don't have access to a car).	1 2 3 4 5 6 7
I would use an external reminder to help me remember that I need to carry out my plan (e.g., an agenda, PDA, cell phone organizer, friend, etc.).	1 2 3 4 5 6 7
I would use an internal reminder to help me remember that I need to carry out my plan (e.g., a song, rhyme, memory mnemonic, etc.).	1 2 3 4 5 6 7
I would routinely think about the things that I need to do, so that I would remember that I need to carry out my plan (e.g., I might make a habit of doing this when I wake up, or before I go to bed).	1 2 3 4 5 6 7

While you are on vacation, you promise your friend that you will bring home a local souvenir. You know about a store that carries the souvenir. Although you have many places and friends to visit, you would like to fulfill your friend's request.

Strategy Description	Rating (I would use this strategy)
I would think about the amount of time that I need to carry out my plan, considering how long it takes me to get ready and travel to the souvenir store.	1 2 3 4 5 6 7
I would make sure that I don't schedule anything else during the time I have reserved for my plan.	1 2 3 4 5 6 7
I would check my previous plans/commitments for the day I plan to be at the souvenir store, and rearrange them so nothing prevents me from carrying out my plan.	1 2 3 4 5 6 7
I would think about or check for any last minute changes that may affect my plan (e.g., weather or traffic conditions that may slow me down).	1 2 3 4 5 6 7
I would plan out the route I would take to arrive at my destination (e.g., the souvenir store).	1 2 3 4 5 6 7
I would think about locations where I would have to be at in order to carry out my plan.	1 2 3 4 5 6 7
I would think about and assemble the means and/or tools necessary to carry out my plan. (e.g., a vehicle, money for parking).	1 2 3 4 5 6 7
I would have an alternative plan available, in case my original plans failed (e.g. call a taxi if I don't have access to a car).	1 2 3 4 5 6 7
I would use an external reminder to help me remember that I need to carry out my plan (e.g., an agenda, PDA, cell phone organizer, friend, etc.).	1 2 3 4 5 6 7
I would use an internal reminder to help me remember that I need to carry out my plan (e.g., a song, rhyme, memory mnemonic, etc.).	1 2 3 4 5 6 7
I would routinely think about the things that I need to do, so that I would remember that I need to carry out my plan (e.g., I might make a habit of doing this when I wake up, or before I go to bed).	1 2 3 4 5 6 7

Your friend is having a dinner party next week. He is looking for a rare wine to serve with the meal but can't find it at the local wine store. You know of a store that carries a wide range of wines and promise to check for it the next time you are in the area.

Strategy Description	Rating (I would use this strategy)
I would think about the amount of time that I need to carry out my plan, considering how long it takes me to get ready and travel to the wine store.	1 2 3 4 5 6 7
I would make sure that I don't schedule anything else during the time I have reserved for my plan.	1 2 3 4 5 6 7
I would check my previous plans/commitments for the day I plan to be at the wine store, and rearrange them so nothing prevents me from carrying out my plan.	1 2 3 4 5 6 7
I would think about or check for any last minute changes that may affect my plan (e.g., weather or traffic conditions that may slow me down).	1 2 3 4 5 6 7
I would plan out the route I would take to arrive at my destination (e.g., the wine store).	1 2 3 4 5 6 7
I would think about locations where I would have to be at in order to carry out my plan.	1 2 3 4 5 6 7
I would think about and assemble the means and/or tools necessary to carry out my plan. (e.g., a vehicle, money for parking).	1 2 3 4 5 6 7
I would have an alternative plan available, in case my original plans failed (e.g. call a taxi if I don't have access to a car).	1 2 3 4 5 6 7
I would use an external reminder to help me remember that I need to carry out my plan (e.g., an agenda, PDA, cell phone organizer, friend, etc.).	1 2 3 4 5 6 7
I would use an internal reminder to help me remember that I need to carry out my plan (e.g., a song, rhyme, memory mnemonic, etc.).	1 2 3 4 5 6 7
I would routinely think about the things that I need to do, so that I would remember that I need to carry out my plan (e.g., I might make a habit of doing this when I wake up, or before I go to bed).	1 2 3 4 5 6 7

You borrowed a book from the library several days ago. Yesterday you just finished reading it. It won't be due for several weeks, but you would like to return it the next time you pass by the library.

Strategy Description	Rating (I would use this strategy)
I would think about the amount of time that I need to carry out my plan, considering how long it takes me to get ready and travel to the library.	1 2 3 4 5 6 7
I would make sure that I don't schedule anything else during the time I have reserved for my plan.	1 2 3 4 5 6 7
I would check my previous plans/commitments for the day I plan to be at the library, and rearrange them so nothing prevents me from carrying out my plan.	1 2 3 4 5 6 7
I would think about or check for any last minute changes that may affect my plan (e.g., weather or traffic conditions that may slow me down).	1 2 3 4 5 6 7
I would plan out the route I would take to arrive at my destination (e.g., the library).	1 2 3 4 5 6 7
I would think about locations where I would have to be at in order to carry out my plan.	1 2 3 4 5 6 7
I would think about and assemble the means and/or tools necessary to carry out my plan. (e.g., a vehicle, money for parking).	1 2 3 4 5 6 7
I would have an alternative plan available, in case my original plans failed (e.g. call a taxi if I don't have access to a car).	1 2 3 4 5 6 7
I would use an external reminder to help me remember that I need to carry out my plan (e.g., an agenda, PDA, cell phone organizer, friend, etc.).	1 2 3 4 5 6 7
I would use an internal reminder to help me remember that I need to carry out my plan (e.g., a song, rhyme, memory mnemonic, etc.).	1 2 3 4 5 6 7
I would routinely think about the things that I need to do, so that I would remember that I need to carry out my plan (e.g., I might make a habit of doing this when I wake up, or before I go to bed).	1 2 3 4 5 6 7

You recently started a new job and have been working for several weeks. At the end of the month your employer has written you a cheque for the work that you have done. You would like to cash it the next time you are at the bank.

Strategy Description	Rating (I would use this strategy)
I would think about the amount of time that I need to carry out my plan, considering how long it takes me to get ready and travel to the bank.	1 2 3 4 5 6 7
I would make sure that I don't schedule anything else during the time I have reserved for my plan.	1 2 3 4 5 6 7
I would check my previous plans/commitments for the day I plan to be at the bank, and rearrange them so nothing prevents me from carrying out my plan.	1 2 3 4 5 6 7
I would think about or check for any last minute changes that may affect my plan (e.g., weather or traffic conditions that may slow me down).	1 2 3 4 5 6 7
I would plan out the route I would take to arrive at my destination (e.g., the bank).	1 2 3 4 5 6 7
I would think about locations where I would have to be at in order to carry out my plan.	1 2 3 4 5 6 7
I would think about and assemble the means and/or tools necessary to carry out my plan. (e.g., a vehicle, money for parking).	1 2 3 4 5 6 7
I would have an alternative plan available, in case my original plans failed (e.g. call a taxi if I don't have access to a car).	1 2 3 4 5 6 7
I would use an external reminder to help me remember that I need to carry out my plan (e.g., an agenda, PDA, cell phone organizer, friend, etc.).	1 2 3 4 5 6 7
I would use an internal reminder to help me remember that I need to carry out my plan (e.g., a song, rhyme, memory mnemonic, etc.).	1 2 3 4 5 6 7
I would routinely think about the things that I need to do, so that I would remember that I need to carry out my plan (e.g., I might make a habit of doing this when I wake up, or before I go to bed).	1 2 3 4 5 6 7



## Appendix G

### *Overview of cluster analysis.*

Cluster analysis is a statistical technique which can be used to identify subgroups (clusters) of individuals based on the profile of their responses or performance across a set of variables. The aim is to identify clusters with a minimal within group variance and maximal between group variance (Hair, Anderson, Tatham, & Black, 1998).

Assignment of individuals to clusters can be achieved using two general clustering techniques: hierarchical and nonhierarchical (Blashfield & Aldenderfer, 1988; Hair et al., 1998).

### *Hierarchical Cluster Analysis*

Hierarchical techniques can be divided into agglomerative methods and divisive methods. In agglomerative methods, each case starts out as its own cluster. Next, the two most similar clusters are joined together forming a new cluster encompassing both cases. In subsequent steps individual cases may join a larger cluster, or two clusters may join together forming an even larger one. The end product of this analysis is one large cluster containing the all cases. Divisive methods take a reverse approach starting with one cluster containing all cases. In subsequent steps, those cases which are most dissimilar are spilt apart into separate clusters. The end result is achieved when each cluster represents a single case. Several different clustering algorithms exist for hierarchical cluster analysis, each possessing advantages and disadvantages.

### *Nonhierarchical Cluster Analysis*

Nonhierarchical techniques do not involve the branching tree like process of hierarchical cluster analysis. Instead they are based on the number of clusters which

are specified at the outset of the analysis. Thus an optimal solution is calculated with respect to an investigator's a priori hypothesis about the number of clusters which should result from the analysis. The first step of nonhierarchical methods is to select the cluster seeds. Different methods of obtaining initial cluster seeds exist (for a review, see Hair et al., 1998). All cases within a specified distance to the cluster seed are included in the resulting cluster. This process continues until all cases are assigned. Reassignment of cases to different clusters may occur throughout the process if cases are more homogeneous to another cluster than the one originally assigned.

#### *Comparing Hierarchical and Nonhierarchical Methods*

There is no definitive answer with respect to whether a hierarchical or nonhierarchical approach yields the most valid solution. Both hierarchical and nonhierarchical methods have their potential advantages and disadvantages. The major advantage of hierarchical methods is that they are able to provide an estimate of how many clusters exist in the data. However, in some situations (e.g., in the presence of outliers) artificial clusters may result due to undesirable early combinations. Because hierarchical methods do not allow the reassignment of cases to clusters, those undesirable combinations tend to influence the assignment of the remaining cases throughout the hierarchical clustering process. Conversely, nonhierarchical methods avoid this potential issue as later iterations allow for cluster reassignment. The disadvantage of nonhierarchical methods is that an a priori specification of clusters is required.

Hair et al. (1998) suggest that one way to overcome the disadvantages of hierarchical and nonhierarchical cluster analysis is to use both methods to arrive at an

optimal solution. First a hierarchical cluster analysis can be performed to provide an estimate of the number of clusters that exist in the data and profile the cluster centers. With an idea of how many clusters exist, a nonhierarchical analysis can then be carried out to fine tune the results by allowing reassignment of cluster membership in successive iterations. In other words, the data set is monitored throughout the clustering process and individuals can be reassigned to different clusters until the best solution is found. The cluster analyses reported in Experiment 2 follow the recommendations outlined in Hair et al. (1998).

## Appendix H

*Planning Activity Sheet – Defining Time.*

**Defining time** is the process of considering the amount of time required to carry out an intention. Often we fail to accomplish our intentions because we simply do not plan enough time, or underestimate the amount of time required. This planning sheet is designed to help you think about the time required to carry out your plans so that you will be able to carry out these tasks at the appropriate time.

1. Break down each of the assigned tasks into smaller steps (e.g., where you might be, where you have to go, how long it will take you to get there, find the locations of objects, etc.). List them in the appropriate box below (use another sheet if necessary).
2. Estimate the time that you will require to carry out each one of these steps. List them in the appropriate box below (use another sheet if necessary).

Book Task

Stamp Task

Confirmation Call