

2003. Brain & Cognition, 51(2), 220-221

States of Awareness Associated with Memory for Emotional and Neutral Pictures in Older
and Younger Adults.

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The present study used the remember/know/guess paradigm to investigate age differences in states of awareness associated with recognition memory for emotional and neutral pictures. Both younger and older adults reported more "remember" responses for negative than for neutral pictures. Positive pictures were associated with more "remember" responses than neutral pictures in younger, but not in older, adults. In addition, older adults reported less "remember" responses than younger adults for emotional (positive and negative), but not for neutral, pictures. These findings suggest that the tendency of emotional stimuli to create rich recollective experience is weakened in older adults.

Several findings suggest that rich recollections of past events (as reported by "remember" responses) tend to occur less often in older than in younger adults (see Gardiner & Richardson-Klavehn, 2000 for a review). This has been demonstrated for neutral but not for emotional stimuli. Yet, recent findings indicate that emotional stimuli tend to be richly re-experienced in memory more often than neutral ones in younger adults (Ochsner, 2000). It may be that the modulating effect of emotion on recollective experience is preserved in older adults and that memory deficits associated with ageing are less pronounced for emotional than for neutral stimuli. Alternatively, emotional stimuli could make older adults focus on their feelings rather than on the perceptual details of the stimuli (Hashtroudi, Johnson, Vnek, & Ferguson, 1994) and this may impair recollection. The purpose of the present study was to examine these propositions by investigating states of awareness associated with memory for positive, negative, and neutral pictures in older and younger adults.

Method

Subjects

Subjects were 20 older adults (M age = 64.5, SD = 2.4, range = 60-68) and 20 younger adults (M age = 22, SD = 2.1, range = 18-25).

Materials

The stimuli consisted of 40 positive, 40 negative, and 40 neutral photos from the IAPS (Lang, Greenwald, Bradley, & Hamm, 1993). These photos were divided in two sets (A and B) of 60 photos (20 positive, 20 negative, 20 neutral). The use of sets A and B as studied or nonstudied items was counterbalanced across participants. Stimuli were placed in a pseudorandom but fixed order such that no more than two photos with the same valence occurred in succession. To counterbalance for order effects, the photos were presented in one order for half the subjects and in the reverse order for the other half. Also, ten filler items

were placed at the beginning and end of the list. For the recognition test, the 120 photos of sets A and B were presented in a pseudorandom but fixed order such that no more than two "old" or "new" photos occurred in succession. The photos were presented in one order for half the subjects and in the reverse order for the other half.

Procedure

Subjects were asked to rate the photos on 7-point scales along each of three dimensions: valence (1 = very negative, 4 = neutral, 7 = very positive), arousal (1 = very weak, 4 = moderate, 7 = very strong), and visual complexity (1 = not at all complex, 4 = moderately, 7 = very complex). The photos were presented on a computer screen approximately 60 cm in front of them. On each trial, a fixation cross appeared in the center of the screen for 750 ms. After a 500 ms pause, a photo appeared on the screen for 2 s. When it disappeared, the rating scales for valence, arousal, and visual complexity appeared successively. Subjects made each rating in this order and the next trial began as soon as the last rating had been completed.

Two weeks later, subjects were presented with an unexpected recognition test. For each photo, they had to decide whether they had seen it during the rating session. Furthermore, they had to report whether their recognition was of the remember (R), the know (K) or the guess (G) variety (Gardiner & Richardson-Klavehn, 2000). Briefly, they were told that an R response should be given to any picture which, at the time it was recognized, brought back to mind something they had consciously experienced at the time it was presented. In contrast, they were asked to make a K response if the photo felt familiar but they were unable to recollect details of its prior exposure. Finally, they were asked to make a G response if they were unsure whether or not the photo had been presented in the study phase.

Results

To allow analysis of R, K, and G responses as a function of valence, we classified the pictures according to the ratings of valence subjects had made during encoding. The third of the pictures with the highest mean ratings were classified as positive, the third of the pictures with the lowest mean ratings were classified as negative, and the third of the pictures with ratings in between were classified as neutral. The mean proportions of R, K, and G responses as a function of valence and age are presented in Table 1.

Table 1. Mean Proportions of R, K, and G Responses as a Function of Valence and Age.

		Young			Old		
		Negative	Neutral	Positive	Negative	Neutral	Positive
R	Hits	.74	.32	.47	.38	.25	.30
	FAs	.01	.01	.02	.05	.01	.03
K	Hits	.11	.35	.26	.19	.30	.26
	FAs	.03	.02	.05	.08	.05	.08
G	Hits	.04	.13	.10	.07	.11	.11
	FAs	.06	.04	.06	.07	.08	.08

Separate age (old vs. young) X valence (negative, neutral, positive) analyses of variance (ANOVAs) were performed on R, K, and G responses. For R responses, the ANOVA revealed a main effect of age, $F(1, 38) = 22.63, p < .001$, a main effect of valence, $F(2, 76) = 73.36, p < .001$, and an age X valence interaction, $F(2, 76) = 21.05, p < .001$. Planned comparisons indicated that both younger and older adults made more R responses to negative than to both positive and neutral pictures (all p 's $< .05$). In contrast, positive photos received more R responses than neutral ones in younger ($p < .001$) but not in older adults ($p = .10$). Further comparisons indicated that younger adults made more R responses than older

adults for both negative ($p < .001$) and positive ($p < .01$) pictures, but not for neutral ones ($p = .19$).

The ANOVA performed on K responses demonstrated an effect of valence, $F(2, 76) = 33.71, p < .001$, and an age X valence interaction, $F(2, 76) = 4.82, p < .05$. In both younger and older adults, neutral and positive pictures received more K responses than negative pictures (all p 's $< .05$). In contrast, neutral pictures received more K responses than positive ones in younger ($p < .01$) but not in older adults ($p = .26$). Further comparisons revealed that older adults made more K responses than younger adults for negative photos ($p < .05$), but not for positive and neutral photos (p 's $> .07$). Finally, there was an effect of valence on G responses, $F(2, 76) = 14.71, p < .001$, but no age X valence interaction, $F(2, 76) = 1.66, p < .20$.

Discussion

The results of the present study show that the effect of emotion on recollection is modulated by age differences. Consistent with a previous study (Ochsner, 2000), positive and negative pictures were richly recollected more often than neutral ones in younger adults. In contrast, older adults reported more R responses for negative but not for positive pictures. Furthermore, they reported less R responses than younger adults for emotional but not for neutral pictures. This is somewhat surprising given that age is generally associated with a decrease in R responses. However, Perfect, Williams, and Anderton-Brown (1995) found that the decrease in R responses in older adults disappeared when elaborative encoding was encouraged. The instructions we used in the present study encouraged such a detailed encoding by drawing attention to various aspects of the stimuli (their visual complexity, valence, intensity) and this could explain the absence of age differences in the recollection of neutral stimuli. In contrast, older adults had a deficit in recollective experience for emotional

stimuli. Despite the instructions which tried to draw attention to both emotional and perceptual details of the stimuli, it may be that, when confronted with emotional stimuli, older adults tend to focus on their feelings to a greater extent than younger adults. In consequence, less resources would be available to encode perceptual and contextual details of the stimuli and hence rich recollections would be less likely to occur. Future studies will be needed to examine this proposition.

References

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