J. Appl. Environ. Biol. Sci., 3(11)111-116, 2013
ISSN: 2090-4274
Journal of Applied Environmental and Biological Sciences
www.textroad.com

Gender and Age Differences in Time-Based Prospective Memory

Abdolmajid Bahrainian[1], Negisa Bashkar[2], Ahmad Sohrabi[3], Morad Rasouli Azad[4], Sirvan Asmaee Majd[4]

[1]Department of clinical psychology, Shahid Beheshti University of Medical sciences. Tehran, Iran.
[2] Department of psychology, Science and Research Branch of Islamic Azad University, Tehran, Iran.
[3] Department of clinical psychology, Kurdistan University. Kurdistan, Iran.
[4] Department of clinical psychology, Shahid Beheshti University of Medical sciences. Tehran, Iran.

Received: September 3 2013
Accepted: October 22 2013

ABSTRACT

Prospective memory is remembering to perform an action at the future point in time. Prospective memory is divided into two types, event-based and time-based. In natural environments it has been often found that older subjects have better performance than young adults in PM but in experimental environment, condition was reversed. Time-based prospective memory (TBPM) has negative relationship with aging and gender differences are not investigated in TBPM by researchers. The goal of this study was to identify gender and age differences in TBPM.
Method: With ex-post facto method and purposeful sampling, one hundred participants were selected. Fifty participants were over 65 years old (25 males and 25 females) having BA degree and fifty participants were graduate students (25 males and 25 females), and the variables which assumes to have effects on TBPM were controlled (drug abuse, cognitive disease). For evaluation of TBPM, DMDX soft ware (foster & foster, 2003) was used. The PM task of this experiment required participants to click one of two buttons at 5-min intervals while responding to multiple choice general information questions. 5-min after the start of the multiple choice test, participants were to click the button labeled “1”. Five minutes later, participants were to touch the button labeled “2” and 5 min after that, button “1” for a total of eight buttons presses (40 min). For time monitoring purposes, a clock icon was present in the upper right hand corner. Participants needed to click the clock icon to see the time. This Prospective memory task gives three scores (PM task, on time click on correct choice; PM error, click on correct choice in wrong time; and Retrospective Memory (RM) error, click on wrong choice). Data were analyzed using two ways analysis of variance (two ways ANOVA).
Findings: Males and Young adults respectively performed better than females and old adults in PM tasks, and there were significant interaction between age and gender in PM tasks (males showed more decreasing in PM tasks during aging). Females committed more PM errors, but there were no interaction between gender and age and differences among old adult and young in PM errors. Also old adults had more RM errors than young, but there were no interaction between gender and age and differences among males and females in RM errors.
Discussion: Gender and age have significantly effect on TBPM function that could be originated from other cognition functions. Frontal lobe function, temporal lobe function, IQ and especially speed processing have tremendous effects on TBPM. These functions are quite influenced by aging. Men have a little better working memory, perceptual organization factor and speed processing than women that can explain gender differences in TBPM. The ongoing studies need to be investigated in natural environments.
KEYWORDS: Time-Based Prospective Memory (TBPM), aging, gender.

INTRODUCTION

For the first time, Prospective Memory (PM) was described by Ingvar [1]. This term are used for remembering to perform an action at the future point in time. In everyday life, PM functions is very vital, for example; remember to do a task in specific time, remember to use a important drug for a patient, remember to give drugs to a patient by a nurse, remember some actions that pilot must do to ground. In fact, PM include both remembering of maps and intentions, and its style and time of commission. Time-Based PM (TBPM) and Event-Based PM (EBPM) are two major forms of PM. EBPM refer to do and remembering an act in future when seeing an environmental cue, for example, to use Memantine (a drug for treatment of Alzheimer) after breakfast. TBPM refer to do an act in determinant time in the future, for example, to use Lozartan (a drug for blood pressure) every morning and night. According to Einstein, & McDaniel [2], PM tasks include two dimension; First, RM dimension that intention is

***Corresponding Author:** Abdolmajid Bahrainian, Associate Professor in clinical psychology, Shahid Beheshti University of Medical sciences. Tehran, Iran. E mail: majid.bahrainian@gmail.com

recoded and maintained during a period. Second, PM dimension that retrieval of intention was done in appropriate context and background, and in self-operation process.

Prospective memory performance is reduced with increasing age. Phillips and Crawford [3] studied the effects of age on prospective and retrospective memory in a meta-analysis research. They found that increasing age has a reverse and negative relation with free reminder of contents. However, according to done-in-laboratory or natural environment of the PM tasks, there are some contradictions. Elderly adults do better the PM tasks than younger adults in natural environments [4, 5, 6, 7]. Rendell and craik [8] in comparing young and elderly people in both of laboratory and natural environment performing PM tasks found that elderly people in natural environment are performing better than young adults in the PM similar tasks and in laboratory environment tasks young people are better. These findings were further confirmed through a meta-analysis study by Henry, MacLeod, Phillips and Crawford [3] that elderly adults showed a weaker performance in lab assignments, but have a better performance in the natural environment tasks. The reasons for the superiority of the elderly adults in the natural environment, it can be noted that during a day young adults are involved in one or more tasks, therefore they perhaps forget the appropriate action associated with the PM at the specified time [9] Also, Einstein, McDaniel, Richardson, Guynn and Cunfer [10] showed that young adults are better than elderly in time-based tasks version (rather than even-based), and the were suspected that age differences in the performance of PM is certainly for tasks that require creativity and spontaneity in the recovery to do the intention and time-based PM tasks rather than event-based require spontaneity for recovery to do the intention. This is why the effects of aging for time-based tasks are more than event-based tasks. Unlike studies of the effect of age on PM, there are very few studies of the effect of gender on PM.

In a study of dementia survey, Huppert, Johnson, and Nickson [11] dealt with the investigating of prospective memory impairments, describing the age function, and recognition of risk factors in this clinical population. Logistic regression analysis showed that successful function is associated strongly and linearly with age and being male and education and low social status substantially increase the risk of prospective memory impairment.

Maylor and Logie [12] also studied, in a large-scale research, 318614 subjects ranging from 8 to 50 years old in a cyber test. Their goal was analyzing the gender differences in prospective and retrospective memory. Their used test had a quite visual content and the prospective memory assessed the event-based. The findings of this study demonstrate the superiority of women's scores on both types of memory. At early ages, the differences in prospective memory is much but at 28 and over, and differences are less and insignificant.

The aim of this study is to investigate the effects of gender and age on time-based prospective memory in a laboratory task oriented.

METHOD

Participants

Using ex-post facto method and purposeful sampling, one hundred participants were selected. Fifty participants were over 65 years old (25 males and 25 females) having BA degree and fifty participants were graduate students (25 males and 25 females). The variables which have effects on TBPM were controlled (depression, drug abuse history, cognitive disease, diabetes, cardiac disease). Graduates were Kharazmi University students in Tehran city and olds were selected from Tehran retired organization.

Materials

Using DMDX [13] that were used in McFarland & Glisky [14] are performed to evaluate TBPM. In this instrument that administered by PC, participants had two tasks; First, to answer a multiple choice test of general knowledge and trivia that presents each question for 12 s. Second, PM task of this experiment required participants to click one of two buttons at 5-min intervals. 5-min after the start of the multiple choice test, participants were to click the button labeled “1”. Five minutes later, participants were to touch the button labeled “2” and 5 min after that, button “1” for a total of eight buttons presses (40 min). For time monitoring purposes, a clock icon was present in the upper right hand corner. Participants needed to click the clock icon to see the time for 2 s. All of questions and bottoms are adapted to Persian language (figure 1). This Prospective memory task gives three scores: A) PM task, on time click on correct choice (bottom “1” or “2”); B) PM error, click on correct choice in wrong time (15 s before and after of target time); and C) Retrospective Memory (RM) error, click on wrong choice).

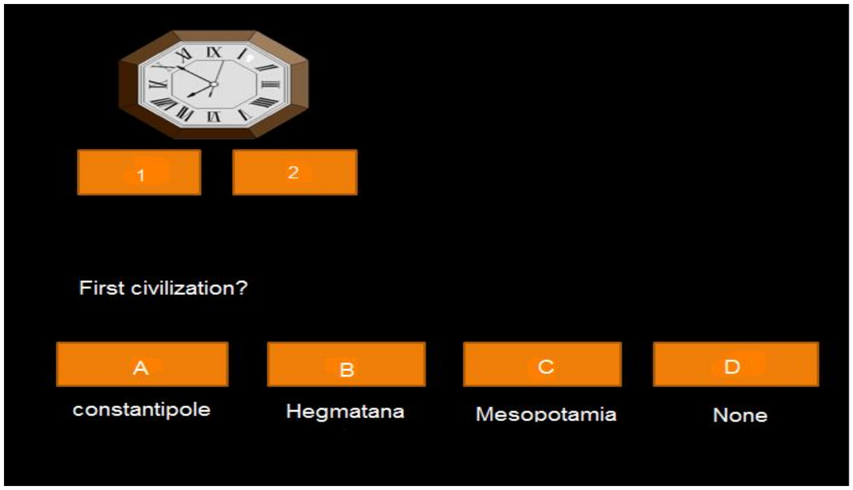

Fig.1. A view from Persian version of experimental TBPM task

Procedure

After interview with participants and checking of depression, drug abuse and other disease that effect on TBPM, target sample were selected. After taking informed consent, participants are taught about task by a researcher. In termination of session and after 1 hour, $15 was paid to each participant. Data were analyzed using two ways analysis of variance (two ways ANOVA) and SPSS 18.

Findings:

For each participant, we had three scores (PM task, PM error, and RM error) that sum of these scores was eight (eight of 5-min intervals). Main and interaction effect of gender and age variables examined with two ways ANOVA. Mean number of PM tasks is presented in Table 1 as a function of PM function.

Table 1 Mean (Standard Deviation) of PM tasks and errors as a PM functions

Variables	Male		Female		Total	
	Young N= 25	Old N= 25	Young N= 25	Old N= 25	Young N= 50	Old N= 50
PM task	5.88 (2.505)	2.44 (1.122)	3.16 (2.444)	0.68 (1.215)	4.52 (2.808)	1.06 (1.754)
PM errors	1.08 (1.579)	1.24 (1.640)	2.56 (2.042)	1.72 (1.968)	1.82 (1.955)	1.48 (1.809)
RM errors	1.04 (1.767)	5.32 (2.577)	2.28 (1.744)	5.56 (2.662)	1.66 (1.847)	5.44 (2.596)

A 2 (male vs. female) × 2 (old vs. young) ANOVA indicated a significant main effect of gender (F = 16.60, Partial η^2= 0.147, $p < .01$) and age (F = 65.65, Partial η^2= 0.406, $p < .01$) with males and young performing significantly more than respectively the females and olds in PM tasks.

There were significant interaction between age and gender in PM tasks (F = 5.27, Partial η^2= 0.052, $p < .05$). Males showed more decreasing in PM tasks during aging (figure 2).

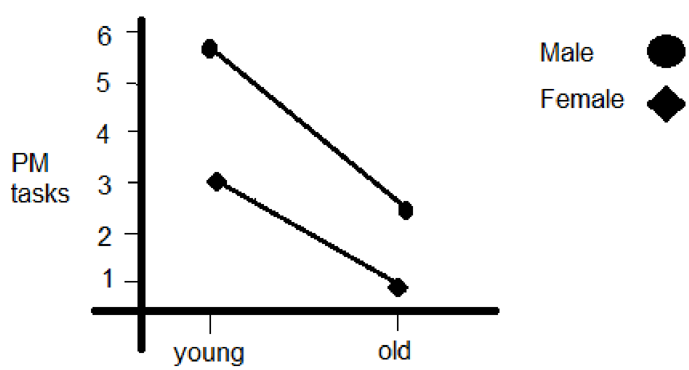

Fig.2. Interaction between gender and age in PM task

Two ways ANOVA indicated females committed more PM errors (F = 7.25, Partial η^2= 0.147, p < .01), but there were no interaction between gender and age (F = 1.79, Partial η^2= 0.019, p > .05) and no differences among old adult and young in PM errors (F = 0.874, Partial η^2= 0.009, p > .05). Females pressed more correct bottoms out of 15 s after and before target time. Also old adults had more RM errors than young (F = 71.80, Partial η^2= 0.428, p < .01), but there were no interaction between gender and age (F = 1.25, Partial η^2= 0.013, p > .05) and no differences among males and females in RM errors (F = 2.75, Partial η^2= 0.028, p > .05). Old adults regardless to previous choice in 5-min interval committed more RM errors rather than young. As you see, Partial Eta Squared of age is more than gender that shows effect size of age is more than gender in PM function.

Also, young adults significantly check clock more to see time (young adults, M= 34.26, SD= 21.83; old adults, M= 8.44, SD= 8.00, F = 62.67, Partial η^2= 0.395, p < .01), and have better function in TBPM. In the number of questions answered on the background task, males performed better and answered more general information questions (F = 7.72, Partial η^2= 0.074, p < .01).

DISCUSSION

The present study investigated effects of gender and aging on an experimental TBPM task. Young adults perform better than old adults in TBPM functions and old adults committed more RM errors; this result is consistent with studies that investigated effects of aging on experimental PM tasks [3, 15, 16, 14, 17, 18, 19, and 20].

Generally, PM functions decrease with aging. Current studies suggested that frontal lobe functions are cause of these differences [14, 19, 21]. There is much evidences that show this decrease only occurs with aging related impairment in frontal lobe functions and also is proved that PM performance in old adults with normal frontal lobe functions is entire (14, 22, 23, 24]. McFarland & Glisky [14] found that with control of frontal lobe functions, there are no differences between old and young adults in PM performance, and impairment of frontal lobe in old adults explain decreases of PM performance and aging just is a mediation variable. In line with these results, Kliegel et al [25] suggested that age differences in PM performance have strong relation with executive functions and they found that executive functions predict PM performance. McDaniel & Einstein [26] investigated neuropsychological aspects of PM in normal aging and suggested that frontal systems are particularly important for prospective memory tasks in three stage of PM including planning an intended action, retrieving the action at the appropriate moment, and executing the action. On the other hand, regarding literature review, better performance in young adults depends on their appropriate performance in following mechanisms; monitoring on environmental cues, maintaining of determinant intent in special time interval, ability to inhibit and controlling of background tasks, planning a method to retrieve intended action, efficient spontaneous processing, ability to integrate intention with cue, retrieving the action at the appropriate moment, better executive functions, for example, attention division function, working memory, and ability to shift, control and inhibit [27, 28, 29, 30, 31, 32].

In this study, males performed better than females in PM tasks and Females committed more PM errors. Gender differences in PM have a big conflict. This finding is consistent with hooper, jahnson, & nickelson [11] that reported being male strongly and directly is related to high PM performance in dementia. Although groot et al [33] in comparing brain damage group with normal group, found differences between two group in PM have no relation with gender and age, that have a conflict whit these study findings. Even maylor & logi [12] reported that females perform better than males in both PM and RM. In this study, the task used had visual content and evaluated EBPM. Studies that investigated gender differences in PM are completely inconsistent, according to findings of this study but better performance in males is related with better performance of males in working memory and speed processing [34] that according with groot et al [33] have more correlation with PM. These findings suggested that gender differences in all forms of PM, need more investigation by future studies.

Acknowledgment

The authors declare that they have no conflicts of interest in the research.

REFERENCES

1. Ingvar DH. Memory of the future: an essay on the temporal organization of conscious awareness. Hum Neurobiol 1985; 4(3): 127—136.

2. Einstein GO, McDaniel MA. Retrieval processes in prospective memory: Theoretical approaches and some new empirical findings. In: Brandimonte M, Einstein GO, McDaniel MA, editors. Prospective memory: Theory and applications. Mahwah NJ: Lawrence Erlbaum Associates Publishers; 1996. p. 115-41.
3. Henry JD, MacLeod MS, Phillips LH, Crawford JR. A Meta-Analytic Review of Prospective Memory and Aging. Psychol Aging 2004; 19(1): 27-39.
4. Devolder PA, Brigham MC, Pressley M. Memory performance awareness in younger and older adults. Psychol Aging 1990; 5(2): 291-303.
5. Maylor EA. Age and prospective memory. Q J Exp Psychol A 1990; 42(3): 471-93.
6. Rendell PG, Thomson DM. The effect of ageing on remembering to remember: An investigation of simulated medication regimens. Australasian J Ageing 1993; 12: 11-18.
7. Rendell PG Thomson DM. Aging and prospective memory: Differences between naturalistic and laboratory tasks. J Gerontol B Psychol Sci Soc Sci 1999; 54(4): 256-69.
8. Rendell PG, Castle AD, Craik FL. Memory for proper names in old age: a disproportionate impairment? Q J Exp Psychol A 2005; 58(1): 54-71.
9. Kvavilashvili L, Fisher L. Is time-based prospective remembering mediated by self-initiated rehearsals? Effects of incidental cues, ongoing activity, age, and motivation. J Exp Psychol Gen 2007; 136(1): 112–32.
10. Einstein GO, McDaniel MA, Richardson SL, Guynn MJ, Cunfer AR. Aging and prospective memory: Examining the influences of self-initiated retrieval processes. J Exp Psychol Learn Mem Cogn 1995; 21(4): 996-1007.
11. Huppert F, Johnson T, Nickson J. High Prevalence of Prospective Memory Impairment in the Elderly and in Early-stage Dementia: Findings from a Population-based Study. Applied cogn psycho 2000; 14(7): 63-81.
12. Maylor EA, Logie RH. A Large-Scale Comparison of Prospective and Retrospective Memory Development from Childhood to Middle-Age. Q J Exp Psychol 2010; 63(3): 442-51.
13. Forster KI, Forster JC. DMDX: A Windows display program with millisecond accuracy. Behav Res Methods Instrum Comput 2003; 35(1): 116–24.
14. McFarland CP, Glisky EL. Frontal lobe involvement in a task of time-based prospective memory. Neuropsychologia 2009; 47(7): 1660–9.
15. Maylor EA. Prospective memory in normal ageing and dementia. Neurocase 1995; 1(3): 285–89.
16. Einstein GO, McDaniel MA, Manzi M, Cochran B, Baker M. Prospective memory and aging: Forgetting intentions over short delays. Psychol Aging 2000; 15(4): 671-83.
17. Brickman AM, Zimmerman ME, Paul RH, Grieve SM, Tate DF, Cohen RA, Williams LM, Clark CR, Gordon E. Regional white matter and neuropsychological functioning across the adult lifespan. Biol Psychiatry 2006; 60(5): 444-53.
18. McDaniel MA, Glisky E, Rubin SR, Guynn MJ, Routhieaux BC. Prospective memory: A neuropsychological study. Neuropsychology 1999; 13(1): 103- 10.

19. Martin M, Kliegel M, McDaniel MA. The involvement of executive functions in prospective memory performance of adults. International J Psychol 2003; 38(4): 195-206.
20. Zacks RT, Hasher L, Li KZH. Human memory. In Craik FM, Salthouse TA (Eds.). the handbook of aging and cognition (2nd ed). Mahwah, NJ: Erlbaum 2000. p 293-357.
21. Kerns KA, Price KJ. An investigation of prospective memory in children with ADHD. Child Neuropsychol 2001; 7(3): 162–71.
22. Burgess PW, Dumontheil I, Gilbert SJ, Okuda J, Scholvinck, Simons JS. On the role of rostral prefrontal cortex (area 10) in prospective memory. In Kliegel M, McDaniel MA, Einstein GO (Eds.). Prospective memory New York: Erlbaum.2008. p. 235–60.
23. Troyer AK, Murphy KJ. Memory for intentions in amnesic mild cognitive impairment: Time- and event-based prospective memory. J Int Neuropsychol Soc 2007; 13(2): 365–69.
24. Okuda J, Fujii T, Ohtake H, Tsukiura T, Yamadori A, Frith CD, et al. Differential involvement of regions of rostral prefrontal (Brodman area 10) in time and event-based prospective memory. Int J Psychophysiol 2007; 64(3): 233–46.
25. Kliegel M, Ramuschkat G, Martin M. Executive functions and prospective memory performance in old age: An analysis of event-based and time-based prospective memory. Z Gerontol Geriatr 2003 36(1): 35-41.
26. McDaniel MA, Einstein GO. The neuropsychology of prospective memory in normal aging: A componential approach. Neuropsychologia 2011; 49(8): 2147– 55.
27. Einstein GO, Holland LJ, McDaniel MA, Guynn MJ. Age-related deficits in prospective memory: The influence of task complexity. Psychol Aging 1992; 7(3): 471-78.
28. McDaniel MA, Einstein GO. Strategic and automatic processes in prospective memory retrieval: A multi-process framework. Applied Cogn Psychol 2000; 14(7): 127-44.
29. McDowd JM, Shaw RJ. Attention and aging: A functional perspective. In. Craik FM, Salthouse TA (Eds.), the handbook of aging and cognition. Hillsdale, NJ: LEA 2000. p. 221-92.
30. Kliegel M, Jager T, Phillips LH. Adult age differences in event-based prospective memory: A meta-analysis on the role of focal versus nonfocal cues. Psychol Aging 2008; 23(1): 203-8.
31. Scullin MK, Bugg JM, McDaniel MA, Einstein GO. Prospective memory and aging: preserved spontaneous retrieval, but impaired deactivation, in older adults. Mem Cognit 2011; 39(7): 1232–40.
32. Basso D, Ferrari M, Palladino P. Prospective memory and working memory: Asymmetrical effects during frontal lobe TMS stimulation. Neuropsychologia 2010; 48(11): 3282–90.
33. Groot YC, Winson BA, Evans J, Watson P. Prospective memory functioning in people with and without brain injury. J Int Neuropsychol Soc 2002; 8(5): 645–54.
34. Heaton RK, Taylor MJ, Manly J. Demographic effects and use of demographically corrected norms with the WAIS-III and WMS- III. In Tulsky DS, Chelune GC, Irnik RJ, Prifi A, Saklofske DH, Heaton RK, et al. (Eds.), Clinical interpretation of the WAIS-III and WMS-III San Diego, CA: Academic Press 2003.p. 181–210.