Chapter-Six

General Discussion
“Don’t forget to remember”

*Prospective Memory*

“If you wish to forget anything on the spot, make a note that this thing is to be remembered.”

Edgar Allen Poe

The quotes of Poe (1844) highlight the context of this thesis. Edgar Allen Poe (1844) addresses the fact that the ability to remember things one wants to do in the future is surprisingly error-prone and there are various factors which correspond to the success or failure of a PM task.

However, this ability is needed in daily life on many occasions. Since most of the daily memory failures are due to problems in the ‘future memory’ (Kliegel & Martin, 2003), so called PM, this topic recently attracted much interest, reflected by a growing body of literature (Kliegel, McDaniel, & Einstein, 2008).

PM is a distinctive aspect of memory that forms the logical, natural complement of retrospective memory. PM is required for carrying out planned activities, such as
removing the pot before it boils over, getting groceries en route from work to home, and taking medication nightly at bedtime.

PM has been described in many ways, including as intention memory (Goschke & Kuhl, 1996; Kvavilashvili & Ellis, 1996; Loftus, 1971), memory for future actions (Einstein & Mc Daniel, 1996; Mantyla, 1996), and remembering that something has to be done (Dobbs & Rule, 1987; Maylor, 1996b).

Thus, PM is a form of memory that involves remembering to perform a planned action or recall a planned intention at some future point in time. PM tasks are common in daily life and range from the relatively simple to extreme life-or-death situations.

Since a great deal of each day is spent forming intentions and acting on those intentions, it is no surprise that at least half of everyday forgetting is due to PM failures (Crovitz & Daniel, 1984). It is important to understand PM not only because of the ubiquity of prospective memory demands but also because PM failures can be devastating. For example, aircraft pilots must remember to perform several actions sequentially prior to take-off and landing and failure to remember to perform any of these actions may result in injury or death. Although aircraft crew PM failures rarely occur or lead to injury, Dismukes (2006) noted that almost 1/5 of major airline accidents can be attributed to PM failures.

Moreover, people who must remember to take medication depend upon their PM for maintaining their health. In a recent Australian survey (Nelson, Reid, Ryan, Willson, & Yelland, 2006), individuals who reported to forgetting to take their blood pressure...
medication at least one time were significantly more likely to have a heart attack or die than individuals who did remember to take their medication.

Because intention forgetting has the potential to be devastating, it is important to learn about the correlates that effect PM. To do so, a greater understanding of PM must be obtained, with careful focus on how memories are retrieved. By understanding how intentions can be successfully retrieved, strategies can be formulated which will promote efficiency and functionality. To summarize, characteristics of tasks involving PM have been simplified and are summarized below (adapted from Burgess, Scott, & Frith, 2003).

1. There is an intention, or multiple intentions (Kliegel, McDaniel, & Einstein, 2000), upon which to act.

2. The intended act cannot be performed immediately after the intention has been formed.

3. The intention is to be performed in a particular circumstance, called the “retrieval context” (Ellis, Kvavilashvili, & Milne, 1999). This can be marked by an external cue, in event-based paradigms, or a particular time, or certain duration, in time-based paradigms.

4. The delay period between creating the intention and the appropriate time to act (i.e., the “retention interval”) is filled with an activity called the ongoing activity (Ellis et al., 1999).

5. The performance of the ongoing task prevents continuous, conscious rehearsal of the intention over the entire delay period. This is typical because the ongoing
activity places a heavy demand on competing for cognitive resources or the delay is too long.

6. The PM cue does not interfere with or directly interrupt the performance of the ongoing task. Intention enactment is, therefore, self-initiated (Graf & Uttl, 2001) and, thus participants are required to recognize the PM cues or retrieval context themselves.

7. In most situations involving PM, no immediate feedback is given in response to the participants’ errors or another aspect of performance.

Thus, the present research was an attempt to explore the correlates of PM in order to deeply understand that how these various factors effect PM. For this purpose, the researcher conducted three studies to explore the various correlates of PM.

Study 1 aimed at exploring the role of depressive symptoms and gender on various aspects of PM. Study 2 aimed at understanding nature of task and importance of task on completion of the task. Second, it also aimed at exploring the role of nature of task, importance of task and depressive symptoms in the selection of tasks and completion of tasks. Study 3 aimed at exploring the nature of PM on patients of substance abuse.

6.1: Study 1

Results from study 1 provided significant evidence that gender is a significant correlate of PM (Table 3.1). It was found that women do better in a prospective memory task than men. However, men were found to be committing more errors. It should also be
noted that this gender difference was not found in the case of retrospective memory recall. Hence, signifying that when the task requires execution of delayed intention which requires recalling the intention as well as performing the task women are at advantage.

Results also suggested that when the retention time of the prospective memory is short men commit more prospective memory errors than women. Thus, in the case of short-term prospective memory, women perform better (Table 3.4). Also that, women perform better in comparison to men in a self-cued and environmental cued prospective memory task (table3.7). These findings are in line with previous literature which suggests that gender differences in the event and time-based prospective memory found that females performed significantly better at event-based prospective memory (for both distinctive and non-distinctive embedded cues) than males.

Results also suggest depressive symptoms as a prominent correlate of prospective memory. Findings from Table .3.5 significantly state that people showing severe depressive symptoms commit more long term and short term prospective memory errors. In comparison to retrospective memory, gender was not found to be a significant correlate. It was found that in comparison to participants showing minimal and mild depressive symptoms, participants showing severe depressive symptoms committed more long term and short prospective memory errors (Table 3.5); and also committed more errors in self-cued and environmental cued prospective memory tasks (Table3.7). These findings are in line with previous researchers (Channon, Baker & Robertson, 1993; Hertel & Hardin, 1990).

Hence, findings of study 1 conclude that gender and depressive symptoms are significant correlates of prospective memory.
6.2 Study 2

Findings from study 1 concluded the role of gender and depressive symptoms on prospective memory. To further elaborate and understand the functioning of the correlates of PM, thus, study 2 was planned and conducted. Since planning is a major aspect of prospective memory, this study emphasized on using a natural paradigm for understanding how plans are formed and later fulfilled? The role of nature & importance of task; on task planning and completion. Second, the role of depressive symptoms in the completion of tasks. The role of depressive symptoms, in forming intentions; and completion of tasks.

Understanding ‘planning’ in prospective memory paradigm-Burgess and colleagues (e.g., Burgess, Veitch, Costello, & Shallice, 2000; see Burgess et al., 2008 for review) have demonstrated that what one does during encoding or planning, can affect the performance of retrieval of PM. In other words, planning during encoding has an important consequence for the successful retrieval of PM intentions. The multiprocess theory predicts that good planning at encoding will prompt spontaneous retrieval processes during PM performance (McDaniel & Einstein, 2000). In one form of planning, the instructions provide specific information about the context in which the PM cues will appear (Marsh, Hicks et al., 2006). A different aspect of planning was tested by Kliegel et al. (2000), who asked young and old participants to remember to perform a single PM task while engaged in a range of processes that included executing a series of multiple intentions (Six Element Test, SET; Burgess, Alderman, Emslie, Evans, Wilson, & Shallice, 1996; Shallice & Burgess, 1991). Even though participants were specifically
asked to plan out how they would perform the task, only 54.1% of the participants remembered to execute the PM task on time and only 50% of the steps indicated in the plans were subsequently followed. This suggests that despite having a formulated plan concerning the different components involved in the PM intention, execution of the intention did not necessarily followed the intended plan. Thus, this study aimed at exploring prospective memory using a naturalistic paradigm.

Table 4.1 describes the nature of tasks planned by the participants. Themes underlying nature of task were Study related tasks (completing college assignments, preparing notes, studying etc.), Shopping (buying and purchasing products of need ), Communication ( calling, talking and conversing, wishing birthdays), Meetings and Appointments (meeting friends, family and acquaintances ), Self Improvement and Behavioural Changes ( included tasks like doing yoga, doing physical exercises , working on spoken English) Household tasks( included daily basis household tasks like cooking, cleaning, helping parents) and tasks related to Entertainment (watching movies, playing games, visiting places).

Table 4.1 highlights that a maximum number of tasks planned were study related. The highest percentage of tasks completed was from the Household category. However, highest percentages of tasks not completed were from shopping-related tasks. This suggests that planning of tasks and then choosing which tasks to be completed shows involvement and role of other factors. Table 4.2 highlights the importance of the task, it represents that maximum percentage of tasks completed was from tasks which were rated highly important (6 and 7 on Likert scale). The study suggests the role of importance of task on task completion.
Effect of depressive symptoms on task planning was also significantly observed. Specifically, it was found that participants showing severe depressive symptoms planned lesser prospective tasks than participants showing mild and minimal depressive symptoms when tasks were study related and related to self-improvement and behavioral changes. Second, participants with severe depressive symptoms comparatively planned lesser prospective tasks than those with minimal and mild depressive symptoms.

6.3 Study 3

Study 3 aimed at understanding the nature of prospective memory among patients with substance abuse. Findings of study 1 and 2 suggested depressive symptoms as a significant correlate of prospective memory. The researcher was keen to explore this effect on patients of substance abuse. Since substances induce depressive symptoms among patients. However, the findings of this study suggested that although the effect of substance abuse was seen on retrospective memory, however, no significant difference was found on prospective memory. Reasons for these findings were sought by explanations stating that prospective memory is not just dependent on recalling the past but it involves mechanisms like the type of task and the underlying cognitive processes of performing delayed intentions. It is highly influenced by situational factors during the performance phase (expert’s opinion). Detrimental effects of age were also seen in prospective memory and retrospective memory on patients of substance abuse.
Major findings of the Research

To conclude the findings of the research the *correlates of prospective memory are:*

1. **Depressive Symptoms:** findings from the studies reflect a dominant role of depressive symptoms on prospective memory. Depressive symptoms were also found to be affecting the planning and completion of the task. It also emphasized on which task to be selected for completion. Thus, a person showing severe depressive symptoms may show difficulty in executing a prospective memory task.

2. **Gender:** The findings from the study revealed that gender acts as a correlate of prospective memory. Findings from study 1 revealed a women advantage in carrying out prospective memory task. It was found that women committed less prospective memory errors than men.

3. **Nature of task:** findings from study 2 showed that the type of prospective memory task planned also effects whether or not the task would be completed. Since the sample included student participants the nature of tasks completed more were related to studying, shopping and entertainment. Thus, highlighting nature of the task as a correlate of prospective memory.

4. **The Importance of task:** Findings from study two revealed that tasks which were rated of high importance were completed more than tasks which were rated of less importance. Thus, importance assigned by the participant plays a vital role in the completion of PM task.

5. **Age:** Results from study 3 revealed that prospective memory declines with age. However, more research needs to be done to further investigate age as a correlate of prospective memory.
Although this research identified some major correlates of prospective memory, there are also some limitations that need to be addressed. The research was conducted using only behavioral measures, however, the findings could have been supported by using computer-based cognitive tasks. The sample size was disproportionate and it could have been more varied. Sample size could have been bigger.

The findings of this dissertation could be helpful in understanding the factors which interfere in executing everyday prospective tasks. This kind of information can further help in devising methods to reduce daily memory failures and help in enhancing prospective memory. Identifying the correlates of prospective memory helps in controlling memory failures. These findings can contribute in the process of formulating a multi-dimensional model on prospective memory functioning.

**Directions for Future Researches**

*Based on the findings of this research in order to understand the distinction between the functioning of prospective and retrospective memories further more neural correlates of prospective memory could be explored and studied.

*Based on the findings of this research, studies to investigate effects of gender on prospective memory could be planned.

*To further investigate the role of depressive symptoms, clinically diagnosed depressive patients could be selected as sample.