

ASSESSING THE RELATIONSHIP OF PROSPECTIVE, RETROSPECTIVE, AND EVERYDAY MEMORY WITH COGNITIVE FAILURE AMONG BANGLADESHI ADULTS

FARIEA BAKUL, MOLLIKA ROY*, SANJIDA AKTAR AND CHHANDA KARMAKER

Department of Psychology, University of Dhaka.

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Abstract

Memory has a profound impact on every aspect of who we are. The present study explored the extent to which deficits in everyday memory (EM), prospective memory (PM), and retrospective memory (RM) serve as predictive indicators of cognitive failure (CF) in the context of the Bangladeshi population, as well as to identify differences for the variables across various age cohorts and genders. A total of 352 participants took part in the cross-sectional survey of PM, RM, EM, CF, and the demographic questionnaire package. The main goal of this study was accomplished by the findings, which showed a positive link between CF and EM, PM, and RM. Additionally, the results show that while deficiencies in RM have a somewhat smaller correlation with CF, lapses in EM and PM primarily serve as predictive indications of CF. The results of the current study reveal a recurrent pattern of memory recall and cognitive failure, where men are doing generally better than those of women. A noteworthy finding was the superior performance of middle-aged adults in comparison to their younger counterparts. Hence the majority of memory research is conducted on Western or European people, therefore the current study and its findings can serve as a strong starting point for determining the reasons, nature, and direction of the correlations between memory types and cognitive failures.

Introduction

The prevailing consensus is that memory is a collection of cognitive mechanisms that enable us to store knowledge for specific periods to learn from our past experiences and anticipate the future. Every aspect of our lives is influenced by memory. Understanding how memory works is the first step toward improving memory. Memory can be divided into various types: retrospective, prospective, everyday memory, etc. Retrospective memory is concerned with recalling events from the past, prospective memory is concerned with reminding oneself to act in the future, and everyday memory refers to memory operations of routine or day-to-day tasks. Everyday memory (EM) and its effective functions are crucial for a hassle-free life. Recalling someone's name, planning a day, and remembering medicine to take on time are some examples of everyday memory.

* Author for correspondence: mollikaroy@du.ac.bd

Compared to prospective and everyday memory, retrospective memory has been the subject of much research⁽¹⁻²⁾. Because people tend to forget future planned actions more often than past or retrospective occurrences, PM is extremely important for daily functioning⁽³⁾. Interestingly women have been found to have an edge over men for 'remembering to remember' which is prospective memory in an Italian study⁽⁴⁾. Women have also been reported to be able to encode more information and hence retain more specific information in their memory for everyday memories, such as everyday experiences and social events⁽⁵⁾. Memory performance can be greatly impacted by age because many cognitive functions, including visual-constructive ability, information processing speed, and accuracy, and attention span for memorizing or recognizing a pattern, face, or landmarks, can deteriorate with advancing age.

More frequently than one might imagine, people experience cognitive failure (CF), sometimes known as "brain farts"⁽⁶⁾. People frequently need to catch up on what they are looking for after entering a room or opening a cabinet. Cognitive decline can affect both healthy adults and the elderly because memory recall is so important⁽⁷⁾. Cognitive control, which is described as the capacity to direct the processing of activities and behavior, actively maintaining goals, making judgments, and making modifications when and where necessary⁽⁸⁾, is likely the cause of CF. Theoretically, all forms of memory processing may be influenced by this lack of cognitive control. Daily cognitive failure has also been shown to differ from person to person⁽⁹⁾.

Strong evidence for cultural differences in our memory processes has been found in terms of the social environment in which people have grown up and communicate⁽¹⁰⁾. It has an impact on how we observe, record, and later recall particular experiences⁽¹⁰⁾. Another study indicated that people from Western cultures tend to memorize things that are self-relevant and object-based, while people from Eastern cultures tend to memorize things that are more contextual and group-relevant⁽¹¹⁾.

The present study

The different types of memory and their effective operation are crucial elements for achieving successful life functioning. Working memory, prospective memory, retrospective memory, and everyday memory functions can all deteriorate over time, which can lead to cognitive deficiencies that could have a significant impact on how we live our lives. Previous studies⁽¹⁰⁻¹¹⁾ have shown the importance of cultural influences in determining an individual's memory capabilities and propensities for forgetfulness. The extent to which deficits in episodic memory (EM), prospective memory (PM), and retrospective memory (RM) serve as predictive indicators of cognitive failure (CF) in the context of the Bangladeshi community must thus be investigated.

A better understanding of these results will provide insightful information on the relationship between the deficiencies of PM, RM, and EM and the manifestation of CF, as well as the extent of their contributing factors. Additionally, it will help us determine

whether real-world occurrences of memory-related difficulties are substantively relevant to cognitive difficulties. Understanding how various aspects of memory affect CF will help to clarify the underlying mechanisms leading to cognitive errors and will open up opportunities for cross-cultural comparison studies.

Furthermore, this investigation delves into the gender disparities within the domains of PM, RM, EM, and CF. The present study is particularly interesting since it allows for the identification of differences across different age cohorts as well as gender distinctions. It makes it easier to recognize which age groups are most likely to experience recurrent cases of CF. It also has the potential to contribute to the advancement of the rapidly developing field of advanced memory and cognitive dysfunction research.

Materials and Methods

Participants and Design

For the present cross-sectional survey research 352 adults were recruited by purposive and snowball sampling methods. The study had three distinct age groups- young adults (YA) aged between 18-35 years, middle-aged adults (MA) aged between 35-55, and older adults (OA) aged between 55-65 years old. They all fulfilled the minimum school education completion criteria to be one of the participants in the study.

Measuring Instruments

Demographic Questionnaire

Data for the present study were collected via Google form and hard copy distribution of the questionnaire wherever suitable. The questionnaire package included a demographic information questionnaire asking about respondents' age, gender, educational level, and socioeconomic status and the Prospective and Retrospective Memory Questionnaire, Everyday Memory Questionnaire, and Cognitive Failure Questionnaire. It took around thirty minutes to complete the full questionnaire.

Prospective and Retrospective Memory Questionnaire (PRMQ)

The PRMQ was originally developed to measure prospective and retrospective memory failures of daily life⁽¹²⁾. This sixteen-item scale was a five-point Likert scale (never= 1 to very often= 5) having two subscales each comprising eight items for measuring prospective and retrospective memory failures respectively. The PRMQ yielded a Cronbach's alpha of 0.89 among non-clinical population⁽¹³⁾. The scale was translated into Bangla for the present study. Cronbach Alpha of the present study population was 0.909 (N=240) for the PRMQ.

Everyday Memory Questionnaire (EMQ)

The EMQ is a 28-item nine-point Likert scale for measuring memory failures, and lapses relating to daily life activities over the last three months⁽¹⁴⁾. The score ranged from 0= not at all to 8= more than once a day. This scale was translated into Bangla for the present study. The present study yielded a very high Cronbach Alpha of 0.975 (N=240) for the EMQ.

Cognitive Failure Questionnaire (CFQ)

The CFQ is a standardized 25-item self-report instrument for measuring attention, perceptual failures, etc., within the last six months⁽¹⁵⁾. Participants responded on a five-point Likert scale (0= never to 4= very often). It yielded a reliability coefficient range of .76 to .86 while administered to the adult population⁽¹⁶⁾. The scale was translated into Bangla for the present study. For the present study population, Cronbach Alpha was 0.947 (N=240). Here, a higher score indicates an increasing rate of subjective cognitive failure.

Statistical Analyses

SPSS Version 23 (IBM SPSS) was used in data analyses. The obtained data were analyzed using an independent sample t-test, Pearson product-moment correlation coefficients, one-way ANOVA, and multiple regression.

Results and Discussion

An Independent-sample t-test revealed that females exhibited higher scores on prospective memory failures ($M= 21.55$, $SD= 6.53$) compared to males ($M= 17.52$, $SD= 5.39$) having a statistically significant difference (Table 1). In retrospective memory also, females and males showed a statistically significant difference between females and males while females exhibited higher RM failures ($M= 19.63$, $SD= 6.26$) compared to their counterparts ($M= 15.43$, $SD= 4.87$). Significant gender differences were found in everyday memory failures, where females ($M= 78.93$, $SD= 51.20$) had a higher score than males ($M= 46.75$, $SD= 39.09$). Furthermore, in the cognitive failure aspect, similar results were found for females having higher scores ($M= 40.86$, $SD= 19.03$) than males ($M= 25.66$, $SD= 16.21$).

Pearson Product Moment Correlation was conducted to investigate the relationship among prospective, retrospective, everyday memory, and cognitive failure (Table 2). Prospective and retrospective memory were significantly positively correlated with everyday memory and cognitive failure ($r= 0.77$ and 0.78 , $p < .01$), respectively. Additionally, a highly significant positive correlation was found between everyday memory and cognitive failure ($r= 0.81$, $p < 0.01$). Furthermore, prospective memory, retrospective memory, and everyday memory also showed significant positive correlations among them.

Table 1. Mean comparison of the male and female among PM, RM, EM, and CF (male n=176, female n=176)

Variables	Male		Female		T
	M	SD	M	SD	
PM	17.52	5.39	21.55	6.53	-6.31***
RM	15.43	4.87	19.63	6.26	-7.01***
EM	46.75	39.09	78.93	51.20	-6.69***
CF	25.66	16.21	40.86	19.03	-8.06***

Note: PM: Prospective memory, RM: Retrospective memory, EM: Everyday memory, CF: Cognitive failures. *** $p < 0.001$

Table 2. Pearson product-moment correlations among PM, RM, PRM, EM, and CF (N=352)

Variables	MD	SD	1	2	3	4	5
PM	19.53	6.31	-				
RM	17.53	5.98	0.87**	-			
PRM	37.07	11.90	0.96**	0.96**	-		
EM	62.84	47.85	0.74**	0.76**	0.77**	-	
CF	33.26	19.22	0.76**	0.74**	0.78**	0.81**	-

Note: PM: Prospective memory, RM: Retrospective memory, PRM: Prospective and Retrospective memory, EM: Everyday memory, CF: Cognitive failures. (** $p < .01$).

Table 3. Regression analysis of PM, RM, PRM, EM on CF (N=352)

Variables	B	95% CI		SE	β	R^2	Adjuste	F
		LB	UB					
CF	-2.79	-6.78	1.19	2.02	0.72	21	0.72	299.62***
PM	0.94	0.58	1.30	0.18	0.31***			
RM	0.25	-0.13	0.64	0.19	0.07			
EM	0.20	0.17	0.24	0.01	0.52***			

Note: PM: Prospective memory, RM: Retrospective memory, EM: Everyday memory, CF: Cognitive failures, PRM: Prospective and Retrospective memory. (** $p < 0.001$).

Researchers employed multiple regression to assess the impact of PM, RM, and EM failure on CF. Results from Table 3 depict that prospective, retrospective, and everyday memory failure can predict cognitive failure (Adjusted $R^2=.718$, $F_{(3, 348)} = 299.62$, $p < 0.001$). This model stated that CF can be predicted in 71.8% of cases due to PM, RM, and EM. Prospective and everyday memory failure were the two prominent predictors of cognitive failure, with β values of 0.311 and 0.521, respectively. The positive slope of prospective memory ($B=0.947$), retrospective memory ($B=.251$), and everyday memory ($B=0.209$) as predictors of cognitive failure indicated a 0.95, 0.25, and 0.21 increase in cognitive failure for each one-point increase in prospective and everyday memory failure. In other words, cognitive failure tends to increase as prospective, retrospective, and everyday memory failure increases. The multicollinearity was also tested during this regression analysis, and VIF values of prospective memory = 4.50, retrospective memory = 4.73, and everyday memory = 2.55 were found. These values are less than 5, suggesting that there were no multicollinearity symptoms for this dataset.

Next, researchers conducted one-way ANOVA to determine the impact of age group on PM, RM, EM, and CF (Table 4). ANOVA showed a significant difference in age groups for the PM, $F_{(2,349)} = 8.17$, $p < 0.001$; the RM $F_{(2, 349)} = 17.83$, $p < .001$, the EM, $F_{(2, 349)} = 38.08$, $p < 0.001$, and the CF, $F_{(2, 349)} = 14.57$, $p < 0.001$.

Post hoc analysis (Tukey test) shows that middle-aged adults (35 - 55 years) performed best in all four categories (PM, RM, EM, and CF). The lower mean of middle-aged adults in the PM, RM, EM, and CF categories indicates better performance of respective memory (Table 4). Next, in comparison between young adults and older adults, younger adults (18–35) scored better than older adults but lower than middle-aged adults in all four categories (PM, RM, EM, and CF).

Table 4. Mean and SD of PM, RM, EM, and CF across three different age groups (N=352)

		Age Groups		
		Young Adults (YA) 18-35 (n = 140)	Middle Aged (MA) 35-55 (n = 118)	Older Adults (OA) 55-65 (n = 94)
PM	<i>M</i>	19.41	18.09	21.54
	<i>SD</i>	6.75	5.74	5.83
RM	<i>M</i>	17.17	15.71	20.37
	<i>SD</i>	6.09	5.15	5.81
EM	<i>M</i>	56.47	44.55	95.27
	<i>SD</i>	43.86	39.92	47.05
CF	<i>M</i>	33.52	26.97	40.78
	<i>SD</i>	19.27	18.36	17.54

Note: PM: Prospective memory, RM: Retrospective memory, PRM: Prospective and Retrospective memory, EM: Everyday memory, CF: Cognitive failures.

The main objective of our current study is to assess if retrospective memory (RM), prospective memory (PM), and everyday memory (EM) are positively associated with cognitive failure (CF). The model depicts that failure of the recollection of everyday memory (EM) and prospective memory (PM) mainly constitutes cognitive failure, unlike retrospective memory (RM). However, the non-significant impact of RM on cognitive failure needs to be explained here. Event-specific memories, which people cannot recall, still impact the formation of concepts or schema. Since the schema is the accumulation of experiences received from environments, memories are accumulated into the schema, gradually changing individuals' concepts and decision-making⁽¹⁷⁾. Here, researchers found no significant impact of retrospective memory failure on cognitive failure. Because, in many cases, memories of past events are associated with some related events. According to retrieval failure theory, recalling one clue leads us to recall related memories. So, the long-term memories associated with contexts and schema are less susceptible to forgetting. Consequently, the direct impact of retrospective memory failure is not evident in immediate cognitive failure because RM does not always impact CF directly. However, a more detailed investigation is needed to understand the strength of retrospective memory compared to prospective and everyday memory.

The next objective was to understand the gender difference in retrieving RM, PM, EM, and cognitive failure. The current study findings show a consistent pattern of memory recall, with females performing overall better than males. Mean shows that female participants surpassed male participants in the retrieval of RM, and PM. These findings are consistent with some memory studies where female participants outperformed male participants⁽¹⁸⁾, and women showed higher amounts of memory recall ability than men⁽¹⁹⁾. However, it is worth noting that the mean of cognitive failure (CF) was significantly higher in females than males. So, although females perform better in RM, PM, and EM retrieval overall, they are more affected by cognitive failure than males. This finding also needs further investigation using objective materials, considering possible mediating variables such as age, societal stress, cultural impact, etc.

The last objective was to determine the impact of age group on RM, PM, EM, and CF. Findings suggest that younger adults did better than older adults in RM, PM, and EM. Additionally, older adults had higher cognitive failure than younger adults. However, the comparison of three age groups shows that middle-aged adults outperformed younger and older adults. This finding also made the study more interesting. Previous memory studies found better memory recall in young adults than middle-aged adults and older adults, which is contrary to the current findings⁽²⁰⁾. However, it was also recommended that the memory recall process of middle-aged people be investigated rigorously⁽²¹⁾. Here, it is evident that there is something else other than the age factor that benefits middle-aged people.

As we mentioned before, there are very few studies where researchers considered middle-aged adults as a separate category to understand the memory mechanism. From the

previous memory studies, we can explain that better memory recall in middle-aged adults could be related to experience and well-formed schema of our surroundings. During middle age, individuals' careers and goals get settled, and our achievement curve usually reaches its peak. Middle-aged people generate a relatively stable idea of their lives and surroundings that helps them to form more crystal intelligence, which comes with experience, time, and learning. Those might make them more confident and proficient in their relevant field. On the contrary, old age is related to several memory-related issues along with physical complaints. Researchers show a decreasing pattern in memory recall ability from young to old age⁽²²⁻²³⁾. Previous studies show that age-related memory deficits usually start in old age among healthy adults.

One of our study's strengths is using the Bangladeshi population. The participants of memory studies were mainly derived from Western and Northern countries. There are very few memory studies conducted in South Asian countries that address the retrieval rate of RM, PM, EM, and CF together in a single paradigm. It is crucial to take into account the variations in familial and societal structures in South Asian nations in comparison with Western societies, not only in terms of lifestyle but also living arrangements⁽²⁴⁾, which can affect life experiences and memory formation profoundly. Such intriguing results on gender differences and age groups from a South Asian country establish the demand for a comparative study using culturally unbiased test equipment.

There are a few limitations of this study. Researchers only collected data on RM, PM, EM, and CF using self-report questionnaires. However, this process alone is not enough to reach a confirmed conclusion. We recommend further investigation using experimental manipulation and brain imaging techniques to precisely assess the self-report data's accuracy. Future research could examine other factors that might potentially contribute to the cognitive failure. Additionally, repeated measurement design should be attempted to determine the nature and direction of the relationships between memory types and cognitive failures, considering the increasing effect of age.

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