

Aging and Cognition: Emotional Context Facilitates Perceptual Memory

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Abstract

This experiment examined older adults' source memory, that is, the ability to remember the context in which information was learned. Older adults typically show poor source memory relative to younger adults, and our aim was to improve source memory for perceptual context (e.g., color) by pairing it with emotional information. In this study, older adults attempted to learn the names of 24 new faces, each of which was bordered by one of two colors (purple or orange). Some participants saw only the faces paired with colors (color-only condition). Others were further instructed that the faces bordered in purple were good, and those bordered in orange were evil (color-plus-emotion condition). All participants were given a surprise memory test for color. Results indicated that those given the color-plus-emotion information were reliably better at recalling color information than those who received only color information. The findings suggest that emotional detail can be used to facilitate memory for perceptual information.

Source memory can be defined as memory for the context in which information is presented and learned (Johnson, Hastroudi and Lindsay, 1993). Source memory can include perceptual information (e.g., time, location and color) and conceptual information (e.g., emotional context). This kind of memory is central to many activities throughout

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daily life. Source memory is critical for remembering where you placed your keys, when you last took your medication, and to whom told you a recent joke. If individuals cannot remember the source of information, they may not be as confident in using that information.

Many researchers have explored source memory and cognitive aging, and evidence strongly suggests age-related decay in the ability to remember contextual information (e.g. Benjamin and Craik, 2001; Johnson, DeLeonardis, Hashtroudi and Ferguson, 1995; McIntyre and Craik, 1987; Ferguson, Hashtroudi and Johnson, 1992; Schacter, Kaszniak, Kihlstron and Valdiserri, 1991; Brown, Jones and Davis, 1995). These studies show that older adults are generally less able than young adults in recalling location, color, voice, time, and environmental cues. However, a handful of studies suggest that source memory is not always impaired with age. Indeed, two separate studies show that source memory can be good if the encoding task forces participants to focus on perceptual details (Glisky, Rubin and Davidson, 2001), or if the source information is emotional in nature (Rahhal, May and Hasher, 2002).

Glisky et al. (2001) found that older adults suffered deficits in perceptual source memory in a natural learning situation, but that they remembered perceptual details well when the encoding task encouraged participants to focus on those details. Rahhal et al. (2002) showed that when older adults were free to focus their attention during learning, they showed poor memory for perceptual details but spared memory for emotional details. Together, these studies suggest that older adults' memory for perceptual details is poor unless the learning situation forces participants to focus on those details, and that memory for emotional detail is, by contrast, relatively good. The present study examined whether older adults can use their memory for emotional details to boost memory for perceptual detail.

In this study we examined older adults' memory for perceptual context (here, color) when the perceptual information was presented alone relative to when it was paired with emotional context. In the color-only condition, participants viewed 24 name-photograph pairs that were bordered in either purple or orange, and their task was to learn the names presented with each face. In the color-plus-emotion condition, participants viewed the same 24 name-photograph pairs

bordered in orange or purple, and in this condition participants were further informed that the color indicated character (i.e., orange = evil; purple = good). As in the color-only condition, the task was to learn the name presented with each face. After the learning phase, all participants across conditions were given a surprise source memory test for color. The results suggested that the addition of emotional context can boost memory for paired perceptual details.

Method

Participants

Thirty-seven older adults (M age = 72.22 yrs., r = 61-83 yrs.) participated in the experiment. These older adults were healthy, community-dwelling volunteers who were reimbursed for their time and parking.

Materials

Materials for this study included 36 pictures of different individuals presented on either an orange or a purple background. These pictures were taken from Internet websites. Half of the photographs were male and half were female. In addition, half of the photographs within each gender were of older adults and half were of younger adults. Names were chosen for each individual in the picture according to their apparent age. Half of the names were older-type names such as Mildred and Rose, while half of the names were younger names such as Tiffany and Brandon. For each participant, 24 of the pictures served as target items in the learning phase, and the remaining 12 served as new items in the test phase. Half of the target items were bordered in purple and half were bordered in orange. Items were counterbalanced so that, across participants, each item served as orange, purple, or new an equal number of times.

Procedure

At the beginning of each experiment, participants completed a consent form and a general health questionnaire. Next, participants were instructed that they would view a series of photographs of individuals, and that a name would appear below each photograph.

All participants were instructed to learn the names of each person and were told that they would be tested on those names later. All participants were also told that half of the photographs would appear with an orange background and half with a purple background. Participants were told they could use the color information to help with names, but that the goal was to learn the names. No further instructions were given to color-only participants.

Older adults in the color-plus-emotion condition were informed that the background color was linked with emotion. For example, an orange background indicated that the person in the picture was evil, and purple indicated that the person in the photograph was good. Further, the participants were told that if the person was evil, he or she committed acts such as vandalism, shoplifting and abuse; by contrast, if the person was good, he or she committed good deeds such as volunteering and donating bone marrow. The participants were then told they could use this information to help them link the names with the faces presented, but that the goal was to learn the names.

When participants fully understood the instructions, the learning phase began. Each photo-name pair appeared in the center of the computer screen for five seconds. When the learning phase was complete, participants completed a non-verbal distractor task for ten minutes.

After the distractor task, each participant completed a surprise paper and pencil source memory test. For this test, participants saw 36 pictures (24 old pictures and 12 new pictures), and made a 3-alternative forced choice decision for each. Participants had to judge whether each photograph had appeared in purple, orange, or was new. All participants were given as much time as needed to complete the task.

Following the source memory test, participants completed the Extended Range Vocabulary Test (ERV; Educational Testing Service, 1976) and the Morningness-Eveningness Questionnaire (MEQ; Horne and Ostberg, 1976). Several studies illustrate that the majority of young adults tend to be evening and neutral types while older adults tend to be morning types. Evidence suggests that these morningness-eveningness tendencies can determine cognitive functioning (e.g., May

and Hasher, 1998; Hasher, Zacks, and May, 1999; May, 1999). Therefore, all the older adults were tested in the morning (i.e., between 8:00 am and 12:00 pm). After the completion of all tasks, participants were debriefed and given a chance to ask questions.

Results

Participants

The significance level for all statistical tests was $p > .05$. Means for all demographic variables are shown in Table 1. A t-test was conducted to evaluate any differences in our older groups. There was a marginally significant difference in age, $t(34) = 1.741$, with participants in the color-plus-emotion condition being slightly older than those in the color-only condition. There were no other differences in demographic aspects of the two conditions.

TABLE 1
Demographic Information for Participants

Condition		AGE	YOE	ERVT	MEQ
Color-Plus-Emotion					
	M	73.8	15.6	27.9	60.4
	SD	5.6	2.8	8.2	9.2
Color-Only					
	M	70.8	14.4	24.1	62.2
	SD	5.7	1.6	7.8	6.8

Memory Performance

Table 2 displays older adults' hit rates, false alarms, and source memory scores in the color-only and color-plus-emotion conditions. To assess source memory, we examined whether participants could identify the correct source of a photograph (i.e., orange vs. purple or good vs. evil), given that they knew the item was in fact old. Thus,

source monitoring scores were calculated by dividing the total number of old items correctly attributed to the appropriate source by the total number of old items correctly identified as old (as in Ferguson et al., 1992; Johnson et al., 1995).

Results indicated that older adults in the color-plus-emotion condition were reliably more successful on the source memory task than those in the color-only condition, $t(34) = 3.49, p < .001$. There were no other reliable differences between the groups, all t 's (34) < 1.5.

TABLE 2
Mean Scores and Standard Deviations
for Older Adults in Both Conditions

Condition	M	SD
Color-Plus-Emotion		
Hits	81	11
False Alarms	44	23
Source Memory	61	10
Color-Only		
Hits	82	12
False Alarms	53	27
Source Memory	50	9

Hits = total percentage of old items correctly identified as old;

False Alarms = total percentage of new items identified as old;

Source Memory Score = total percentage of old items attributed to the correct source/total number of old items correctly identified as old (hits).

Discussion

This study examined older adults' source memory for perceptual details when those details were presented alone and when they were paired with emotional cues. We found that adding emotional cues, even those that were irrelevant to the primary goal, facilitated memory for perceptual information when the emotional cues were consistently linked with the perceptual detail.

The enhanced memory that older adults show for emotional information may derive in part from the fact that the brain mechanisms responsible for processing emotion are relatively spared with age (Smith et al., 1999). For example, research has shown that the amygdala does not decline in functioning as adults grow older, but instead, shifts in the type of stimuli to which it is most responsive (Mather et al., 2004).

Another factor that may influence enhanced memory for emotional information with age is the possibility that with age, processing priorities shift and individuals place greater emphasis on information that is emotional or value-based in nature (Carstensen, 1993, 1995). These findings suggest that older adults do not place heavy emphasis on perceptual aspects of an event, and that they instead spontaneously focus on meaningful, value-based or emotional dimensions when encoding information. Because emotional material is more engaging to older adults, it may evoke more elaborative, detailed processing. Thus, these data are consistent with the well-documented finding that the focus at encoding is an essential determinant of what is remembered, and that successful recollection is tied to distinctive, elaborative processing (e.g., Craik and Lockhart, 1972; Hay and Jacoby, 1999; Morris, Bransford and Franks, 1977; Tulving and Thompson, 1973). Because older adults have heightened interest in emotional material, they may engage in more elaborative processing, which in turn results in greater recall (Carstensen and Turk-Charles, 1994).

The most meaningful finding is that having an emotional link to perceptual source information helps older adults' memory for perceptual detail as well. In this experiment, when older adults were instructed that they could use the emotional aspects of the situation, they still remembered background color more so than if they were

told only that they could use background color. This information could be used in many aspects of older adults' lives. For example, after losing their keys, older adults might rely on emotional details, such as how they felt when placing the keys down from a hard day's work, in recalling where the keys were placed. The present experiment adds to past literature that suggests that older adults' memory for emotional information may be better than memory of other types of information due to prioritizing. If this is true, older adults could possibly choose to use emotional details to help remember perceptual information.

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