

Research Report

The Role of Motivation in the Age-Related Positivity Effect in Autobiographical Memory

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ABSTRACT—*This study reveals that older adults have a positivity effect in long-term autobiographical memory and that a positivity bias can be induced in younger adults by a heightened motivation to regulate current emotional well-being. Three hundred nuns, ages 47 to 102 years, recalled personal information originally reported 14 years earlier. They did so under experimental conditions that repeatedly primed them to focus on their current emotional states or on their memory accuracy, or that provided no instructional focus (control condition). Both older control participants and participants who were focused on emotional states showed a tendency to remember the past more positively than they originally reported in 1987. In contrast, both younger control participants and participants who were focused on accuracy tended to remember the past more negatively than originally reported.*

Older people experience a subjective quality of life that is comparable to, if not better than, that of younger adults and also display superior abilities to regulate emotional states (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Gross et al., 1997; Mroczek, 2001). In this study, we examined implications of age-related improvements in emotion regulation for autobiographical memory. Recalling distant personal experiences involves reconstruction (Bartlett, 1932; Singer & Salovey, 1993); the recounting of a personal experience differs from previous descriptions and is influenced by direct retrieval processes and subjective factors, such as current mood and motivation (Bower & Forgas, 2000; Levine & Safer, 2002; Luszcz & Bryan, 1999; Woike & Polo, 2001). The few longitudinal studies of autobiographical memory that have included older adults have found that the reconstructions of older adults are more likely than those of younger adults to be more positive than original accounts (Field, 1981, 1997; Wagenaar & Groeneweg, 1990; Yarow, Campbell, & Burton, 1970). Yet methodological limitations of previous studies make it difficult to discern whether this apparent positivity effect is real and, in the absence of

theoretical explanations, fail to address the underlying mechanisms. Previous studies have confounded age and time between data collections, or used different questionnaires or different informants at different times. Because many researchers and health care providers regularly ask older individuals to provide information about their pasts, identifying potential memory effects is important.

Socioemotional selectivity theory provides a motivational explanation for the apparent positivity of older adults' reconstructions of past events (Carstensen, Isaacowitz, & Charles, 1999). According to this theory, when time is perceived as limited—a perception strongly associated with chronological age—emotionally meaningful goals are more likely to be pursued than goals aimed at gaining new information. Emotionally meaningful goals include feeling good in the moment and deriving emotional meaning from life. On the basis of this theory, we reasoned that (a) older adults are more motivated than younger adults to remember their past in emotionally satisfying ways and (b) older adults' positivity bias in reconstructive memory reflects the motivation to regulate emotional experience. To investigate these hypotheses, we experimentally manipulated motivational states while respondents retrieved personal information they had provided 14 years earlier and also obtained ratings of their mood after retrieval.

During retrieval, participants in the experimental conditions were repeatedly prompted to focus on their feelings (emotion-focused condition) or on accuracy (accuracy-focused condition). In a no-manipulation control condition, participants were simply asked to retrieve the information. We expected that in the control condition, older adults, but not younger adults, would show a positivity effect. We hypothesized that in the emotion-focused condition, younger participants' reports would be comparable to those of older adults and show a positive bias, whereas in the accuracy-focused condition, older adults' reports would be comparable to those of younger participants and not show a positive bias. Nine variables related to physical, mental, and emotional well-being were examined. Two alternative explanations for an age-related positivity effect—mood and global memory decline—were explored. Numerous studies using undergraduates have shown that current mood influences memory (Bower & Forgas, 2000). Furthermore, there may be a selective mortality effect, such that there are more positive people in older than younger populations (Danner,

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Snowdon, & Friesen, 2001). Alternatively, a positivity effect associated with age may be due to age-related decline in memory.

METHOD

Participants

In 1987, 862 School Sisters of St. Francis (mostly in the Milwaukee, Wisconsin, area) completed the entire questionnaire described later in this section. In 2001, 316 of these Sisters were alive, and 300 participated in this study. Participants ranged in age from 47 to 102 years ($M = 73.2$ years, $SD = 10.3$). All Sisters were Caucasian and well educated ($M = 17.7$ years, $SD = 2.9$); they had lived in the religious community for an average of 53.3 years ($SD = 10.3$).

Materials

Survey Questionnaire

The original questionnaire (Carstensen & Burrus, 1987), comprising questions about demographic background, health practices, physical and mental illnesses, and family medical history, was completed by the Sisters in 1987. Measures with Likert rating scales (rather than yes/no responses) and with responses that ranged in their positive-negative valence were selected for investigation in the follow-up study conducted in 2001. The following measures in the survey questionnaire were used:

- *Frequency of health activities* (Carstensen & Burrus, 1987). On this measure, participants rate the extent to which they do 13 healthy activities, such as walking, reading about health, and eating healthily.
- *SCL-90* (Derogatis, Rickels, & Rock, 1976). The Physical Symptoms, OCD (obsessive-compulsive disorder) Symptoms, Depression Symptoms, Hostility Symptoms, and Paranoid Ideation Symptoms subscales of this instrument were used.
- *Carstensen Emotion Questionnaire* (Carstensen, 2000). Two items from this questionnaire were used, (a) the frequency of experiencing four negative emotions (sadness, anger, disgust, and fear) and (b) the level of control over the external expression of those four negative emotions when feeling them.
- *UCLA Loneliness Scale* (Russell, Peplau, & Cutrona, 1980). On this scale, participants rate the extent to which they endorse each of 20 items pertaining to loneliness (e.g., "I have nobody to talk to," "I feel left out").

These measures were used to develop two versions of the original questionnaire. In the *current* version, participants were instructed to complete all questions on the basis of their current state. In the *retrospective* version, the questionnaire items were changed to the past tense, and each question referred to the year 1987. For example, "How much are you distressed by feeling nauseous" was changed to "In 1987, how much were you distressed by feeling nauseous?" In the two experimental conditions, questions in the retrospective version were interspersed with prompts designed to direct participants toward particular motivational states.

Emotion Checklist

On the Carstensen Emotion Questionnaire (Carstensen, 2000), participants rated the extent to which they felt each of 8 positive and 11 negative emotions.

Hopkins Verbal Learning Test

Participants completed the free-recall component of the Hopkins Verbal Learning Test (HVLT; Brandt, 1991). For this test, they heard a list of words three times and after each presentation of the list recalled the words they remembered.

Procedure

Participants received two questionnaire packets by mail. To control for possible order effects, we counterbalanced the order of the current and retrospective questionnaires in the mailings. The first packet contained a cover letter, a consent form, a measure of baseline mood, either the current or the retrospective questionnaire, a measure of postquestionnaire mood, and a preaddressed stamped envelope. The importance of completing the questions in the order presented was emphasized throughout the packet.

The second packet, mailed 3 weeks after the completed first packet was returned, contained a cover letter, a measure of baseline mood, the other questionnaire, and a measure of postquestionnaire mood.¹

The HVLT was conducted by telephone 1 week after the completed second packet was returned.

We randomly assigned Sisters to complete the retrospective questionnaire under one of three conditions:

- *Accuracy-focused condition*. In this condition, participants were told, "Think back to the year 1987 and answer the questions as you think you answered them back then. *It is very important that you answer the questions as accurately as you can.*" Participants periodically rated the extent to which they used each of five memory strategies in recalling information for responding to the questionnaire.
- *Emotion-focused condition*. In this condition, participants were told, "Think back to the year 1987 and answer the questions as you think you answered them back then. *It is very important that you focus on how you are feeling while answering the questions.*" Periodically, participants rated the extent to which they were feeling each of five emotions while recalling information for their responses to the questionnaire.
- *Control condition*. In this condition, participants were told simply, "Think back to the year 1987 and answer the questions as you think you answered them back then."

Before starting the retrospective questionnaire, the Sisters completed an exercise designed to help them remember their life in 1987. They viewed pictures of major national events that occurred in 1987 and rated how well they remembered each event. They then completed sentences, such as "In 1987, my favorite activities were _____."

The study had within-subjects and between-subjects components. That is, we were able to compare each participant's original and retrospective reports. In addition, the between-subjects component—the three conditions under which participants recalled their past—allowed us to test our motivational hypotheses.

RESULTS AND DISCUSSION

For each of the nine variables, we created three global indices based on individual items: One was calculated from responses in 1987,

¹The Sisters filled in the date and time on all measures of mood so we could be sure that the baseline mood measure was completed before the retrospective questionnaire.

TABLE 1
Participants' 1987, Current, and Retrospective Ratings of Their Physical, Mental, and Emotional Well-Being

Variable	Maximum possible	Group													
		Youngest controls				Oldest controls				Emotion-focused				Accuracy focused	
		1987	Current	Retrospective	1987	Current	Retrospective	1987	Current	Retrospective	1987	Current	Retrospective	Current	Retrospective
Frequency of healthy activities ^a	39	25.09 (3.19)	26.03 (3.41)	22.71 (3.14) ^{b,c}	23.36 (2.93)	22.74 (4.22)	22.40 (3.74) ^c	23.53 (4.07)	24.90 (4.13)	24.57 (4.59)	24.82 (3.69)	24.88 (3.77)	23.34 (3.99) ^{b,c}		
Level of physical symptoms ^b	48	3.87 (4.05)	4.59 (4.35)	3.75 (2.92)	6.47 (5.31)	6.76 (5.24)	4.21 (3.87) ^{b,c}	5.63 (5.2)	7.57 (6.30) ^a	4.46 (4.05) ^{b,c}	5.39 (4.33)	5.47 (4.52)	5.01 (4.29)		
Frequency of negative emotions ^c	16	10.86 (1.41)	10.00 (1.79)	10.03 (1.78) ^c	9.76 (1.84)	9.60 (1.96)	8.57 (1.91) ^{b,c}	10.58 (2.01)	10.11 (2.31)	9.37 (2.56) ^c	10.15 (1.84)	9.44 (2.09) ^a	12.68 (6.09) ^{b,c}		
Control of negative emotions ^c	16	12.03 (2.04)	12.16 (2.08)	12.51 (2.25)	12.43 (1.20)	12.62 (1.77)	11.87 (2.25)	11.62 (2.26)	11.98 (2.70)	11.52 (3.19)	11.83 (1.97)	12.42 (2.43)	12.69 (2.18) ^b		
Loneliness ^d	80	17.68 (15.92)	18.80 (11.10)	18.88 (13.15) ^a	11.68 (7.69)	16.00 (12.49)	17.82 (12.40) ^{b,c}	15.08 (12.96)	13.14 (11.64) ^a	19.34 (16.90) ^{b,c}	13.66 (11.72)	15.23 (11.58) ^a	18.28 (14.95) ^{b,c}		
Level of OCD symptoms ^b	40	4.37 (3.67)	5.09 (3.90)	4.97 (3.98)	6.68 (5.23)	8.90 (6.95)	7.16 (5.78) ^a	8.10 (5.92)	8.39 (6.13)	6.79 (5.64) ^{b,c}	6.97 (4.25)	7.83 (4.73)	7.37 (5.74)		
Depression ^b	52	4.97 (4.76)	5.65 (5.09)	8.28 (6.36) ^{b,c}	5.26 (4.37)	5.47 (4.09)	6.48 (5.68) ^{a,b}	8.18 (7.24)	6.78 (5.48)	8.12 (7.77) ^b	7.10 (5.51)	5.71 (4.78) ^a	8.98 (8.38) ^{b,c}		
Hostility ^b	24	1.43 (1.48)	1.13 (1.04)	2.48 (2.31) ^{b,c}	2.06 (1.48)	2.00 (1.04)	1.52 (1.49) ^{b,c}	2.51 (2.67)	1.70 (1.57)	2.29 (2.20) ^b	2.15 (2.35)	1.50 (1.41)	2.84 (2.76) ^{b,c}		
Paranoid ideation ^b	24	.83 (1.29)	1.06 (1.02)	2.59 (2.17) ^{b,c}	1.50 (1.09)	.76 (.83)	.95 (.92) ^c	3.59 (3.75)	1.17 (1.02)	2.84 (2.62) ^{b,c}	2.89 (2.18)	.92 (.89) ^a	3.06 (3.01) ^b		

Note. Numbers in parentheses denote standard deviations. Step-wise Bonferroni corrections and 99% confidence intervals were used to control for Type I and II errors. Using this criterion, on of significance age differences for levels of loneliness in the control condition did not meet significance. OCD = obsessive-compulsive disorder.

^aWithin-condition 1987 and current ratings differ at the .01 level (two-tailed).

^bWithin-condition retrospective and current ratings differ at the .01 level (two-tailed).

^cWithin-condition retrospective and 1987 ratings differ at the .01 level (two-tailed).

TABLE 2
Descriptive Statistics for the Measures of Mood and Short-Term Memory

Variable	n	Responses		
		Mean (SD)	Range	Maximum possible score
Baseline intensity of positive mood	292	5.14 (.90)	2.00–7.00	7
Baseline intensity of negative mood	292	2.33 (.91)	1.00–6.00	7
Postquestionnaire intensity of positive mood	295	5.22 (.90)	2.00–7.00	7
Postquestionnaire intensity of negative mood	295	2.24 (.87)	1.00–5.00	7
Verbal learning and memory	158	24.49 (6.03)	7.00–36.00	36

another from responses to the current (2001) questionnaire, and the third from responses to the retrospective questionnaire. For example, each participant had three indices of level of hostility, a 1987 hostility index, a retrospective hostility index, and a current hostility index (see Table 1). Each index was calculated by summing the responses to the individual items of that particular variable. Next, we calculated difference scores between the 1987 and retrospective indices. To control for current health, we used indices of participants' current ratings as covariates in the main analyses. Table 2 provides descriptive statistics for the mood indices and HVLTL scores. Age and HVLTL recall were significantly correlated ($r = -.32, p < .01$), whereas age was not significantly correlated with either positive baseline mood ($r = .10$) or negative baseline mood ($r = -.05$).

Because the Sisters were fairly old ($M = 73.2$ years), we used the data from only the top and bottom age quartiles in the control group in order to make maximum use of the data from the relatively few younger Sisters. Thus, the control group was divided into a *youngest-controls* group ($n = 28$, age range: 47–65 years) and *oldest-controls* group ($n = 28$, age range: 79–101 years). As Table 1 shows, significant differences were found between retrospective and current ratings in each age group, suggesting that participants were not simply replicating their current ratings when completing the retrospective questionnaire. A general index of participants' overall direction of memory bias across all dependent variables was created. First, difference scores of the dependent variables of interest were weighted systematically so that all scores contributed equally to the overall index. Next, weighted difference scores were summed for each participant to calculate a global difference score. These weighted difference scores were used for general linear modeling, which indicated that the oldest controls showed a greater overall positive memory bias than the youngest controls, $F(1, 53) = 4.44, p < .04, \eta^2 = .10$.

Individual variables also were examined. In each analysis, we controlled for HVLTL scores and participants' current ratings of that particular variable. An increase in positivity with increasing age was found for five variables: frequency of healthy activities, $F(1, 53) = 4.01, p < .05, \eta^2 = .06$; level of physical symptoms, $F(1, 53) = 4.81, p < .03, \eta^2 = .19$; depression, $F(1, 53) = 4.00, p < .05, \eta^2 = .07$; hostility, $F(1, 53) = 6.51, p < .01, \eta^2 = .12$; and paranoid ideation, $F(1, 53) = 5.92, p < .05, \eta^2 = .21$.

Difference scores between baseline and postquestionnaire mood indicated that the oldest controls were more likely than the youngest

controls to be in a more intense positive mood after answering the questionnaire than at baseline, $t(55) = 1.77, p < .05$. This result suggests that the positivity effect was an effective emotion-regulation strategy.

Emotion-focused participants were significantly more likely than accuracy-focused participants to show an overall positivity effect, $F(1, 179) = 4.70, p < .01, \eta^2 = .05$. Analyses indicated that after controlling for HVLTL memory performance and participants' current ratings, the comparison between emotion-focused and accuracy-focused participants showed the predicted pattern of results for seven variables: frequency of healthy activities, $F(1, 179) = 8.58, p < .001, \eta^2 = .07$; level of physical symptoms, $F(1, 179) = 3.70, p < .05, \eta^2 = .04$; frequency of negative emotions, $F(1, 179) = 23.07, p < .001, \eta^2 = .12$; level of OCD symptoms, $F(1, 179) = 4.43, p < .05, \eta^2 = .04$; depression, $F(1, 179) = 4.02, p < .05, \eta^2 = .04$; hostility, $F(1, 179) = 3.91, p < .05, \eta^2 = .03$; and paranoid ideation, $F(1, 179) = 4.07, p < .05, \eta^2 = .02$. Additionally, emotion-focused participants were in a less negative mood than accuracy-focused participants upon completing the retrospective questionnaire, $t(116) = 1.90, p < .05$.

The ratings for the prompts in the emotion-focused condition (see Table 3 for means) revealed that a positivity effect was associated with decreased sadness ($B = -1.17, SE_B = 0.48, \beta = -.36, p = .006$) and disgust ($B = -1.28, SE_B = 0.51, \beta = -.32, p = .02$), suggesting that the positivity effect in memory diminished negative affect. In the accuracy-focused condition, no memory strategy significantly correlated with memory effects.

Figure 1 shows the overall direction of memory effects in all four groups. No significant differences between the emotion and accuracy conditions were found for baseline positive mood, $F(3, 240) = 0.55$; baseline negative mood, $F(3, 240) = 0.98$; HVLTL memory performance, $F(3, 158) = 0.61$; questionnaire order, $F(3, 240) = 2.01, p = .17$; or age distribution, $F(2, 298) = 2.04, p = .10$. Except for frequency of engaging in healthy activities, $F(3, 254) = 2.92, p = .02$, participants' 1987 ratings for the dependent variables did not differ significantly across conditions.

The results were consistent with socioemotional selectivity theory. Older adults in the control condition had a positivity effect when recalling personal information (see Fig. 1). This positivity effect seemed to help regulate emotion, as older controls were in a more positive mood after answering questions about their memories than they were at baseline. In contrast, the youngest adults in the control condition had a negativity effect when recalling personal information. This negativity effect adversely affected mood, as younger participants' mood did not improve after recall. Furthermore, the positivity effect was influenced by currently activated goals. Regardless of age, emotion-focused participants were more likely than accuracy-focused

²Linear regressions with all control participants, rather than only the top and bottom age quartiles, showed a similar pattern of results. In all conditions, the pattern of results did not change when current health was excluded as a covariate or when baseline mood and age were included as covariates.

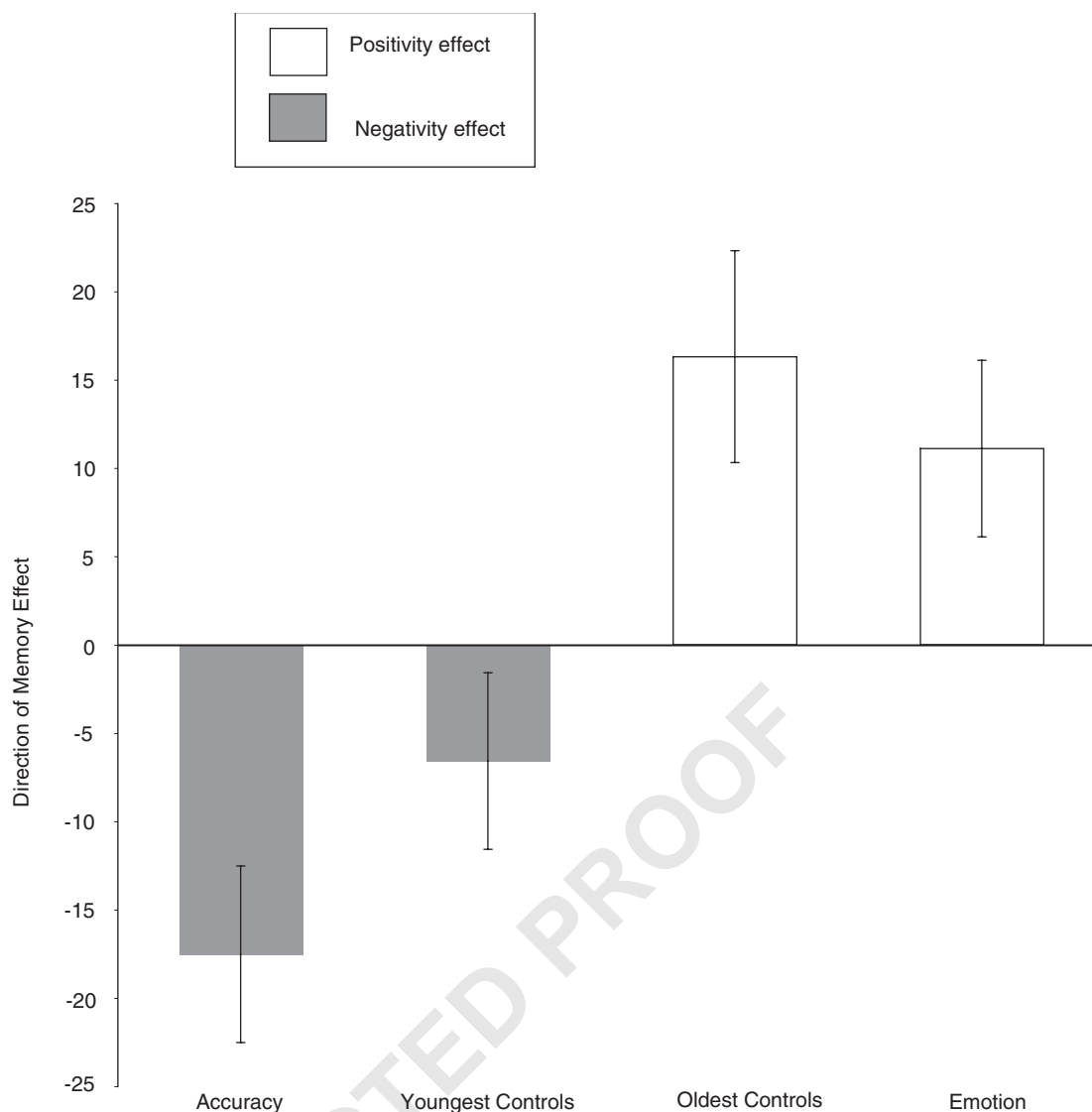


Fig. 1. Global memory effect (calculated from the ratings of all dependent variables) as a function of condition. Error bars represent standard errors.

participants to show a positivity effect when recalling past personal information; emotion-focused participants were also in a less negative mood after recall than accuracy-focused participants. The oldest controls and emotion-focused participants showed similar patterns of positively directed memory, whereas the youngest controls and accuracy-focused participants exhibited similar patterns of negatively directed memory. This pattern occurred for all variables for which age-group differences emerged in the control condition. Findings remained the same after controlling for performance on a verbal learning and memory test (HVLTL), baseline mood, and current ratings of physical, mental, and emotional well-being. Consequently, the findings indicate convincingly that there is a positivity effect among older adults and that it can be explained by their motivational state.

Moreover, motivation appears to more strongly influence the positivity effect than either mood-congruent memory or age-related memory decline does. A mood-congruent memory account would suggest that the age-related positivity effect is due to older adults'

enhanced emotional well-being in daily life. Yet even after controlling for baseline mood, we found an age-related positivity effect in the control condition. Also, although age and HVLTL performance were negatively correlated, HVLTL performance did not predict the autobiographical-memory effect. When recalling distant personal information, people may rely heavily on semantic memory processes (Robinson & Clore, 2002), which then are influenced by reconstructive factors like motivation.

Findings of a negativity effect in the accuracy-focus condition suggest that people demonstrate more of a negativity effect when engaged in more deliberative memory processes. In previous research, carefully appraising potential outcomes of a decision led to poorer self-perceptions and worsened mood than the process of implementing a decision (Taylor & Gollwitzer, 1995). Accuracy-focused recall may entail a similar process of careful appraisal.

In the control condition, as age increased, a negative memory effect in autobiographical memory shifted to a positive effect. The positivity

TABLE 3
Descriptive Statistics for Responses to the Prompts in the Experimental Conditions

Variable	n	Responses		Maximum possible score
		Mean (SD)	Range	
Accuracy-focused prompts				
In recalling the above information, to what extent did you . . .				
Think of the context in which you did the questionnaire?	97	4.11 (1.63)	1.00–7.00	7
Make an effort to recall the information?	97	4.36 (1.71)	1.00–7.00	7
Visually picture your responses in the questionnaire?	97	3.53 (1.90)	1.00–7.00	7
Feel confident in your accuracy recalling the information?	97	4.69 (1.60)	1.00–7.00	7
Think of other things that reminded you of the above information?	97	4.11 (1.63)	1.00–7.00	7
Emotion-focused prompts				
In recalling the above information, to what extent did you experience the following emotions?				
Sadness	95	2.17 (1.07)	1.00–5.00	7
Fear	95	2.08 (1.16)	1.00–5.00	7
Happiness	95	4.39 (1.58)	1.00–7.00	7
Anger	95	2.06 (1.13)	1.00–5.00	7
Disgust	95	1.81 (1.01)	1.00–5.00	7

Note. On the rating scale, 1 = *not at all* and 7 = *very much*. Age was positively correlated with the level of endorsement of visualization ($B = 2.86$, $SE_B = .83$, $\beta = .52$, $p = .001$) and negatively correlated with level of confidence ($B = -1.73$, $SE_B = .87$, $\beta = -.27$, $p = .05$) and sadness ($B = -3.30$, $SE_B = 1.70$, $\beta = -.35$, $p = .05$).

effect appears to be an effective emotion-regulation strategy, as participants' mood improved after engaging in positively biased recall. Recent studies have found that older adults tend to prefer emotion-focused problem-solving strategies (Watson & Blanchard-Fields, 1998) and avoid attending to negative information (Mather & Carstensen, 2003); compared with younger adults, they tend to remember disproportionately fewer negative than positive images (Charles, Mather, & Carstensen, in press), recall negative emotions less intensely (Levine & Bluck, 1997), and remember past choices more positively (Mather & Johnson, 2000). The present study extends findings of an emotionally motivated pattern of attention and memory to autobiographical memory. The results have implications for researchers and health care providers who rely on self-report measures and for future research in the fields of aging, emotion, and memory.

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