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Long-term retention of transient news events

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Abstract

Many retrospective analyses of remote memory have demonstrated recency effects in that memory for events proximal to the time of testing is superior to memory for events from remote time periods. However, the rate at which information decays over time and the specific pattern of forgetting may vary depending upon the distinct attributes of stimuli used as indices of memory. Studies examining long-term forgetting of well rehearsed, conceptually integrated information underscore preservation of remote events, some of which are thought to be permanently stored in memory. A different pattern of forgetting emerges in relation to recall of discrete facts whereby recall declines according to a negatively accelerated decay curve. In the current study long-term retention of transient news events was examined. Results were examined in relation to the effects of age and sex. All age groups demonstrated recency effects in that events from the recent past were recalled better than remote events. Age did not exert a negative influence on recall of remote or recent events with the exception of younger participants who did not recall items predating their dates of birth. Older female participants were less adept at recalling very old events than their male counterparts. (*JINS*, 2000, *6*, 44–51.)

Keywords: Age, Memory, News events

INTRODUCTION

The life-span of a given event depends upon a number of factors, including the extent to which information is rehearsed and the nature of the to-be-remembered information. Although many studies have examined the rates at which memories fade out over time, the findings of these studies are often difficult to reconcile due to the fact that they employ not only different instruments of measurement and study different populations, but they also tap the recollection of diverse types of memory. Investigators have examined retention of information acquired in academic settings (Bahrick, 1984b; Bahrick & Hall, 1991; Conway et al., 1992; Semb & Ellis, 1994), autobiographical events (Conway, & Rubin, 1993; Rubin, & Schulkind, 1997) and popular news items (Howes & Katz, 1988, 1992; Squire, 1989). Findings from all three domains have demonstrated that information declines as a function of retention interval; however, the rate of decline and the asymptote vary in relation to the nature of the material being studied and the conditions of original learning.

Effects of Rehearsal on Long-Term Retention

Bahrick and colleagues considered the effects of rehearsal in various investigations of long term memory. In one study participants were asked to recognize the faces of high school classmates from as long as 50 years prior (Bahrick et al., 1975). Recent high school graduates and those who had graduated 50 years before remembered the same amount of information regarding former classmates, indicating that information can exist in a semipermanent state in very long-term memory. In a subsequent study college professors were asked to name former students. There was a clear pattern of memory decline over an 8-year retention interval (Bahrick, 1984). The discrepancy in the results of these two studies can be explained by differences in exposure to the to-be-remembered stimuli: The students in the 4-year high school setting had greater exposure to classmates than the professors had to their students. The more frequently we are exposed to information over time, the more durable is the knowledge.

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In another study Bahrick examined semantic memory for Spanish learned in high school in 773 normal control participants (Bahrick, 1984b). Participants differed in the extent of original learning as reflected by number of Spanish courses taken during high school. They also differed with respect to recency of exposure to Spanish, which ranged from 1 to 50 years. Retention curves indicated a decline in knowledge for Spanish over the first 3 to 6 years following initial learning. Relative stability of retention was noted for the subsequent 20-to-25-year period suggesting that some semantic information had entered "permastore" (Bahrick, 1984b). Critics of this study noted that memory for Spanish may have been resistant to decay due to the well-organized nature of semantic memory (Neisser, 1984).

Further support for the idea that well rehearsed information may be accessible years after initial registration comes from the Oscar Test (Brandt & Benedict, 1993). This is a recently developed test of remote memory where respondents are asked to identify the year in which a movie (1928–1989) won the Academy Award. Normal elders (*M* age 70) demonstrated equivalent recall of movies from the 1920s as those from the 1980s. The latter finding suggests that some aspects of memory for popular movies is retained over a 60-year interval of time. It may be that memories for award winning movies, which are often viewed over the course of many years, are preserved as a result of frequent exposure.

Memory for Conceptually Based Information *Versus* Discrete Events

Another factor that influences long term retention concerns the extent to which information is conceptually organized. Findings from a number of studies have shown that memories integrated within a coherent network adhere to a different forgetting pattern than memories that are of a more circumscribed nature: The former do not appear to be as vulnerable to decay as are the latter. Knowledge pertaining to conceptual aspects of a particular subject is more resistant to decay than specific knowledge regarding proper names or discrete facts (Conway et al., 1991, 1992). In a meta-analysis of studies of school based learning, Semb and Ellis (1994) demonstrated that participants preferentially recalled conceptually based or schematic information, whereas discrete facts were less well remembered.

Long-term forgetting of discrete events was examined by Squire (1989) who studied retention of the names of television shows that had been on the air for one season. Testing was conducted each year over 9 consecutive years with different participants in each test session. Findings indicated that the names of television programs were forgotten at a steady rate over a 15-year period. However, retention of older (7–15-year-old) events appeared relatively stable. These data were interpreted as indicating that forgetting occurs over many years but that ultimately some events are resistant to further decay. Squire argued that differences between his finding of gradual and continuous forgetting over many years *versus* earlier work by Bahrick indicating stable retention of memories across 25 years had to do with differences in amount of exposure and internal organization of the to-be-remembered information. Convergent data from these studies support the idea that well rehearsed, schematically based information stabilizes over time whereas discrete information decays according to a more accelerated schedule.

Effects of Age on Recall and Recognition From Long-Term Memory

A number of investigators have studied the effects of age on retention of public event information. Many studies of laboratory based learning and autobiographical recall have shown that age does not adversely affect rate of forgetting from long term memory (e.g., Giambra & Arenberg, 1993; Rubin & Schulkind, 1997; Salthouse, 1991). However, studies that have specifically focused on the relationship between age and recall of public events have yielded mixed results. Several investigators demonstrated a negative relationship between age and memory for remote public events (Howes & Katz, 1988, 1992; Squire, 1974; Warrington & Sanders, 1971) whereas others did not find evidence of age-related memory decline (Botwinick & Storandt, 1980; Poon et al.,1979; Storandt et al., 1978). Moderating factors in this relationship included the age and, therefore, nature of the to-be-remembered material. Studies that included items more than 40 years old (which assess general knowledge as much as remote memory) did not show age effects; in contrast, those that included items from 1 to 40 years old demonstrated age effects. Other factors that may account for inconsistent findings across studies involves educational and intellectual differences in the samples studied. It is likely that increased education and intelligence are positively correlated with recall of news events (Howes & Katz, 1988). Another issue that bears upon the relationship between age and remote memory concerns whether testing is conducted in a free-recall *versus* recognition format. In some studies age did not adversely affect recognition of past events even though free recall was affected (Poon et al., 1979; Warrington & Sanders, 1971). However, this is not an invariant finding and other studies have shown that recall and recognition are affected equally by aging (Botwinick & Storandt, 1980; Squire, 1974).

In the current study we examine the effects of age on forgetting from long-term memory with a newly developed news events questionnaire. Items were constrained in terms of content and frequency of exposure: Only events that were newsworthy for a time-limited period were chosen. In this respect, items were considered discrete or transient events. A relatively homogeneous sample of highly educated participants was selected. Recall and recognition were both tested in order to determine whether forgetting curves might differ according to specific retrieval demands. Consistent with previous work in this area we expected that events from recent years would be recalled better than events from the distant past. Because our stimuli were discrete events, we

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expected that forgetting would occur at an accelerated rate but that some events would be impervious to forgetting. In light of studies indicating that older individuals retain information as well as younger ones, we predicted that old and young participants would recall equal amounts of information from the last decade but that very young participants would not recall information from the time period predating their births. We did not have any *a priori* predictions regarding the influence of sex on recall of news events.

METHODS

Research Participants

The Transient News Events Test (TNET) was administered to 200 participants during 1995 and early 1996. These were recruited through local advertisements and received a small honorarium for their participation in the study. There were six groups ranging in age from 20 to 80 (Table 1). All were in good health. Exclusion criteria included a history of neurological disorders, psychiatric disease, and alcohol and substance abuse. All of the participants were U.S. citizens who had resided in the country between 1950 and 1995. Based on previous research indicating that intelligence and education influence recall of news events, we restricted our sample in terms of these variables. All participants were well educated and of above average intelligence (Table 1). Participants were matched according to education (M education = 15.37 years, $SD = 2.16$) and verbal intelligence using the American National Adult Reading Test (ANART) as an estimation of verbal IQ (M ANART score = 118.80, $SD = 10.62$). There were no significant group differences with respect to years of formal education [$F(5,194) = .58$, $p > .05$] or verbal IQ [$F(5,194) = .78$, $p > .05$]. There were no significant correlations between recall performance and ANART scores ($r = .11$, $p > .05$) or between recall performance and years of education ($r = .04$, $p > .05$). We would have expected these relationships to emerge had the participant pool been more heterogeneous with respect to IQ and education. The percentage of male *versus* female participants varied slightly but not significantly across age groups ($p > .05$).

Test Development

The TNET was developed to assess free recall and recognition of transient news events that were unlikely to be relearned through subsequent exposure after the event had taken place. Items that were of general interest were included. Content of items focused on politics, crimes, and entertainment news. Initial item identification was conducted through surveys of world almanacs. The *New York Times Index* was used to determine the number of days each item appeared in the news during a specific year and in the 3 following years. A large pool of items was selected and reviewed by two of the authors (M.O.C. and B.K.). Events of a similar nature, the details of which might be confusing (e.g., plane crashes, terrorists attacks, etc.), were not included. Events were narrowed down to include only those items that faded out of the news over the 3 year period following their initial appearance. Events with prolonged news exposure (e.g., the O.J. Simpson trial) over the course of several years were discarded. Attempts were made to exclude items that were only of regional interest.

Three events were chosen from each of 9 hemidecades (1950–1994). The average initial exposure of the items chosen was 70 days per year. There were no statistical differences between the mean initial exposure of events in each of the 9 hemidecades [$F(8,18) = 1.8$, $p > .05$]. The 27 TNET events declined in frequency by 84% the year following the event, 91% 2 years following, and 99% by the 3rd year. There were no significant differences between the fade-out rates by hemidecade [$F(8,24) = 1.5$, $p > .05$]. Some events (e.g., the Tylenol scare) resurfaced briefly in the news years after their initial appearance. It was our belief that this transient reemergence would not engender durable memories for these events for the general population. This assumption was supported by data indicating that younger participants did not have significant knowledge of these events. The transient nature of the 27 selected events was supported by data indicating that younger participants did not know items that predated their births or that occurred during early childhood years (i.e., before age 10). The 40 youngest participants, born between 1964 and 1974, recalled only 13 of a possible 1080 events (27 events across 40 participants) that occurred before 1974. In contrast, the twenty-seven 70- to

Table 1. Demographic data

Age group	N	% Male	% Female	Age (years) M	Age (years) (SD)	Education (years) M	Education (years) (SD)	ANART score M	ANART score (SD)
20–29	40	48	52	24.4	(2.5)	15.7	(1.3)	117.1	(8.7)
30–39	47	47	53	34.4	(2.9)	15.4	(2.4)	116.4	(7.8)
40–49	32	41	59	44	(2.8)	15.3	(2.3)	117.9	(7.6)
50–59	27	44	56	53.9	(2.8)	15.0	(2.2)	119.3	(6.4)
60–69	27	56	44	64.9	(3.1)	15.6	(2.5)	121.0	(7.0)
70–79	27	41	59	73.1	(2.1)	15.0	(2.3)	122.2	(4.8)

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79-year-olds recalled 183 of 729 possible events (27 events across 27 participants) from the same time period.

The test consisted of 27 questions with three questions per hemidecade from 1950 to 1994. Both free recall and recognition were probed. Recall questions were worded so that the most salient aspect of the event was mentioned. Such wording decreased the extent to which momentary word finding difficulties influenced test performance. Recognition questions were administered in a forced choice format where the correct answer was paired with a distracter item. Distracter questions were developed by several of the authors (M.O.C. and B.K.) and were piloted on a naive group in order to determine whether they were plausible alternatives. Recognition questions were arranged in a hierarchical fashion so that the first question probed general information for an event while the second question focused on more specific details (Table 2).

Procedure

All participants were tested individually. Questions were presented orally by an examiner. Recall and recognition scores were computed separately. The participant received full 2-point recall credit if two predetermined critical items were correctly identified. One point was given if one critical item was recalled. If neither of the critical items was recalled, the participant received a zero. A maximum recall score of 6 was possible per hemidecade. If the participant correctly recalled both critical items, the recognition questions were not administered and the participant automatically received full recognition credit. The participant received 1 point for each recognition question answered correctly. Again, a maximum recognition score of 6 was possible for each hemidecade, with 3 representing chance performance. All verbal responses to the questions were recorded on the score sheet.

RESULTS

Recall of Transient Public Events

The database consisted of 108 distributions broken down by hemidecade, age, and sex. The database was edited by removing recall of items from the 1950s to achieve a balanced design and by eliminating 6 participants to reduce the percentage of missing data points so that we could use the analysis of variance procedure.

Hemidecade Effects

All age groups demonstrated superior recall for events from the recent past *versus* more remote events [$F(7,1200) = 155$, $p < .0001$]. Examination of recall patterns (Figure 1) revealed distinct differences between the amount of information recalled from early (1950–1969) *versus* late (1970–1994) hemidecades. Recall of transient news events declined at a very gradual rate over a 15- to 20-year period after which a rapid decrease in recall occurred which was then followed by a decrease in the slope of the forgetting curve. These findings suggest that recall of transient public events adheres to a forgetting curve characterized by gradual forgetting over several decades, a brief period of accelerated forgetting (for events 20–25 years old) and a negatively accelerated forgetting curve for events greater than 25 years in age. It may be that ceiling effects contributed to the shape of the forgetting curve. Because items were matched according to frequency criteria, it is likely that observed ceiling effects represent recency of exposure.

Age Effects

The Age × Hemidecade interaction was statistically significant [$F(35,1200) = 6.32$, $p < .0001$]. While all participants, regardless of age, preferentially recalled events from

Table 2. Sample questions from the Transient Events Test (TET)

Year	Sample questions from TET
1956	
Question	In 1956 some Marine recruits died at Parris Island, how did it happen?
Recall criteria	1. Punishment march. 2. Recruits drowned.
Recognition Questions	1. Were they fired on during an artillery exercise that used live ammunition or *did they drown when their sergeant took them on a forced night march to discipline them*? 2. Was the sergeant's name *Matthew C. McKeown* or Richard E. Sparrow?
1992	
Question	Why was Joseph Buttafucco receiving so much attention in 1992?
Recall criteria	1. Had an affair with a 17-year-old girl. 2. She shot his wife.
Recognition questions	1. *Did he have an affair with a 17-year-old girl* or did he testify in court against John Gotti? 2. Was the girl arrested for charging thousands of dollars on his credit card or for *shooting his wife*?

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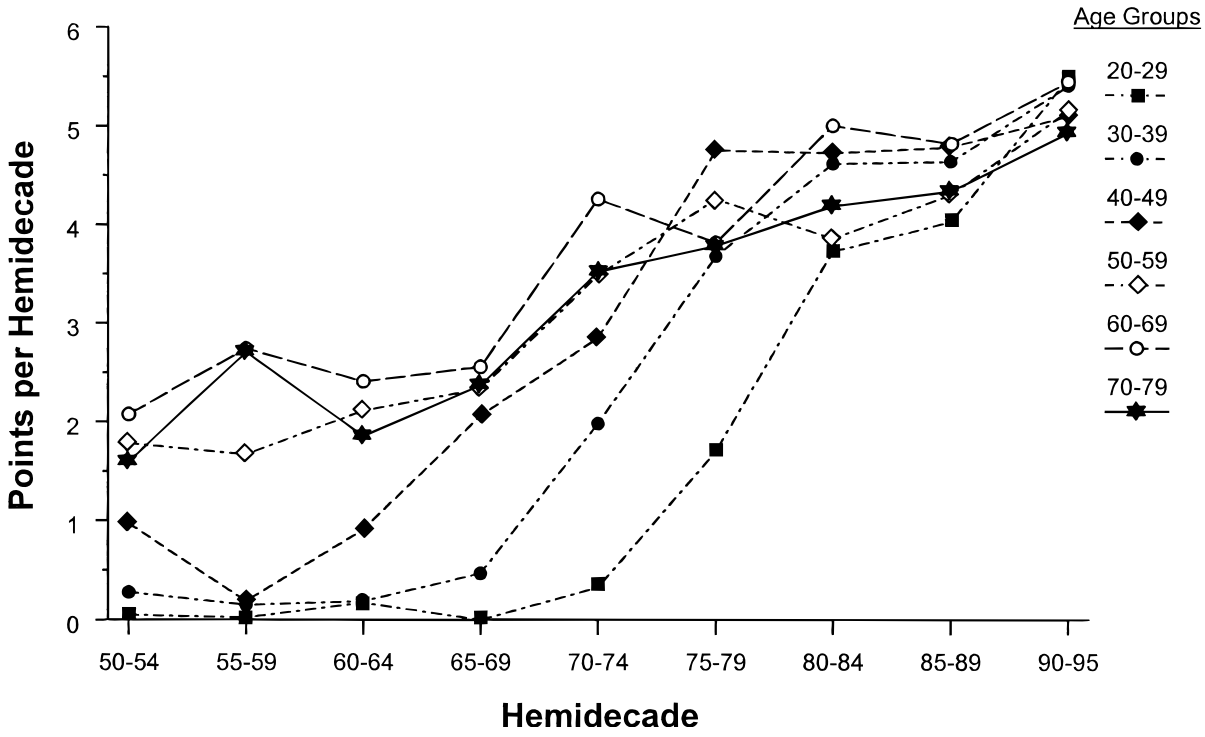

Fig. 1. Recall of transient news events for participants ages 20–79 years. Hemidecade = year that an event was in the news (1950–1995). Points per hemidecade = number of correct answers out of a total of 6.

later years better than those from the distant past, older participants recalled more of the TNET events than did the younger participants. The age advantage appeared to be secondary to the fact that younger participants were unable to recall events that predated their birth, which in some sense validated selection of items as transient public events. There were no age differences in recall of events from the last 2 hemidecades ($p > .05$). *Post-hoc* analyses included a Kruskal-Wallis Test (Howell, 1992), which revealed equivalent rates of forgetting for 50-, 60-, and 70-year-old participants, who performed at the same levels of performance, relative to one another, for every hemidecade.

Participants from the three youngest age groups recalled very little information from the earliest 3 hemidecades due to the fact that these transient events occurred either prior to their births or prior to the time when they were interested in popular culture. Twenty- and 30-year-old participants demonstrated equal recall of items from 1950 to 1969. The 40-year-old participants did not differ from 20- and 30-year-old subjects in recall of items from 1955 to 1964. While the three youngest age groups exhibited similar patterns of recall from the 3 early hemidecades, each group broke away from their younger cohort at a critical point in time. This typically occurred when participants were between 10 and 15 years of age. Hence, 40-year-old participants (born around 1955) were indistinguishable from 20- and 30-year-old participants until the period from 1965 to 1969, when their performance became statistically indistinguishable from the older cohorts.

Sex Effects

The Sex × Hemidecade interaction was significant [$F(7,1200) = 4.45$, $p < .0001$]. Men recalled information from the first 3 hemidecades (1950–1964) better than women whereas sex did not significantly affect recall of more recent time periods. The Sex × Age interaction was significant [$F(5,216) = 2.96$, $p < .05$]. This difference was largely due to the superior recall of older men for the remote time periods.

Hemidecade × Age × Sex Interaction

The differences between hemidecade, age, and sex were tested by a 3-factor repeated measures analysis of variance with two grouping factors and one repeated measure factor followed by multiple sample comparisons using the Kruskal-Wallis multiple sample comparison test (Howell, 1992). The ANOVA for Hemidecade × Age × Sex was not significant [$F(35,1200) = 1.07$, $p > .05$].

Recognition of Transient Public Events

The recognition database consisted of 108 distributions broken down by hemidecade, age, and sex. The database was edited by removing recall of items from the 1950s to achieve a balanced design and by eliminating 6 individuals to reduce the percentage of missing data points, so that we could use the analysis of variance procedure.

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Recall and recognition scores were highly correlated ($r^2 = .99$) because recognition scores were based on recall performance. Consequently, trends already described for recall also held true for recognition. The differences between hemidecade, age, and sex were tested by a three-factor repeated measures ANOVA with two grouping factors and one repeated measure factor followed by multiple sample comparisons using the Kruskal-Wallis multiple sample comparison test. Significant main effects included hemidecade [$F(7,1200) = 197$, $p = .0001$]. All participants recognized recent items better than those from the remote past (Figure 2). The effect of age was significant [$F(5,216) = 34.48$, $p = .0001$], in that older participants recognized more items than younger ones. Finally, men recognized significantly more items than women [$F(1,216) = 10.99$, $p = .001$]. The three-way interaction of Hemidecade × Age × Sex was not significant [$F(35,1200) = 1.14$, $p > .05$]. As with recall there was no significant correlation between recognition performance and years of education ($r = .039$, $p > .05$) or ANART scores and recognition performance ($r = .074$, $p > .05$). The extent to which subjects benefited from recognition cues did not differ significantly in relation to age ($r = -.27$, $p > .05$). Age-based benefits from recognition were not seen even when comparisons were restricted to the last 2 decades ($r = -.04$, $p > .05$).

DISCUSSION

In the current study we investigated the long-term retention of transient news events that spanned a 45-year interval of time. The effects of age and sex on forgetting were examined with a participant pool broken down into six distinct age groups with a relatively equal distribution of men and women in each group. Across all participants there was evidence of a three component forgetting curve characterized by relatively intact recall of recent events, followed by a period of accelerated forgetting, and terminating in a period of stable retention for older events. These findings imply that forgetting of discrete news events may proceed at a relatively constant rate for a number of years after which there may be a critical period when more fragile memories recede and more robust memories become permanently entrenched in long-term memory. The relative preservation of the most distant (i.e., 1950–1969) events was supported by the finding that the 50-, 60-, and 70-year-old participants did not differ with respect to recall of these items.

The present findings are consistent with data from previous studies illustrating stable retention of remote memories (Bahrick et al., 1975; Bahrick, 1984b; Squire, 1989). The actual rate of forgetting and the critical period for entry into long-term storage depends upon the nature of retained information and the circumstances of original learning. The discrete news events used in the current study were forgotten at a steady rate for 20 years, after which increased forgetting occurred for a period of 5 to 10 years. A subsequent period of decelerated forgetting indicated relative preservation of the most remote (i.e., 30–45-year-old) events. These data are generally consistent with other studies measuring recall of discrete types of information over long time intervals (Bahrick, 1984; Squire, 1989). Of particular relevance,

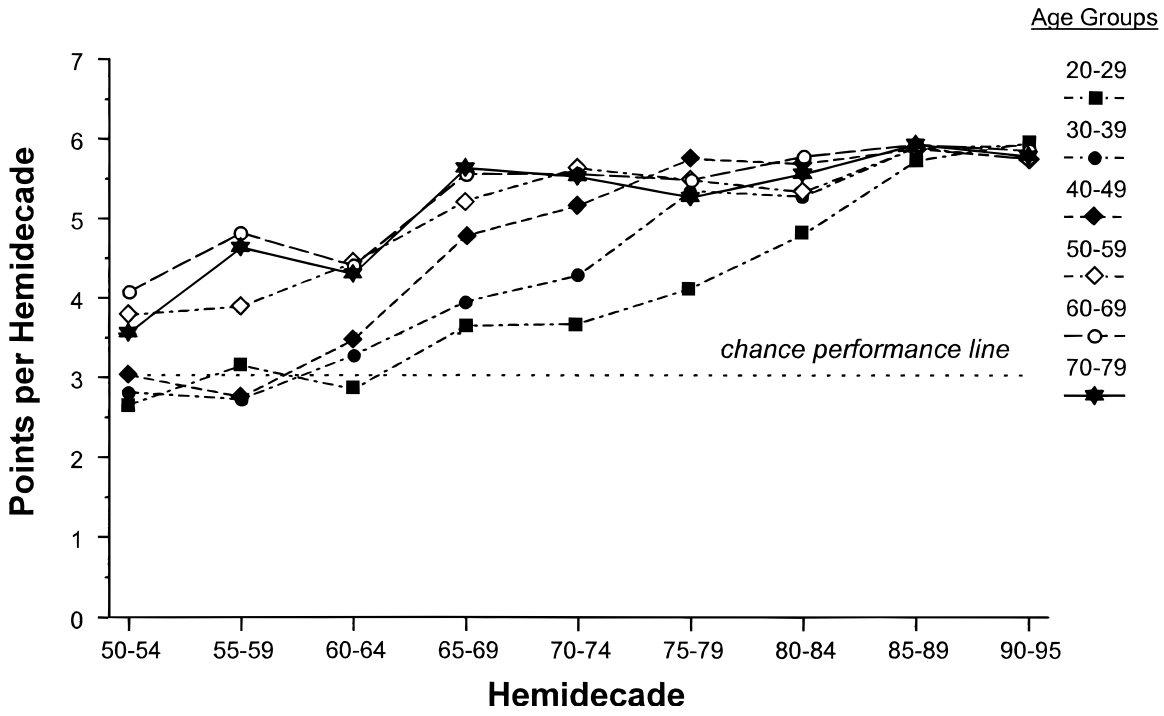

Fig. 2. Recognition of transient news events for participants ages 20–79 years. Hemidecade = year that an event was in the news (1950–1995). Points per hemidecade = number of correct answers out of a total of 6.

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Squire (1989) demonstrated that memory for short-lived television programs (i.e., those aired only one season) declined rapidly during the first 6 years of the retention interval but that memories for older (7–15-year-old) programs were resistant to further decay. The current study and Squire's investigation are consistent with the idea that discrete types of information, which may not be conceptually integrated within a larger network of associations, may be particularly vulnerable to decay with the passage of time (Conway et al., 1992). At the same time, both studies reveal that memories for some discrete events may endure over very long intervals of time.

With regards to the effects of age on remote memory, the current findings revealed that elderly individuals demonstrated better memory for transient news events from the last 45 years in comparison to younger participants. This finding was primarily due to the fact that younger participants were at a disadvantage with respect to items that predated their interest in news events. Nonetheless, the lack of significant differences across age groups in recall or recognition of events from the last 10 years indicated that age is not associated with accelerated forgetting. While these findings contradict earlier reports indicating that elderly participants are less proficient in recalling remote events (Howes & Katz, 1988, 1992; Squire, 1974; Warrington & Sanders, 1971), they are entirely consistent with investigations of prospective learning as well as some studies of remote recall (Giambra, et al., 1993; Rubin & Schulkind, 1997; Salthouse, 1991).

Findings indicated that males recalled transient news events from the first three hemidecades better than females whereas no sex effect was observed in relation to recall of events from more recent time periods. These results are compatible with previous studies indicating that women recalled less news information than men (Botwinick & Storandt, 1980; Storandt et al., 1978). A detailed investigation of the effects of sex revealed that women scored lower in terms of specific content areas (politics, disasters, sports and crimes) than men but that their recall of entertainment items indicating that sex effects are not pervasive (Howes & Katz, 1988). In all likelihood, the superior recall of older male participants for the remote time periods reflects the sociocultural climate prevalent during the 1950s. It may be that some of older women were less apt to attend to news events than their male peers simply as a result of competing cultural and social demands. The generational identities of men may have developed with reference to news reports whereas women may have been influenced more by other external events.

Clinical Applications and Limitations

In the clinical setting many elderly individuals report preferential recall of events from the distant past *versus* deficient memory for recent events. Observations of this nature are consistent with Ribot's law of regression (Ribot, 1882), which holds that memories become increasingly impervious to decay with the passage of time. In line with these observations are research studies of amnesic patients indicating increased memory for remote *versus* recent events, a profile commonly referred to as temporally graded retrograde amnesia (Albert et al., 1979; Butters & Cermak, 1986). Together, the retrospective reports of elders and the retrograde amnesias of memory impaired patients have been seen as support for Ribot's gradient. However, it may be that these observations are due to the faulty comparison of different types of memory from different time periods.

Surveys of remote memory often compare overlearned information from distant time periods with discrete episodes from the recent past. The individual may easily recall a remote figure such as Charlie Chaplin because they were exposed to this famous man in many different ways over the course of many years. In like manner, some early personal memories concerning school or family life may have been preserved because they were reflected upon many times over the course of one's life. Recent memories for news items (e.g., Monica Lewinksy) or personal events (e.g., a recent gift) may seem important at the time of their occurrence; however, in the absence of repeated exposure over the course of many years, they may be of transient significance. Consequently, the disparity between accurate recall of the remote *versus* recent event may be partly due to frequency of exposure and integration within a network of memories.

In contrast with the idea that remote memories are preferentially preserved, a different pattern of long-term forgetting emerges when memory tests include items where there are attempts to constrain type of memory, conditions of original learning, and the extent to which information is rehearsed. Under these conditions, recency effects are obtained indicating that younger events are more accessible than older ones.

Despite attempts to control for the effects of interest in news events and exposure to specific items, all retrospective analyses of memory are limited in that the experimenter cannot control the original circumstances of learning or subsequent exposure to specific events. In the current study, we selected participants who were interested in news events and who were of high average intelligence. It is likely that the learning profiles of selected participants will not generalize to a broader population of individuals.

Summary

In the current study transient news events were forgotten at a steady rate over the course of many years. A recency effect was observed indicating that all participants were able to retrieve recent events better than those from the past. Other findings indicated that advanced age did not adversely affect recall or recognition. Finally, a sex effect was described in that older female participants were less apt to recall remote news events than their male counterparts.

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