

Emotion and memory across ages: recognition performance and false memory susceptibility

Abdul Awal and Mollika Roy*

Department of Psychology, University of Dhaka, Dhaka-1000, Bangladesh

Keywords: Positive emotion, Negative emotion, False memory, Age group, Recognition performance

Abstract

Aging is a core component of lifespan development that affects different segments of cognitive functioning, including memory, learning, emotion regulation, etc. Current study aimed to examine the influence of age on emotion-related memory recognition and susceptibility to false memories. Guided by socio-emotional selectivity theory and fuzzy-trace theory, the research aimed to assess age-related variances in the retrieval of emotion related memories and the recognition of positive and negative emotion associated false memories. A total of 147 Bangladeshi participants, categorized into young adults, middle-aged adults, and older adults, were recruited through purposive sampling. Participants completed a word recognition task featuring positive and negative emotional words. Results from a one-way ANOVA revealed significant age differences in emotional memory performance ($p < .05$), with older adults demonstrating enhanced recognition of positive stimuli, consistent with the positivity effect. In addition, older adults showed higher rates of emotional false memories compared to younger and middle-aged groups. These findings suggest that emotional valence influences memory accuracy differently across age groups, reflecting age-related shifts in cognitive-emotional priorities. By extending this line of research to a non-Western context, the study contributes to a more culturally inclusive understanding of emotional memory and cognitive aging.

Introduction

Memory is the cognitive process that encodes and stores experiences and allows individuals to retrieve information to apply in present or future context (Anderson & Neely, 1996). Experiences that are personal or context-dependent are stored in episodic memory, a subtype of long-term memory. In episodic memory where individuals personally experienced events that occurred in time and place are stored with individuals' sensory and emotional details; here, cognitive state provides a context for the information to be remembered (Tulving, 1983). A number of episodic memories are associated with different

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

kinds of emotions because sensory-motor experiences are encoded along with contextual and emotional cues, which strengthen memory traces through embodied cognition (Barsalou, 2008).

Emotion can be referred as a neural reaction, that is, a perception-based response of objects or events (Bechara & Damasio, 2005). Emotional memories are often more vivid, durable, and resistant to forgetting than neutral memories, because emotion activates the amygdala, which works with the hippocampus to strengthen memory consolidation (McGaugh, 2013). On the other hand, neutral memories are often less detailed, less prioritized, and more, prone to forgetting we don't focus on the context detail due to the regular texture of the memory (Kensinger, 2009).

Previous studies (Dolcos et al., 2017; Hamann, 2001) show that information related to emotional experience is recalled more easily than neutral information. This benefit of emotional content is labelled as *emotional enhancement of memory* and has been conclusively shown in both young and older adults (Kensinger & Schacter, 2008). Emotional information is built on two key dimensions, *arousal* (a spectrum that ranges from tranquility to excitement) and *valence* (a continuum that differs from negative to positive, with neutral point as a middle ground). Study suggests that in divided attention situation the emotional arousal triggers the amygdala-hippocampal network, which leads to automatic and better memory consolidation (Kensinger & Corkin, 2004). On the other hand, memory enhancement for valence depends on the prefrontal cortex-hippocampal network and controlled attention-dependent processing. Further study findings suggest that arousal and valence create two ways of emotional memory enhancement: (i) arousal strengthens memories automatically through physiological activation, and (ii) valence influences memory through deliberate cognitive processes. Focusing on the impact of age on processing of emotional memory, older adults show better emotional regulation than younger adults; and older adults exhibit more refined emotional regulation strategies which contribute to heightened well-being (Burr et al., 2021). Effective emotion regulation enhances recall and reduces emotional distress during encoding which allows better attention and deeper processing of experiences (Gross, 2015). However, study revealed that emotion narrows attention to the central details, which potentially leads to a discount in memory for peripheral information or context details (Christianson, 1992).

Among a few crucial properties of Emotion, it is usually characterized in positive or negative categories, which are termed *positive valence* and *negative valence*, respectively. Study mentioned that older adults prioritize positive over negative information processing. In contrast to young people, they pay more attention to recall positive information than negative information (Fairfield et al., 2022). This positivity bias highlights positive stimuli to be better retrieved (Reed et al., 2014). The Socioemotional Selectivity Theory (SST) explains this positivity bias, suggesting that as people perceive their remaining time frame as restricted, they focus on emotionally meaningful aims and experiences. This motivational switch leads the older adults to pay attention on positive events rather than

negative events and regulate emotions more effectively (Carstensen, 1999). Further studies (Simon, 2023; Martins, 2018) support this theory and shows that older adults focus more on emotionally meaningful goals and exhibit superior emotional regulation. Older adults' strong emotion regulation ability contributes to emotional stability and helps to retain meaningful positive memories by reducing negative recall (Burr et al., 2021).

Although older adults have enhanced emotion regulation, they are also more susceptible to false memories, particularly associative false memories (Dennis et al., 2008). False memory refers to the phenomenon where an individual recalls and recognizes an event or information that did not occur in reality (Loftus, 1997). Numerous memory researchers have investigated the phenomenon of false memory, indicating that susceptibility to such distortions increases with age. This heightened vulnerability has been attributed to age-related cognitive decline as well as alterations in neural processing mechanisms (Koutstaal & Schacter, 1997; Norman & Schacter, 1997; Rankin & Kausler, 1979). Although older adults encode and retrieve emotional information more accurately, they are also susceptible to false memories. The reconstructive nature of memory for emotional content makes them susceptible to false memories (Schacter & Addis, 2007). Emotional contents are more likely to be remembered due to their distinctiveness. However, the salience of emotional content can overshadow currently presented neutral information, leading to impaired recall of non-emotional material. Taken together, this evidence suggests that emotional content may enhance retrieval accuracy while also appearing to reduce the likelihood of false recognition (Schmidt, 2007).

Nevertheless, contrasting findings have been reported in the literature, with study suggesting that emotional content may actually increase susceptibility to false memory recognition and this highlights the dualistic role of emotion in memory processes (Windmann & Kutas, 2001). Emotion induced an attention bias that increases the false recognition of emotional content particularly positive contents (Brainerd et al., 2008). Individuals often use emotion as an organizing factor when categorizing conceptually related items. While such conceptual relatedness can facilitate organization, it may also lead to memory confusion, thereby increasing the likelihood of false recognition for non-studied emotional items (Bower, 1981). Moreover, although emotional arousal may strengthen memory for central details, it can simultaneously promote memory distortions through increased associative activation (Talmi et al., 2007).

Current study

Building on the understanding of emotion's multifaceted and contradictory role in memory processes, research suggests that emotion can influence memory representations by either inhibiting or enhancing contextual details (Loftus, 1997). Empirical findings are mixed, indicating that both effects are possible. Emotional arousal has been found to strengthen memory encoding (Kensinger & Corkin, 2004) and in addition to that, as age influences memory functioning, with increasing age, individuals start to prioritize favoring

positive information and regulate emotions as an adaptive strategy rather than a cognitive decline (Charles et al., 2003). However, other study suggests that it may also increase susceptibility to false memories (Brainerd et al., 2008). So, emotional valence and age interact to influence both accurate and false memory performance. Notably, relatively few studies have investigated how emotion simultaneously affects both true and false memories, leaving a significant gap in understanding how emotional processing impacts overall memory accuracy. Though a substantial body of research has been conducted in Western contexts, there is a notable lack of empirical studies examining these relationships within non-Western populations, particularly in Bangladesh. Cultural differences may influence memory during encoding and retrieval, and therefore, it is essential to investigate whether the findings regarding emotional memory and false memory can be generalized in the Bangladeshi context. Furthermore, examining age-related differences across younger, middle-aged, and older adults can provide a more comprehensive understanding of developmental trends in memory processes within this population and will enrich researches in the domain of emotional memory and aging. From a practical standpoint, understanding the interaction between emotional memory, false memory, and age has important implications for various applied settings. In a forensic context, particularly when evaluating eyewitness testimony, emotional events are not always recalled accurately, and age differences in susceptibility to false memory may affect the reliability of testimony. To improve the reliability of eyewitness testimony, study findings can assist professionals in developing age-appropriate interview techniques. Insights on age-related differences in emotional memory processing can help educators develop strategies that improve both retention and accuracy of learned material. Understanding how emotional memory processes across age groups may help clinicians to improve age-related interventions aimed at emotional regulation and reducing cognitive distortions.

Understanding how memory processing changes across the lifespan is critical for both theoretical and applied research. Emotional memory and false memory are central to understanding everyday functioning. This influences decision-making, social interactions, and the reliability of autobiographical memory recall. Age-related differences in memory performance may reflect broader changes in cognitive and emotional processing, including attentional allocation, executive functioning, and neural mechanisms underlying memory encoding and retrieval. The current study aims to address gaps in the literature regarding how emotional content modifies memory recall accuracy at different stages of adulthood, by examining the interplay between age, emotional memory, and susceptibility to false memories. Such insights can inform interventions to support cognitive and emotional well-being in aging populations and contribute to models of lifespan cognitive development. To investigate the complex relationship among age, emotional memory, and false memory, this study has formulated four primary objectives. First, the study aims to examine whether different age groups show significant differences in emotional memory retrieval. Second, we intended to understand the effect of age during the retrieval of positive and negative

emotional stimuli. Third, the study assesses the impact of age on the recognition of emotion related false memories. Finally, it explores whether age influences the retrieval of false memories associated with positive and negative emotional content.

Materials and Methods

Participants and Design

Current research employed a cross-sectional mixed factorial design. Age groups were treated as between-subject factor and emotional valence served as within-subject factor. A total of 147 healthy adults (no indications of significant mental or neurological conditions) were recruited from three age groups (49 participants in each group). Participants were recruited by employing purposive sampling based on predefined age group criteria by using community-based convenience method. Age groups were determined based on *Life span developmental theory*: young adult group (18-40 years), middle-aged adult group (41-60 years), and older adult group (61 years and above) (Baltes et al., 1998). The calculated sample size was 144 with a moderate effect size of ($f = .30$), $\alpha = .05$ and power = .90 by using G* Power software (Faul et al., 2007).

Ethical Clearance

The ethical clearance was obtained from the Ethics Review Committee of the Department of Psychology, University of Dhaka (Approval Code: PSY25/05/065). Informed consent was obtained from all participants to ensure voluntary participation and adherence to ethical research standards.

Measuring Instrument

Two word lists were employed in this study. List A consisted of 32 words, including 16 emotional words—8 associated with positive emotions and 8 associated with negative emotions—and 16 neutral words. The neutral words were included to balance the presentation of emotional stimuli and control for potential biases in participants' responses.

There were 64 words in List B, where 32 words were the same as List A and the rest 32 words were also emotional and neutral words but different from List A. Selected words were collected from *Affective Norms for English Words (ANEW)*, which provides the emotional ratings for different categories of English words (Bradley & Lang, 1999). Each word in ANEW has been rated by participants on three key extents: emotional valence, dominance, and arousal. In ANEW, words are rated on a 1 to 9-point rating scale ranging from *extremely negative* to *extremely exciting*. Words rated higher than 5 in the valence scale are positive words, and negative words are rated lower than 5 in the valence scale. Neutral words are used to create a balance in the arrangement of the words. A pilot test was conducted in two stages on ANEW to test the validity of emotional valence ratings in accordance with cultural relevance to the Bangladeshi community. In the first stage, participants were instructed to rate each word according to their perceived emotional

valence from positive to negative on a rating scale (Likert scale) from 1 to 5. In the second phase participants were asked to label those words highly positive to highly negative. Words which were found highly positive and negative and consistent with the valence ratings were retained for use to the main study.

Apparatus

An ASUSX509J series laptop was used equipped with Windows-11 generation operating system, Intel Core I:3 processor and 4 GB of RAM. Stimuli were presented on a 15.6-inch display with a 1920×1080-pixel resolution, a 60 Hz refresh rate, and a white background, displayed in Times New Roman font (24-pt). Participants were seated approximately 50-60 cm from the screen and they gave their responses by using laptop keyboard.

Procedure

Participants were recruited through flyers circulated on social media and posted within the university residence. Interested individuals were subsequently contacted and invited to the Psychology Department laboratory to participate in the study. Each session was conducted individually. At the beginning of the session, participants were given written and verbal instruction of the study. Next we gave a them form to read and sign, confirming their voluntary participation. Finally, participants received both verbal and written instructions detailing the tasks they were required to perform.

There were two phases in this study. In the first phase, respondents were stated that, a few words would appear on the computer screen. Each word would be on the screen for two seconds. After finishing the whole list, they were given a 5-minute break. They performed a distraction task (drawing anything objects from a given list. They can choose one from two given options- village hut, and rainy day. The distraction task was performed to stop them from rehearsing the words. In the second phase, participants were shown the words from the second list in a randomized order, with each word displayed for two seconds. Participants' task was to indicate which of these words they had seen in the previous phase. Responses were made using the keyboard: the left arrow key indicated 'not seen,' and the right arrow key indicated 'seen.' Participants were instructed to respond immediately upon seeing each word. The presentation of word lists and response recording were employed using PsychoPy (version 2024.2; Pierce et al., 2019).

Results and Discussion

Statistical Analysis

The assumption of normality was assessed using the Shapiro-Wilk test for all six variables. The results indicated that emotional word, emotional false memory, positive word and negative word did not significantly deviate from normality ($W = .93, p = .06$; $W = .91, p = .08$; $W = .97, p = .08$; $W = .94, p = .08$), while positive and negative false memory

showed minor violations ($W = .50, p = .04$; $W = .42, p = .04$). However, visual inspection of Q-Q plots suggested that deviations were not substantial, and therefore parametric analyses were considered appropriate. All four study objectives were assessed by conducting one-way ANOVA and post hoc (Bonferroni test) comparison to examine the mean differences among the three age groups for each research objective and a 3 (Age group: young, middle-aged, older adults) $\times$ 2 (Emotional valence: positive and negative) mixed-method ANOVA was conducted to see the emotional valence $\times$ age-group interaction effect. We conducted the data analyses using SPSS software (Version 29). The main factor was age group which had three levels (young adult, middle-aged adult and older adult) and the dependent variables were recognition of emotional words, types of emotion, and false memory recognition.

Referring to the first objective, one-way ANOVA was conducted and the result showed that there is a significant impact of age on the retrieval of emotional words $F(2,144) = 10.71, p < .001, \eta^2p = .13, 95\% \text{ CI} (.04, .23)$, (Table 1). The accuracy of emotional word recognition was highest for older adult group ($M = 11.41, SD = 1.84$), followed by young adults ($M = 10.55, SD = 1.57$), and middle-aged adults ($M = 9.94, SD = 1.28$), respectively (Figure 1).

Table 1. One-way ANOVA results for emotional memory across age groups

	df	Mean Square	<i>F</i>	<i>P</i>	η^2p
Between Groups	2	26.694	10.714	< .001	.13
Within Groups	144	2.491			

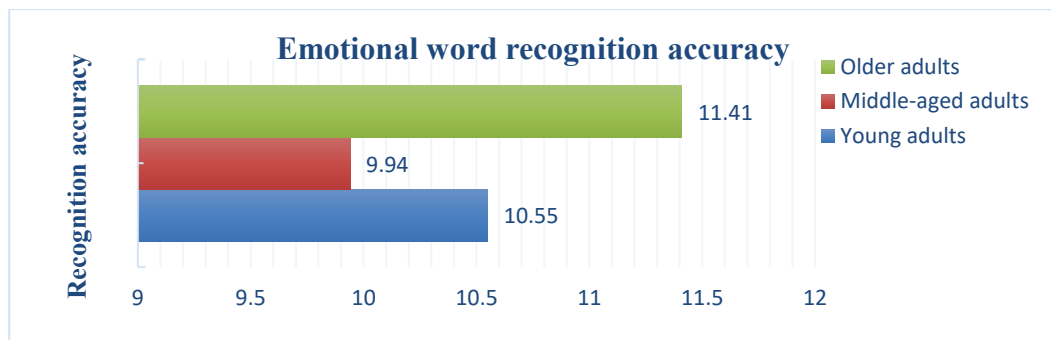


Fig. 1. Emotional word recognition across three age groups (young adults, middle-aged adults and older adults).

Table 2. Multiple comparisons of emotional words across age groups

Dependent Variable	Age group	Age group	Mean difference	SE	<i>p</i>
Emotional word	Young adult	Middle-aged adult	.612	.319	.171
		Older adult	-.857*	.319	.024
	Middle-aged adult	Young adult	-.612	.319	.171
		Older adult	-1.469*	.319	.001
	Older adult	Young adult	.857*	.319	.024
		Middle-aged adult	1.469*	.319	.001

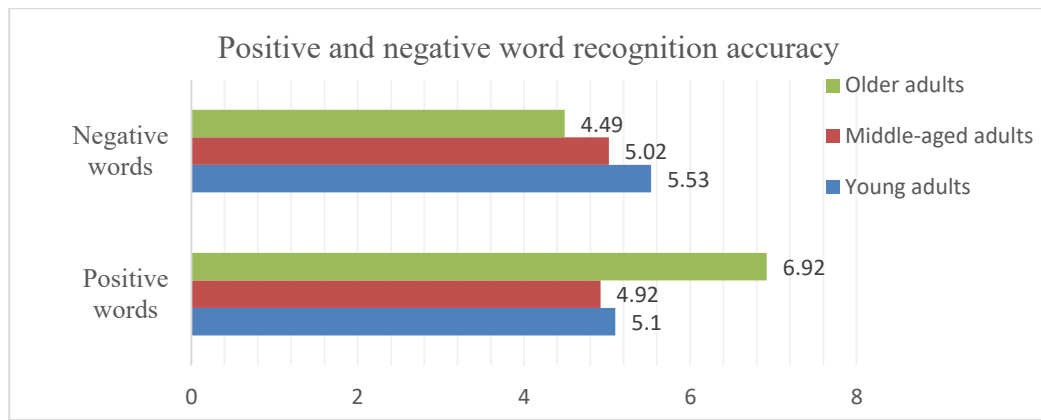
We conducted post hoc comparisons using the Bonferroni correction, which revealed that older adults significantly outperformed which both young and middle-aged adults in recognizing emotional words. The difference between older and middle-aged adults was particularly pronounced ($MD = 1.469$, $SE = .319$, $p = .001$), indicating a stronger group effect compared to the difference between older and younger adults ($MD = .857$, $SE = .319$, $p = .024$). There was no significant difference between younger and middle-aged adults ($MD = .612$, $SE = .319$, $p = .171$), (Table 2).

The first finding of this study corresponds to the first objective indicates that age has a significant effect on emotional memory recognition. The current study findings show that age groups have a significant impact on emotional memory retrieval where older adults recognized more emotional words than younger and middle-aged adults. People start to give more priority to recognize emotional information as their age increases. During emotion regulation, emotional stimuli tend to capture attention more readily than neutral stimuli, reflecting the brain's inherent tendency to prioritize emotionally salient cues in the environment (Öhman et al., 2001). Here, the amygdala plays an important role in emotional information processing of the brain which leads to stronger emotional memory encoding and retrieval (Murty et al., 2010). These findings imply that older adults employ more refined emotional regulation strategies during the encoding and retrieval of emotional memory, which enables them to recall more emotional content than younger adults (Burr et al., 2021).

Regarding the second objective, a one-way ANOVA was conducted, which revealed a significant effect of age on the retrieval of both positive words, $F(2,144) = 21.460$, $p = .001$, $\eta^2p = .22$, 95% CI (.12, .34); and negative words, $F(2,144) = 4.409$, $p = .014$, $\eta^2p = .05$, 95% CI (.01, .14), (Table 3).

Table 3. One-way ANOVA results for positive and negative memories across age groups

		df	Mean Square	<i>F</i>	<i>p</i>	<i>n</i> ² <i>p</i>
Positive memory	Between groups	2	59.884	21.460	.001	.22
	Within groups	144	2.791			
Negative memory	Between groups	2	13.272	4.409	.014	.05
	Within groups	144	3.010			

**Fig. 2.** Positive and negative word recognition across three age groups (young adults, middle-aged adults and older adults).**Table 4. Multiple comparisons of positive and negative emotional memory recognition across age groups**

Dependent Variable	Age group	Age group	Mean difference	<i>SE</i>	<i>p</i>
Positive word	Young adult	Middle-aged adult	.184	.337	1.00
		Older adult	-1.816	.337	.01
	Middle-aged adult	Young adult	-.184	.337	1.00
		Older adult	-2.000*	.337	.01
	Older adult	Young adult	1.816*	.337	.01
		Middle-aged adult	2.000*	.337	.01
Negative word	Young adult	Middle-aged adult	.510	.351	.44
		Older adult	1.041*	.351	.01
	Middle-aged adult	Young adult	-.510	.351	.44
		Older adult	.531	.351	.39
	Older adult	Young adult	-1.041*	.351	.01
		Middle-aged adult	-.531	.351	.39

Table 5. Mixed-method ANOVA results for positive and negative memories across age groups

Source	Sum Squares	df	<i>F</i>	<i>p</i>	<i>n</i> ² <i>p</i>
Emotional valence	29.418	1	6.436	.012	.043
Emotional valence × Age group	119.837	2	13.108	.001	.154
Error (Emotional valence)	658.24	144	4.571		

**Note. Greenhouse-Geisser correction applied

The results indicate that, for positive word retrieval, older adults outperformed ($M = 6.92$, $SD = 1.55$) young adults ($M = 5.10$, $SD = 1.82$), whereas middle-aged adults ($M = 4.92$, $SD = 1.631$) had the lowest score (Figure 2). An opposite scenario was revealed in negative emotional word retrieval- younger adults ($M = 5.53$, $SD = 1.927$) outperformed middle-aged adults ($M = 5.02$, $SD = 1.887$), with older adults ($M = 4.49$, $SD = 1.325$) demonstrating the lowest mean score (Figure 2). Post hoc comparisons using Bonferroni correction revealed that, for positive word recognition, older adults differed significantly from younger adults ($MD = 1.816$, $SE = .337$, $p = .01$) and from middle-aged adults ($MD = 2.000$, $SE = .337$, $p = .01$). For negative word recognition, a significant difference was observed between older and younger adults ($MD = -1.041$, $SE = 0.351$, $p = .01$) (Table 4). Mixed ANOVA revealed a significant main effect of emotional valence suggesting that memory performance varied according to emotional content (positive and negative) stimuli $F(1,144) = 6.436$, $p = .012$, $n^2p = .043$, 95% CI (.002, .124); and the interaction between *emotional-valence* × *age-group* revealed a significant main effect indicating that emotional valence differed across age groups $F(2,144) = 13.108$, $p < .001$, $n^2p = .154$, 95% CI (.056, .258), (Table 5).

The second objective was to understand the influence of age on positive and negative emotional memory retrieval. The finding of current study shows a significant impact of different age groups on positive and negative emotion retrieval. Older adults recognize positive information more than younger and middle-aged adults and scored lowest in negative information retrieval. Study support this finding and suggest that, due to the positivity effect a shift from negativity bias to positivity bias that typically emerges in middle to late adulthood older adults demonstrate a stronger preference for positive over negative emotional information (Mather & Carstensen, 2005). In contrast, younger adults tend to exhibit heightened sensitivity to negative stimuli. These age-related differences reflect distinct emotional regulation strategies across the lifespan (Carstensen & Mikels, 2005). Younger adults show high attention grabbing tendency for negative information and with shifting age this attention shift from negativity bias to positivity bias. As individuals age and begin to perceive their future time as more limited, older adults tend to prioritize emotionally meaningful goals and the pursuit of well-being. In contrast, younger adults, who view their time horizons as more expansive, are more likely to prioritize goals related to knowledge acquisition, exploration, and career advancement. So, the difference in emotional prioritization between age groups is driven by motivational shifts (Carstensen et

al., 2003). Younger adults prioritize neutral or goal-relevant information to aid their long-term goals whereas older adults emphasize more on emotional information, particularly positive experiences. Additionally, increased emphasis on emotion regulation associated with deriving emotional meaning from life would result in decreased performance for negative material (Carstensen, 2006).

Addressing the 3rd objective, a one-way ANOVA revealed that there is a significant impact of age on emotional false memory recognition $F(2,144) = 5.397, p < .001, \eta^2p = .07$, 95% CI (.01, .14) (Table 6). For emotional false memory recognition, older adults ($M = .67, SD = .944$) scored the highest, followed by middle-aged adults ($M = .31, SD = .585$), and younger adults ($M = .24, SD = .480$), respectively (Figure 3).

Table 6. One-way ANOVA results for emotional false memory across age groups

	df	Mean Square	<i>F</i>	<i>P</i>	η^2p
Between Groups	2	2.633	5.397	< .001	.07
Within Groups	144	.488			

The Bonferroni correction post hoc test result showed that there is a significant mean difference between older and younger adult ($MD = .429, SE = .141, p = .009$), as well as between older adults and middle-aged adults ($MD = .061, SE = .141, p = .031$) in recognition of emotional false memory. However, there was no significant mean difference between young adult and middle-aged adult ($MD = .061, SE = .141, p = 1.00$), (Table 7).

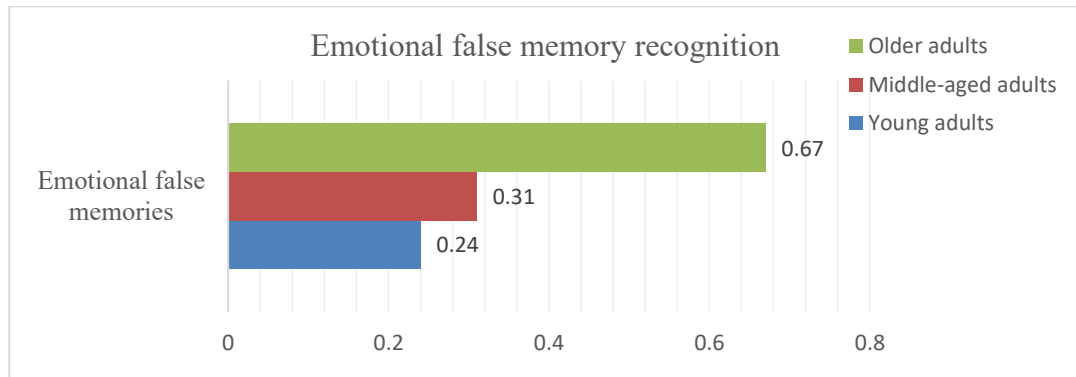
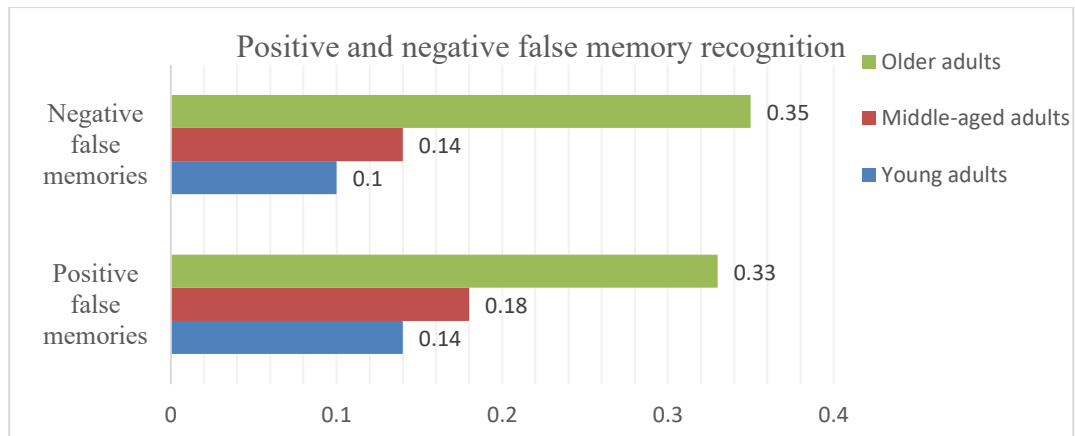


Fig. 3. Emotional false memory recognition across three age groups (younger adult, middle-aged adult and older adult).

Table 7. Multiple comparisons of emotional false memory recognition across age groups

Dependent Variable	Age group	Age group	Mean difference	SE	P
Emotional false memory	Young adult	Middle-aged adult	-.163	.141	1.000
		Older adult	-.429*	.141	.009
	Middle-aged adult	Young adult	-.163	.141	1.000
		Older adult	-.061*	.141	.031
	Older adult	Young adult	.429*	.141	.009
		Middle-aged adult	.061*	.141	.031

Referring to the third objective, current study findings highlight age-related changes that increase susceptibility to memory distortions and enhance recognition of false memories related to emotional contents (Windmann & Kutas, 2001). Memory representations can be divided into verbatim and gist traces. With increasing age, peoples' tendency to store information shift from verbatim-based to gist-based processing, contributing to differences in false memory recognition. Older adults tend to rely more on gist-based memory representations as a compensatory strategy for cognitive decline (Greene & Naveh-Benjamin, 2024). Our study findings are consistent with the *response bias effect*- the idea that enhanced conceptual similarity of emotional items can increase memory distortions and which potentially explains the aspects of emotional false information (Laney & Loftus, 2008). So emotionally arousing information increased false recognition in all three age groups but most false memory recognition was found in older adults group, consistent with aging studies (Dodson et al., 2007). Aging study also found that older adults showed more confident in false recognition of emotional contents compared to the younger adults thus supports the idea that age enhances illusory recollection (Gallo et al., 2009).

**Fig. 4.** Positive and negative false memory recognition across three age groups (younger adult, middle-aged adult and older adult).

Addressing the 4th objective, we conducted an F-test, and the results showed that there was no significant effect of age on both positive false memory recognition $F(2,144) = 2.18$, $p = .117$, $n^2p = .02$, 95% CI (.01, .09) and negative false memory recognition $F(2,144) = 3.07$, $p = .05$, $n^2p = .04$, 95% CIs (.01, .11), (Table 8). The result indicates that for positive false memory recognition, older adults ($M = .33$, $SD = .55$) recorded the highest performance, followed by middle-aged adults ($M = .18$, $SD = .44$), whereas younger adults ($M = .14$, $SD = .35$) exhibited the lowest average (Figure 4). In contrast, for negative false memory recognition, younger adults ($M = .10$, $SD = .37$) demonstrated lower scores than middle-aged adults ($M = .14$, $SD = .41$), with older adults ($M = .35$, $SD = .72$) achieving the greatest mean performance (Figure 4).

Table 8. One-way ANOVA results for positive and negative false memories across age groups

		df	Mean Square	<i>F</i>	<i>P</i>	n^2p
Positive false memory	Between groups	2	.456	2.179	.117	.02
	Within groups	144	.209			
Negative false memory	Between groups	2	.844	3.068	.05	.04
	Within groups	144	.275			

The findings of the fourth objective revealed that there was no significant impact of age on positive and negative false memory recognition. However, older adults exhibited slightly higher rates of both positive and negative false memories compared to younger and middle-aged adults. Study revealed that positive valence had a dual effect on older adults' memory performance (Piguet et al., 2008). While positive emotional content enhanced recognition rates, it also increased susceptibility to memory distortions. According to them, high salience of positive content may disrupt the memory retrieval process. So, when older adults faced conceptually related content they failed to discriminate between true memories and false memories (Brainerd et al., 2008). As a result, they recognize more false memories compared to younger and middle-aged adults. Socioemotional selectivity theory suggests that older adults are biased to positive information and this bias generally affects attention and encoding rather than getting rid of negative information from memory (Carstensen, 2021). Due to emotional salience and semantic relatedness negative stimuli are strongly encoded which increases the reliance on gist-based processing and resulting higher false recognition (Marsh & McBride, 2026). In addition to that, increasing age leads to a decline in source monitoring and inhibitory control, contributing vulnerability to negative false memories (Szöllösi et al., 2025). However, in the current study, the differences in recognition rates of positive and negative false memories across age groups were not statistically significant. One possible explanation for this finding is the relatively low mean rates of false memory recognition, which may have reduced the statistical power to detect meaningful group differences. Future research should consider increasing the sample size to achieve higher mean scores, thereby enhancing the statistical power to detect significant effects.

Findings from above studies suggest that age has a significant impact on both emotional memory retrieval and false memory recognition within similar experimental paradigms. Current study findings revealed that older adults exhibited enhanced emotional memory retrieval and a notable positivity bias which can be explained by Socioemotional selectivity theory (Carstensen et al., 2003). According to this theory as people get older, they perceive time as limited and prioritize emotion related goals. Since perceived time is correlated with chronological age, a goal related motivational shift can be seen as people move towards their adulthood. Because goals help direct cognitive resources, aging is associated with shifts in preferences, decision-making, and an increased emphasis on maximizing emotional satisfaction. Furthermore, older adults tend to show greater susceptibility to emotional false memories, which may reflect a shift toward gist-based processing with age (Carstensen, 2006). These findings will add valuable insight to the growing literature on cognitive aging and emotion processing across the lifespan. However, in the current study middle-aged adult's performance observed lower compared to younger adults, can be explained by early declines in fluid cognitive abilities which are critical for encoding and retrieval and this reflects age-related changes involving cognitive decline and shifts in motivational priorities (Salthouse, 2019). Additionally, middle adulthood represents a transitional phase in emotional regulation, not as cognitively sharp as young adults and not fully optimized in emotional regulation like older adults (Carstensen, 2021). This transition lead them to less precise verbatim encoding, more gist-based processing and potentially lower recognition accuracy. Future research should incorporate middle-aged cohorts to provide a comprehensive understanding of the developmental trajectory underlying the age-related emotional memory recognition concept.

Conclusion

Current study contains two notable limitations. First, the use of a cross-sectional design restricts the ability to draw causal inferences regarding age-related changes in memory performance. Future research employing a longitudinal or repeated-measures design would be more effective in tracking memory changes over time. Second, although emotional stimuli were selected from the Affective Norms for English Words (ANEW), linguistic differences may have influenced emotional perception and memory performance. The affective ratings in the ANEW may not fully reflect the emotional salience of words for Bangladeshi participants. Culturally validated emotional word lists are recommended for future research. Future research should incorporate comprehensive cognitive assessments to further elucidate the mechanisms underlying age-related differences in memory performance. Such findings could inform the development of age-sensitive strategies aimed at enhancing recall and recognition accuracy while reducing susceptibility to false memories. This knowledge may also have practical applications in clinical settings, particularly in tailoring treatment plans for older adults by accounting for cognitive and emotional memory processes.

Authors' Contribution

Abdul Awal was responsible for identifying the research gap, designing the test, conducting the assessment, performing the data analysis, and drafting the manuscript. **Mollika Roy** contributed to study conceptualization, developing the test framework, the standardization of materials, experimental procedures, statistical guidance, critical revisions and the final review of the manuscript.

References

- Anderson, M. C., & Neely, J. H. (1996). Interference and inhibition in memory retrieval. In E. L. Bjork & R. A. Bjork (Eds.), *Memory: Handbook of perception and cognition* (2nd ed., pp. 237–313). Academic Press.
- Baltes, P. B., Lindenberger, U., & Staudinger, U. M. (1998). Life-span theory in developmental psychology. In *Handbook of child psychology* (pp. 1029–1143). Wiley.
- Barsalou, L. W. (2008). Grounded cognition. *Annual Review Psychology.*, *59*(1), 617–645. <https://doi.org/10.1146/annurev.psych.59.103006.093639>
- Bechara, A., & Damasio, A. R. (2005). The somatic marker hypothesis: A neural theory of economic decision. *Games and Economic Behavior*, *52*(2), 336–372. <https://doi.org/10.1016/j.geb.2004.06.010>
- Bower, G. H. (1981). Mood and memory. *American Psychologist*, *36*(2), 129. <https://doi.org/10.1037/0003-066X.36.2.129>
- Bradley, M. M., & Lang, P. J. (1999). *Affective norms for English words (ANEW): Instruction manual and affective ratings*, *30*(1), 25–36. Technical report C-1, the center for research in psychophysiology, University of Florida.
- Brainerd, C. J., Stein, L. M., Silveira, R. A., Rohenkohl, G., & Reyna, V. F. (2008). How does negative emotion cause false memories? *Psychological Science*, *19*(9), 919–925. <https://doi.org/10.1111/j.1467-9280.2008.02177.x>
- Burr, D. A., Castrellon, J. J., Zald, D. H., & Samanez-Larkin, G. R. (2021). Emotion dynamics across adulthood in everyday life: Older adults are more emotionally stable and better at regulating desires. *Emotion*, *21*(3), 453–464. <https://doi.org/10.1037/emo0000734>
- Carstensen, L. L. (2006). The influence of a sense of time on human development. *Science*, *312*(5782), 1913–1915. <https://doi.org/10.1126/science.1127488>
- Carstensen, L. L., Fung, H. H., & Charles, S. T. (2003). Socioemotional selectivity theory and the regulation of emotion in the second half of life. *Motivation and Emotion*, *27*(2), 103–123. <https://doi.org/10.1023/A:1024569803246>
- Carstensen, L. L., & Hershfield, H. E. (2021). Beyond stereotypes: Using socioemotional selectivity theory to improve messaging to older adults. *Current Directions in Psychological Science*, *30*(4), 327–334. <https://doi.org/10.1177/09637214211011468>

- Carstensen, L. L., Isaacowitz, D. M., & Charles, S. T. (1999). Taking time seriously: A theory of socioemotional selectivity. *American Psychologist*, *54*(3), 165–181. <https://doi.org/10.1037/0003-066X.54.3.165>
- Carstensen, L. L., & Mikels, J. A. (2005). At the intersection of emotion and cognition: Aging and the positivity effect. *Current Directions in Psychological Science*, *14*(3), 117–121. <https://doi.org/10.1111/j.0963-7214.2005.00348.x>
- Charles, S. T., Mather, M., & Carstensen, L. L. (2003). Aging and emotional memory: The forgettable nature of negative images for older adults. *Journal of Experimental Psychology: General*, *132*(2), 310–324. <https://doi.org/10.1037/0096-3445.132.2.310>
- Christianson, S. Å. (1992). Emotional stress and eyewitness memory: A critical review. *Psychological Bulletin*, *112*(2), 284–309. <https://doi.org/10.1037/0033-2909.112.2.284>
- Dennis, N. A., Kim, H., & Cabeza, R. (2008). Age-related differences in brain activity during true and false memory retrieval. *Journal of Cognitive Neuroscience*, *20*(8), 1390–1402. <https://doi.org/10.1162/jocn.2008.20096>
- Dodson, C. S., Bawa, S., & Krueger, L. E. (2007). Aging, metamemory, and high-confidence errors: A misrecollection account. *Psychology and Aging*, *22*(1), 122–132. <https://doi.org/10.1037/0882-7974.22.1.122>
- Dolcos, F., Katsumi, Y., Denkova, E., Weymar, M., & Dolcos, S. (2017). Current issues and emerging directions in the impact of emotion on memory: A review of evidence from brain imaging investigations. In *Brain, Mind, and Society* (pp. 57–101). Springer. https://doi.org/10.1007/978-3-319-46812-9_3
- Fairfield, B., Padulo, C., Bortolotti, A., Perfetti, B., Mammarella, N., & Balsamo, M. (2022). Do older and younger adults prefer the positive or avoid the negative? *Brain Sciences*, *12*(3), Article 393. <https://doi.org/10.3390/brainsci12030393>
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191. <https://doi.org/10.3758/BF03193146>
- Gallo, D. A., Foster, K. T., & Johnson, E. L. (2009). Elevated false recollection of emotional pictures in young and older adults. *Psychology and Aging*, *24*(4), 981–988. <https://doi.org/10.1037/a0017025>
- Greene, N. R., & Naveh-Benjamin, M. (2024). The time course of encoding specific and gist episodic memory representations among young and older adults. *Journal of Experimental Psychology: General*, *153*(6), 1671–1697. <https://doi.org/10.1037/xge0001589>
- Gross, J. J. (2015). Emotion regulation: Current status and future prospects. *Psychological Inquiry*, *26*(1), 1–26. <https://doi.org/10.1080/1047840X.2014.940781>
- Hamann, S. (2001). Cognitive and neural mechanisms of emotional memory. *Trends in Cognitive Sciences*, *5*(9), 394–400. [https://doi.org/10.1016/S1364-6613\(00\)01707-1](https://doi.org/10.1016/S1364-6613(00)01707-1)
- Kensinger, E. A. (2009). Remembering the details: Effects of emotion. *Emotion Review*, *1*(2), 99–113. <https://doi.org/10.1177/1754073908100432>

- Kensinger, E. A., & Corkin, S. (2004). Two routes to emotional memory: Distinct neural processes for valence and arousal. *Proceedings of the National Academy of Sciences*, *101*(9), 3310–3315. <https://doi.org/10.1073/pnas.0306408101>
- Kensinger, E. A., & Schacter, D. L. (2008). Neural processes supporting young and older adults' emotional memories. *Journal of Cognitive Neuroscience*, *20*(7), 1161–1173. <https://doi.org/10.1162/jocn.2008.20080>
- Koutstaal, W., & Schacter, D. L. (1997). Gist-based false recognition of pictures in older and younger adults. *Journal of Memory and Language*, *37*(4), 555–583. <https://doi.org/10.1006/jmla.1997.2529>
- Laney, C., & Loftus, E. F. (2008). Emotional content of true and false memories. *Memory*, *16*(5), 500–516. <https://doi.org/10.1080/09658210802065955>
- Loftus, E. F. (1997). Creating false memories. *Scientific American*, *277*(3), 70–75. <https://doi.org/10.1038/scientificamerican0997-70>
- Marsh, E. M., & McBride, D. M. (2026). Comparison of emotional and neutral false memories at short- and long-term tests. *Quarterly Journal of Experimental Psychology*, *79*(4), 1050–1067. <https://doi.org/10.1177/17470218251376336>
- Martins, B., Sheppes, G., Gross, J. J., & Mather, M. (2018). Age differences in emotion regulation choice: Older adults use distraction less than younger adults in high-intensity positive contexts. *The Journals of Gerontology: Series B*, *73*(4), 603–611. <https://doi.org/10.1093/geronb/gbx065>
- Mather, M., & Carstensen, L. L. (2005). Aging and motivated cognition: The positivity effect in attention and memory. *Trends in Cognitive Sciences*, *9*(10), 496–502. <https://doi.org/10.1016/j.tics.2005.08.005>
- McGaugh, J. L. (2013). Making lasting memories: Remembering the significant. *Proceedings of the National Academy of Sciences*, *110*(Suppl. 2), 10402–10407. <https://doi.org/10.1073/pnas.1301209110>
- Murty, V. P., Ritchey, M., Adcock, R. A., & LaBar, K. S. (2010). fMRI studies of successful emotional memory encoding: A quantitative meta-analysis. *Neuropsychologia*, *48*(12), 3459–3469. <https://doi.org/10.1016/j.neuropsychologia.2010.07.030>
- Nairne, J. S. (2011). In J. S. Nairne (ed.), *The foundations of remembering: Essays in honor of Henry L. Roediger, III* (pp. 26–50). Psychology Press.
- Norman, K. A., & Schacter, D. L. (1997). False recognition in younger and older adults: Exploring the characteristics of illusory memories. *Memory & Cognition*, *25*(6), 838–848. <https://doi.org/10.3758/BF03211328>
- Öhman, A., Flykt, A., & Esteves, F. (2001). Emotion drives attention: Detecting the snake in the grass. *Journal of Experimental Psychology: General*, *130*(3), 466–478. <https://doi.org/10.1037/0096-3445.130.3.466>
- Peirce, J., Gray, J. R., Simpson, S., MacAskill, M., Höchenberger, R., Sogo, H., Kastman, E., Lindeløv, J. K., & others. (2019). PsychoPy2: Experiments in behavior made easy. *Behavior Research Methods*, *51*(1), 195–203. <https://doi.org/10.3758/s13428-018-01193-y>

- Piguet, O., Connally, E., Krendl, A. C., Huot, J. R., & Corkin, S. (2008). False memory in aging: Effects of emotional valence on word recognition accuracy. *Psychology and Aging, 23*(2), 307–314. <https://doi.org/10.1037/0882-7974.23.2.307>
- Rankin, E. J., & Kausler, D. H. (1979). Adult age differences in false memory recognition. *Journal of Gerontology, 34*(1), 58–65. <https://doi.org/10.1093/geronj/34.1.58>
- Reed, A. E., Chan, L., & Mikels, J. A. (2014). Meta-analysis of the age-related positivity effect: Age differences in preferences for positive over negative information. *Psychology and Aging, 29*(1), 1–15. <https://doi.org/10.1037/a0035194>
- Salthouse, T. A. (2019). Trajectories of normal cognitive aging. *Psychology and Aging, 34*(1), 17–24. <https://doi.org/10.1037/pag0000288>
- Schacter, D. L., & Addis, D. R. (2007). The cognitive neuroscience of constructive memory: Remembering the past and imagining the future. *Philosophical Transactions of the Royal Society B: Biological Sciences, 362*(1481), 773. <https://doi.org/10.1098/rstb.2007.2087>
- Schmidt, S. R. (2007). Unscrambling the effects of emotion and distinctiveness on memory. *The foundations of remembering: Essays in honor of Henry L. Roediger III*, 141–158.
- Simons, M., Reijnders, J., Janssens, M., Lataster, J., & Jacobs, N. (2023). Positive affect as mediator: The socioemotional selectivity theory applied to the association between bonding social capital and wellbeing in later life. *Journal of Social and Personal Relationships, 40*(6), 1854–1874. <https://doi.org/10.1177/02654075221145513>
- Szöllősi, Á., Bencze, D., Zsebi, S., Juhász, E., & Racsmány, M. (2025). Age-related differences in the relationship between confidence and false memory in a mnemonic discrimination task. *Scientific Reports, 15*(1), Article 8369. <https://doi.org/10.1038/s41598-025-92684-1>
- Talmi, D., Luk, B. T., McGarry, L. M., & Moscovitch, M. (2007). The contribution of relatedness and distinctiveness to emotionally enhanced memory. *Journal of Memory and Language, 56*(4), 555–574. <https://doi.org/10.1016/j.jml.2007.01.004>
- Tulving, E. (1983). *Elements of episodic memory*. Oxford University Press.
- Windmann, S., & Kutas, M. (2001). Electrophysiological correlates of emotion-induced recognition bias. *Journal of Cognitive Neuroscience, 13*(5), 577–592. <https://doi.org/10.1162/089892901750363172>

(Manuscript Received on 01 April, 2026; Accepted on 28 June, 2026)