Childhood Amnesia and the Beginnings of Memory for Four Early Life Events

JoNell Adair Usher and Ulric Neisser

Childhood amnesia was examined in a between-groups study of adults' memories of 4 datable target events—the birth of a younger sibling, a hospitalization, the death of a family member, and making a family move. College students ($N = 222$) answered questions about events that had occurred when they were 1, 2, 3, 4, or 5 years old and also about external information sources, such as family stories. Results show that the offset of childhood amnesia (earliest age of recall) is age 2 for hospitalization and sibling birth and 3 for death and move. Thus, some memories are available from earlier in childhood than previous research has suggested. Subjects' mothers judged most of their children's memories as accurate. External information sources were negatively related to recall from the earlier ages (2–3) but positively to recall from later ages (4–5). These results are compatible with a multiple-determinants account of childhood amnesia.

The life history of any adult begins with a period from which no events are remembered. Although this "childhood amnesia" has been much discussed since Freud (1916/1963) first called attention to it, there have been few empirical studies of the phenomenon itself. By definition it begins at birth, but when does it end? Most estimates of the offset of childhood amnesia stem from studies in which adults are asked to report and to date their "earliest memories" (e.g., Dudycha & Dudycha, 1941; Kihlstrom & Harackiewicz, 1982; Waldvogel, 1948). This method produces average earliest memories from around age 3 1/2. In a related method, subjects get cue words and are asked to date whatever recollections the cues bring to mind (Crovitz & Shiffman, 1974; Rubin, Wetzler, & Nebes, 1986). Analysis of the frequencies with which different portions of the life span are represented in these recalls produces a "forgetting function," in which childhood amnesia appears as a steep drop for the first few years of life.

These methods seem problematic to us. The dates assigned to such memories are not easily verified, and the role of external information sources (e.g., frequently told family stories) has rarely been assessed. Moreover, neither the recalled events themselves nor the unrecalled ones that have apparently succumbed to childhood amnesia are controlled; both vary haphazardly from one subject to another. The present study is based on a different method that we call *targeted recall*. We first located subjects who had undergone a target

experience at a known age in early childhood and then asked a series of questions about their memory of it. Four experiences served as targets: the birth of a younger sibling, a hospitalization of at least one night, the death of a family member, and a family move to a new home. In many cases, we were able to check the accuracy of the subjects' recall with their parents. The possible confounding role of external information sources was addressed with internal controls. Our results suggest that the offset of childhood amnesia— that is, the earliest age from which something can be remembered into adulthood—varies with what has been experienced; some events are more memorable than others. For hospitalization and the birth of a sibling, the critical age is appreciably earlier than previous estimates have suggested.

It seems likely that more than one factor is responsible for childhood amnesia. Many theories of the phenomenon have been proposed, and more than one may be right. Although our research was not explicitly designed to test any of those theories, two particularly plausible ones are worth mentioning here. One likely contributing factor is the immaturity of the infant nervous system (Pillemer & White, 1989; Spear, 1979). The hippocampus, for example, is not fully developed at birth. In view of the known involvement of the hippocampus with adult episodic memory, several authors have proposed that the late maturation of this structure may play a role in childhood amnesia (Nadel & Zola-Morgan, 1984; White & Pillemer, 1979).

Although this explanation seems plausible enough, it cannot provide a full explanation of the phenomenon. Two-and-a-half-year-old children readily recall events that took place 6 months earlier (Fivush & Hamond, 1990), so their episodic memory systems must be in place. Why, then, are memories from this later period also forgotten so completely? We believe that their inaccessibility results from the changes in cognitive structure that accompany development (Neisser, 1962; Schachtel, 1947). Because of those changes, the experiences of childhood do not fit adult "schemata," hence they can no longer be brought to mind. A modern version of this theory might place particular emphasis on the *life narrative* (called the "remembered self" in Neisser, 1988).

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Adults think of their lives—past, present, and future—in terms of a series of well-defined periods and milestones that constitute a rich retrieval structure and thus facilitate recall. Young children do not have this schema; they do not think of their experiences as comprising a personal narrative. That narrative will develop later, but it can hardly facilitate recall of experiences that occurred before it began.

Another schema change that may contribute to childhood amnesia has been described recently by Robyn Fivush. When young children recall things, they often focus on aspects of the event that would not seem memorable to an adult: [What did you do on the camping trip?] "First we eat dinner, then go to bed, and then wake up and eat breakfast" (Fivush & Hamond, 1990, p. 231). Because these aspects may seem neither unique nor interesting in later life, the event itself is eventually forgotten. Conversely, any event in which the child's focus of attention does happen to fit adult schemata should be relatively easier to recall later on. The birth of a sibling may constitute one such event. Parents typically draw the child's attention to the importance of the birth and its significance for the future ("You're going to have a little baby sister [or brother]!"), and the child's own experience soon confirms those predictions. In contrast, the significance of a death in the family is usually not well understood by children, hence they may have difficulty remembering it.

The emotional tone of an event may also affect the probability that it will be recalled in later life. Many early memories are of painful or embarrassing experiences. Under some conditions, children seem to recall painful medical experiences (e.g., inoculations) especially well (Goodman, Rudy, Bottoms, & Aman, 1990). Of the target events in this study, hospitalization would seem to fit this description best.

We turn now to the background of our own research. The first study using targeted recall was that of Sheingold and Tenney (1982), who examined recollections of the birth of a younger sibling. Forty-two college students were asked to recall births that had taken place when they themselves were from 1 to 17 years old. The results suggested a very steep offset of childhood amnesia, again around age 3 1/2. Only 2 of 22 subjects who had experienced a sibling birth before the third birthday could answer even a single question about it. In contrast, most of those who had been 4 or older recalled a great deal.

Although this age of offset is consistent with that obtained in traditional free-recall studies, it may not represent a true population value. For one thing, an informal replication reported by Neisser (1982, p. 201) gave quite different results. In contrast to Sheingold and Tenney's (1982) findings, many subjects who had experienced sibling births at 3 or even 2 years of age were able to answer several questions. Moreover, a careful review of Sheingold and Tenney's procedure reveals that many of their subjects must have contributed data from more than one event age. Indeed, all the subjects "had had at least one sibling born when they were three or older" (p. 204). Thus, each of the 22 sibling births experienced between the ages of 1.00 and 2.99 years was reported by a subject who had experienced at least one similar occasion later on. This later experience could result in a kind of retroactive interference; memories of the more recent births

may have reduced recall of the earlier ones. This source of interference was minimized in the present study by targeting only the subject's last preschool experience of a given type of event.

Winograd and Killinger (1983) also used targeted recall in a study of childhood-encoded flashbulb memories. Using the death of President John F. Kennedy as the target event, they selected subjects who had been between 1 and 7 years at the time. These researchers analyzed subjects' recollections on the basis of only five questions: where subjects were when they first heard the news, what they were doing, how the news reached them, what they did immediately afterward, and were there any other details they remembered. These questions corresponded to the categories most frequently found in adult flashbulb memories (see Brown & Kulik, 1977). Winograd and Killinger found that less than half of those who had been younger than 5 years old at the time recalled anything about this event as adults. This contrasts sharply with the vivid recollections of most adults. Thus, these data exemplify the phenomenon of childhood amnesia.

In any research on childhood memory, the question arises as to whether recollections have been shaped by frequently told family stories, often-reviewed photographs and movies, or some other memory-preserving object or activity. To assess this possibility, we explicitly asked our subjects about external information sources of this kind. We also asked them to estimate the recency and frequency with which they had thought, spoken, or heard about the events in question.

Our study involved two phases of data collection. Both phases began with survey questionnaires intended to locate Emory University students who had experienced the target events at given ages in childhood. These subjects then answered standard sets of specific questions about these events. They were told to report only what they personally remembered, not what they had heard from others. Additional questions dealt with the possible presence of external information sources (family stories, photographs, etc.) and with the frequency and recency of rehearsal. Subjects in Phase 1 were also asked whether we could contact their parents to verify these recollections; most gave us permission to do so.

Phase 1, in which the bulk of the data were collected, focused on four ages (2, 3, 4, and 5 years) and four events—birth of a sibling, a hospitalization, death of a family member, and a family move to a new home. These events resulted in a 16-cell design. At least 10 subjects were located and tested for each cell. A full account of Phase 1 appears in Usher (1989). Phase 2 had two goals. The first goal was to increase the power of our tests by raising the number of subjects per cell to 12. The second goal was to include a new age group: subjects who had been only 1 year old at the time of the event in question. As it turned out, few respondents had experienced either a hospitalization or a death in the family at age 1. Adequate numbers of 1-year-old subjects were available for only two events: sibling birth and family move. Thus the data reported here are based on 12 subjects at each of five ages (1 through 5) for these two events; there are 12 subjects at each of four ages (2 through 5) for the hospitalization and death of a family member events.

Method

Subjects

A background survey, designed to identify individuals who had experienced the target events during childhood, was mailed to all entering freshmen at Emory University in two phases, Phase 1 in 1986 and Phase 2 in 1991. The survey was also distributed to students in introductory psychology classes. A total of 737 surveys (445 in Phase 1, 292 in Phase 2) were returned. These respondents provided the subject pool for our research.

The survey was identified only as an effort to collect descriptive data about college students' early life. It was not linked in any way to research on memory. On the contrary, the respondents were asked to answer each question "whether you remember the event or not." The respondents provided information about their own place and date of birth, any early hospitalizations, any births and deaths that may have occurred in their families, and any moves the family had made. To make its purpose less obvious, the survey also included questions about starting school and taking lessons such as dance and swimming.

For each of the four target events—birth of a sibling, hospitalization,[1] death of a family member, and a family move—and for each target age, we selected at least 12 respondents who had reported having had that experience at that age. JoNell Usher telephoned these individuals, asking them to participate in a study involving additional questionnaires. Although the background survey was mentioned as the point of contact, the investigator did not mention that the experiment was memory related.

The subjects (175 in Phase 1, 47 in Phase 2) came to the laboratory in small groups to fill out the questionnaires: 61 about a birth, 50 about a hospitalization, 48 about a death, and 63 about a move. There were 136 women and 86 men in the total sample. (This disparity resulted because a higher proportion of women responded to our original surveys.) No subject was queried about more than one event. Those who had had several experiences in the same category (e.g., who had moved more than once) were asked to recall only the *most recent* (preschool-age) event. Move subjects also answered a second, orally presented set of questions about the home from which they had moved.

Questionnaires

A separate questionnaire was designed for each type of target event. Each questionnaire included a strict caution to report only what was actually remembered, not what was known from family stories or other external sources. Four types of questions followed:

1. Introductory yes and no questions (e.g., "Do you remember being told that your mother was going to have a baby?"). These questions were not scored.
2. Universal questions that applied to everyone who had the target experience (e.g., "What were you wearing when . . ."). The 17 universal questions from the birth questionnaire are listed in Table 1. The three other questionnaires were similar in format but varied in the number of universal questions (hospitalization = 21, death = 9, move = 16). These questions are the basis for most of the analyses that follow.
3. Contingent questions about things that might or might not have been experienced by a given subject (e.g., "Did you take any special objects with you on the trip [to your new home]? What were they?"). Recall of these items exhib-

Table 1
Universal Questions from the Sibling Birth Questionnaire

Item no.	Universal question
1.	Who told you (that your mother was going to have a baby)?
2.	Where were you?
3.	What were you doing when this happened?
4.	What time of day was it?
5.	Who told you that your mother was leaving to go to the hospital?
6.	What were you doing when she left?
7.	Who went with her?
8.	What did you do right after your mother left?
9.	Who took care of you while your mother was in the hospital?
10.	How did you find out that the baby was a boy or girl?
11.	Where were you the first time you saw the baby?
12.	What was the baby wearing?
13.	What was the baby doing?
14.	Who picked your mother and the baby up from the hospital?
15.	What time of day was it when they came home?
16.	What did you do when they arrived home?
17.	Who was at home with you when they came home?

ited no consistent trends and will not be reported here (see Usher, 1989, for more details).

4. Emotion questions that asked subjects to describe their feelings at various points during the event (e.g., "Do you recall your emotional reaction to your mother's leaving? What was it?").

Each questionnaire asked subjects to estimate the *recency* and *frequency* with which they had thought or talked about the target event, using 4-point scales. They also were asked about external information sources, including photographs, family stories, home videos, or "others." If they reported that a given source had been present, they gave a rate of incidence for the source on a 5-point scale, ranging from *annually or less* (1) to *more than once a month* (5). Subjects in the family move group were asked to return for a supplementary interview. These interviews focused on the spatial layout of the home in which the subject had lived before the move. Because memory of this type does not concern specific episodes, these reports are not strictly comparable to the findings reported here and will not be considered further. (See Usher, 1989, for details.)

At the end of the questionnaire, Phase 1 subjects were asked if we might contact their parents for a follow-up. The majority (106 of 175) agreed and provided their mothers' addresses. (No letters were sent in the 27 cases in which a subject had recalled nothing about the target event.) Each mother was first asked how old the child had been at the time of the event. Then she gave her own

[1] Most of the respondents who reported a childhood hospitalization had gone to the hospital for a planned surgical procedure such as a tonsillectomy. To obtain a relatively homogeneous group of subjects, we made this into a selection criterion; that is, we tried not to select individuals who had been hospitalized as a result of trauma or critical illness.

independent recall of the questions that her child had answered (these were marked on a similar questionnaire). At that point she opened a sealed envelope containing her child's actual responses and rated them for accuracy. As an incentive for returning the ques-

tionnaire, each mother had the choice of having us send her daughter or son two tickets to the Emory Harland Cinema Theater or of asking us to send a $2 donation to the Emory Alumni Fund. The high return rate (67%) may have been due to these incentives.
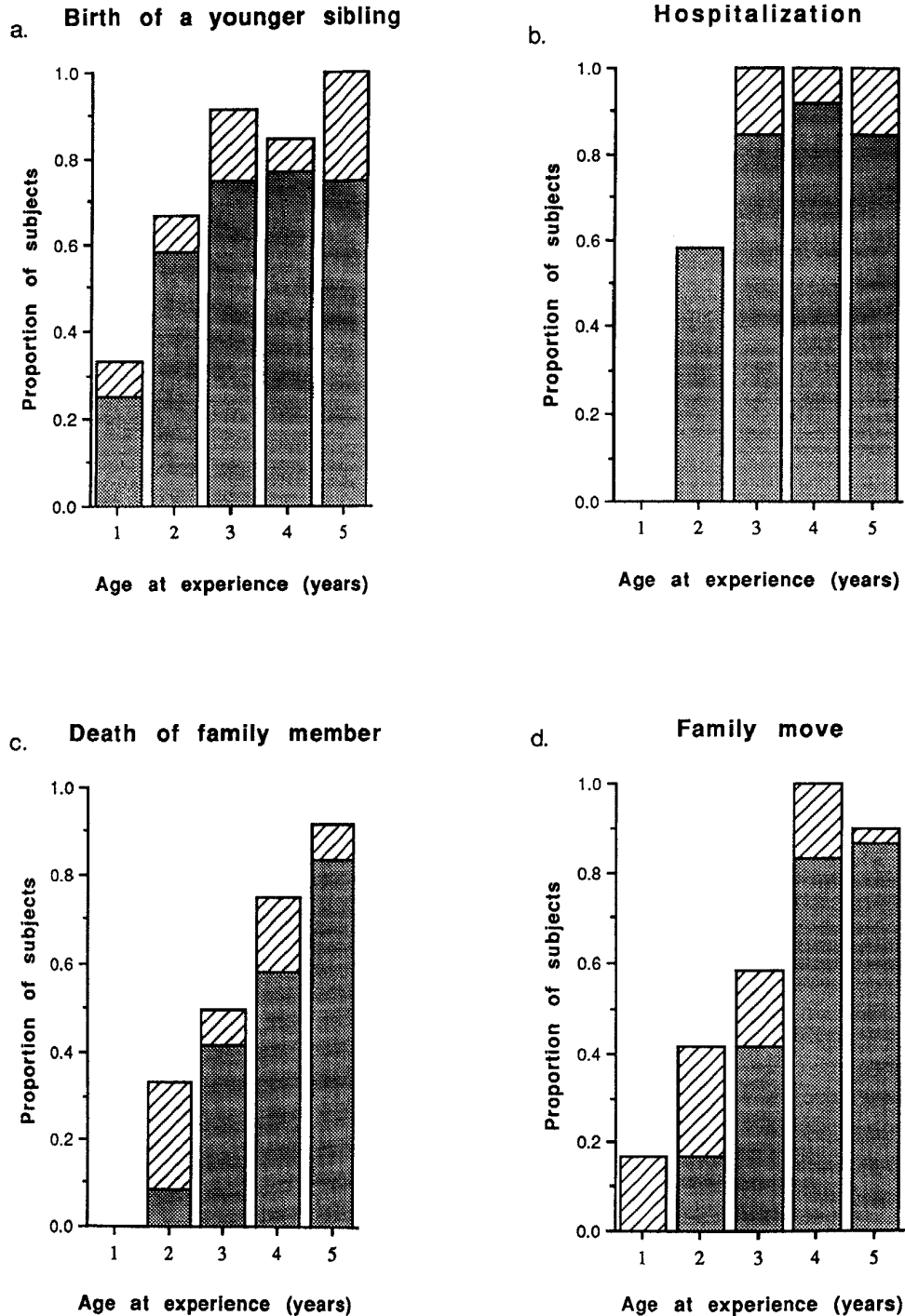

Figure 1. Proportions of subjects who answered at least one (hatched)/three (solid) question(s) about the target events.

Results

Offset of Childhood Amnesia

A lenient criterion for remembering an event would be answering at least one universal question about it. The heights of the full (solid plus striped) bars in Figure 1 show, for each of the four target events, the proportion of subjects at each age who met this criterion. (In Figure 1 and elsewhere, ages are categorized by the preceding birthday. When subjects described themselves as "2 years old," for example, we take this to mean that they were between 2.00 and 2.99.) What do these data say about the offset of childhood amnesia? By analogy with the classical concept of a threshold, it is convenient to define that offset as *the age at which at least half the subjects recall something about an event*. Using this definition and the lenient criterion of recall, Figure 1 shows that two of the events (sibling birth and hospitalization) are especially memorable; they emerge from childhood amnesia at age 2—that is, before the third birthday. The other two events (making a family move and the death of a family member) emerge from amnesia at the more traditionally accepted age of 3—before the fourth birthday.

The criterion of answering at least one question is somewhat arbitrary. The result of using a stricter criterion—answering at least three universal questions—is also shown in Figure 1. As is apparent, this stricter criterion leaves the 50% thresholds for birth and hospitalization unchanged. The offsets of amnesia for the death and move events, however, rise to age 4.

Subjects who were 1 year old at the time of an event (birth and move only) were unlikely to remember it. Using the lenient one-question criterion, only 4 of the 12 sibling birth subjects recalled anything at all; only 2 of 12 move subjects did so. Using the stricter three-question criterion, 3 of 12 recalled a sibling birth, and none recalled a move.

The strict criterion proportions from Figure 1 were used to test the statistical significance of the differences among the four events. For subjects who were 2 years old at the time of the event, we obtained the following proportions of those who remembered the birth, hospitalization, death, and move events: 7 of 12, 7 of 12, 1 of 12 and 2 of 12, respectively. These proportions differ significantly, $\chi^2 = 11.19$, $df = 3$, $p < 0.02$. The proportions of those who remembered among subjects 3 years old at the time of the event also differ significantly, $\chi^2 = 12.19$, $df = 3$, $p < 0.01$. The offset of childhood amnesia is evidently not at the same age for all events; it occurs earlier for sibling birth and hospitalizations than for family deaths and moves.

Recall Scores

The number of universal questions answered by each subject divided by the total number of such questions asked will be called the *recall score*. Table 2 shows the means and standard deviations of these scores for each event at each age. The standard deviations of these proportions are substantial; that is, there were large individual differences in recall. The means are plotted in Figure 2. To test the significance of the differences among them, and also to explore the possibility of unpredicted sex differences, two analyses of variance (ANOVAs) were conducted on the arcsine-transformed recall scores, using the SAS general linear model (Kirk, 1982; SAS User's Guide, 1985). The first of these focused on the four ages (2, 3, 4, and 5 years) at which we have data for all four events. This 4 × 4 × 2 (Event × Age at Experience × Sex of Subject) ANOVA showed highly significant main effects for event, $F(3, 166) = 5.27$, $p < 0.002$, and age, $F(3, 166) = 13.23$, $p < 0.0001$. For events, protected t tests (Collyer & Enns, 1987; Keppel, 1982) show that birth and hospitalization are both significantly higher than move ($p < 0.025$ and $p < 0.01$, respectively) and death ($p < 0.01$ and $p < 0.0025$). For age, protected t tests show that subjects who were 2 years old at the time of the event scored lower ($p < 0.0005$) than any other age group; those who were 3 years old also scored significantly below those age 4 and 5 ($p < 0.01$ and $p < 0.005$, respectively). The interaction between age and event was not significant, $F(9, 166) = 1.12$, $p = 0.353$. There was no main effect of sex nor any interactions involving this variable.

A second ANOVA was restricted to the two events (birth and move) for which we have data at five ages (1–5 years). This 2 × 5 (Event × Age at Experience) ANOVA again showed highly significant main effects for event, $F(1, 114) = 7.37$, $p < 0.008$, and for age, $F(1, 114) = 13.37$, $p < 0.0001$. Subjects recalling a sibling birth experience remembered more than similar-aged subjects recalling a childhood family move. Protected t tests indicate that adults' recall for events that happened when subjects were 1 year old was

Table 2

Mean Recall Scores (and Standard Deviations) as Functions of Target Event and Age at Experience

Event	1 year M	1 year SD	2 years M	2 years SD	3 years M	3 years SD	4 years M	4 years SD	5 years M	5 years SD
B	.127	.249	.309	.320	.387	.267	.452	.267	.407	.206
H	—	—	.254	.257	.403	.255	.563	.200	.432	.248
D	—	—	.075	.148	.200	.262	.275	.263	.458	.239
M	.010.	.024	.099	.197	.167	.205	.380	.202	.425	.203

Note. There were no 1-year-old subjects in the H and D groups. Dashes indicate data not available. B = birth of a sibling; H = hospitalization; D = death of a family member; M = family move.
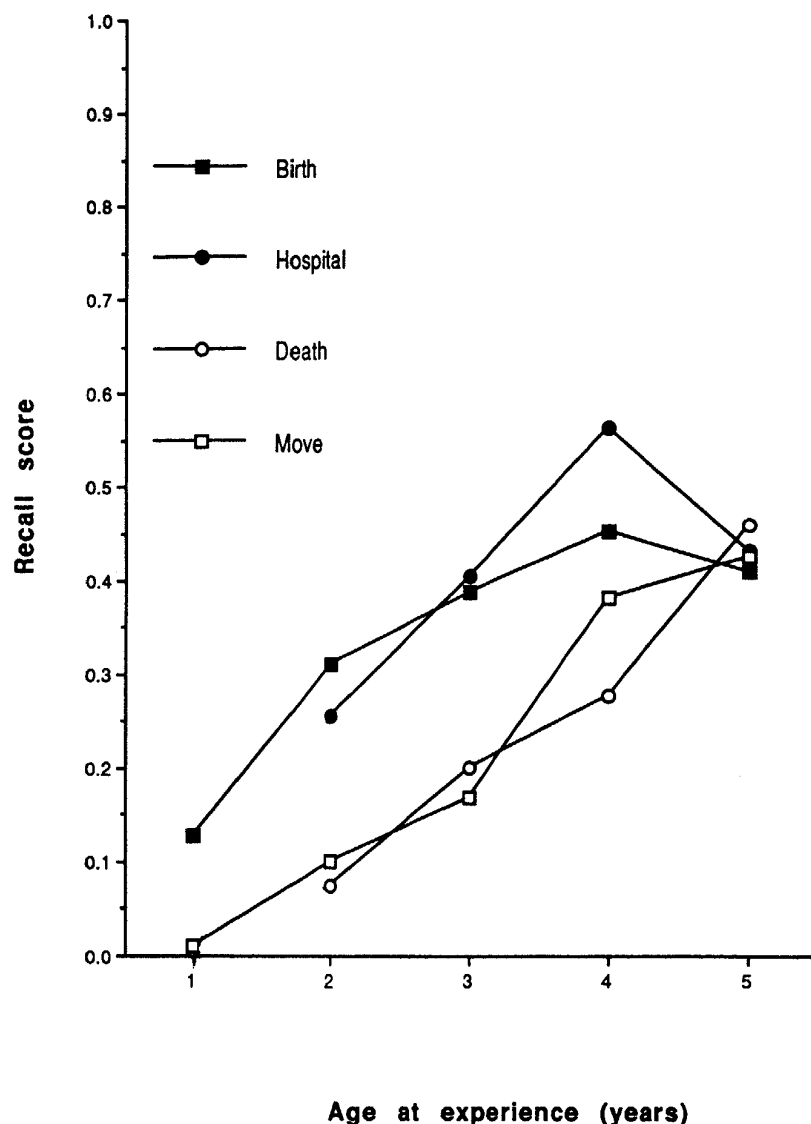
Figure 2. Mean recall scores for four target events as a function of age at experience.

significantly poorer than for events that happened at later ages. There was no event by age interaction.

Emotionality and Recall

Subjects were asked to report their childhood emotional reactions to the target events at four points in each questionnaire. Because the four emotion reports given by the same individual were typically quite similar, only the reactions to the "core event" (mother leaving for the sibling delivery, being in the hospital, hearing of the family member's death, and making the move) were analyzed.

Of the subjects who did remember their feelings, most reported strong positive or negative emotional reactions to

the target events. Examples of negative feelings are "felt a loss," "cried," and "felt terror." More positive emotions included "curious," "excited," and "happy." However, some subjects said they were essentially indifferent to the event. These responses ranged from "felt little emotion," to "didn't care," to "couldn't understand what the fuss was about." Surprisingly, the mean recall scores across all events (omitting 1-year-olds) of those reporting negative, positive, or indifferent feelings at the time of the target event were quite similar: .450 (n = 48), .408 (n = 37), and .412 (n = 14), respectively. (All three scores are much higher than the recall scores for subjects who, while remembering some aspects of the event, did not recall their feeling states, M = .283, n = 56.) The patterns for

each event shown in Table 3 generally follow this overall pattern.

Rehearsal/Review

All subjects were asked whether any of several external information sources (photos or slides, videos or films, family stories, and other objects) had been available to them. The majority (200 of 222) reported having had one or more such external sources. Few subjects reported the presence of either videos or movies ($n = 39$) or other external sources ($n = 8$), so these will not be considered further.

The most common type of potential source of information was family stories, reported by 176 subjects (birth, $n = 49$; hospitalization, $n = 38$; death, $n = 40$; move, $n = 49$). Figure 3 contrasts the patterns of recall for subjects whose families did and did not have stories about each target event. These figures suggest that recall depends on an interaction between age at experience and the presence of family stories, especially for the sibling birth and hospitalization events. Adults who were only 1 or 2 years old when a target event occurred recalled less about that event if family stories were present than if they were not. In contrast, subjects who were 3 years old or older recalled more (or about the same) with stories than without.

To determine whether these recall differences were significant, we dichotomized age at experience into younger (2 and 3 years) and older (4 and 5 years), omitting the 1-year-old group. This established large enough cell sizes for a $4 \times 2 \times 2$ (Event $\times$ Age Level $\times$ Presence of Family Stories) ANOVA on the recall scores. There were main effects of event and age, but no main effect of the presence or absence of family stories. There was, however, a significant Age $\times$ Presence of Family Stories interaction, $F(1, 182) = 6.06, p = .015$, that supported the trends apparent in Figure 3. Family stories about very early experiences apparently have a negative effect on direct recall of these experiences. For later events (ages 4 and 5), there is no effect or perhaps a positive one.

Recall with and without photographs as an external information source may follow a similar pattern, at least for sibling birth (see Figure 4). Using the younger and older age levels described above for the birth, death, and move

events (hospitalization was excluded because only 6 subjects reported relevant photographs), a $3 \times 2 \times 2$ (Event $\times$ Age Level $\times$ Presence of Photographs) ANOVA revealed main effects of event and age but not of photographs. The Presence of Photographs $\times$ Age interaction almost reached significance, $F(1, 136) = 2.79, p = .097$. As with family stories, the presence of photographs seems to reduce recall of experiences at younger ages.

In addition to reporting external information sources, subjects estimated how recently and frequently they had "thought about, talked about, or heard others talk about" the event being remembered. Recency was reported on a 4-point scale, ranging from before high school (1, least recent) to within the last 6 months (4, most recent). Collapsing across ages, we correlated estimated recency with recall scores for each event separately. None of these correlations was significant; the highest was .22 for the sibling birth event. When all events were combined, the correlation was .049. Apart from these correlations, the pattern of recencies across the four events is of some interest in its own right. Table 4 shows what happens when recency of event review was dichotomized at its median; reviews of the death event were relatively recent compared with those of the other three events. Siegel's (1956) extension of the median test shows that this difference is significant ($p < .001$). This result is strikingly different from the pattern of recall across events that appeared in Figure 2.

Estimated frequency of thinking or talking about the events, rated on a 4-point scale ranging from never (1) to many times (4), was significantly correlated with recall scores for the death event ($r = .31, p = .03$), though not for any of the other target events taken individually. Averaged across events, the correlation was .196 ($p = .004$). Table 4 shows that birth of a sibling, hospitalization, and death of a family member were talked about or thought about most frequently and that a family move was talked or thought about least. The majority of subjects reported seldom discussing or thinking about any of the events.

Accuracy

Of the 79 mothers to whom letters were sent, 53 (67%) responded by returning the packet. Eight of them (15%)

Table 3

Mean Recall Scores of Subjects Reporting Different Emotional Responses to Four Target Events, Collapsed Over Ages 2–5

	Category of reported emotion							
	Negative		Positive		Neutral		No report	
Event	Score	N	Score	N	Score	N	Score	N
Seeing baby	.507	7	.489	3	.387	17	.225	15
Staying in hospital	.496	22	—		.412	5	.314	18
Receiving news of death	.368	13	.386	8	—		.308	8
Actually moving	.391	6	.406	3	.430	15	.290	15
Overall	.450	48	.412	14	.408	37	.283	56

Note. Subjects with zero recall scores were omitted.
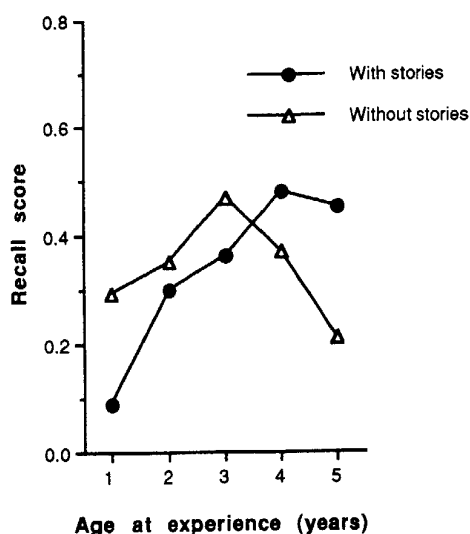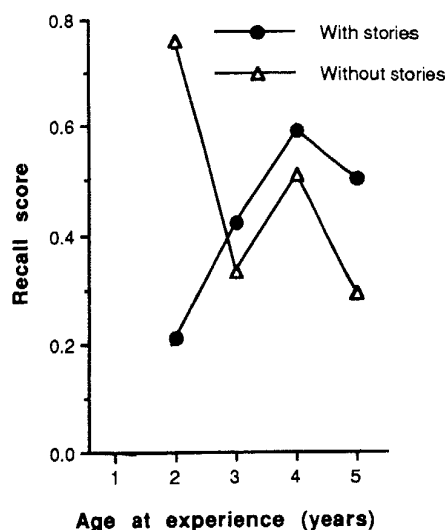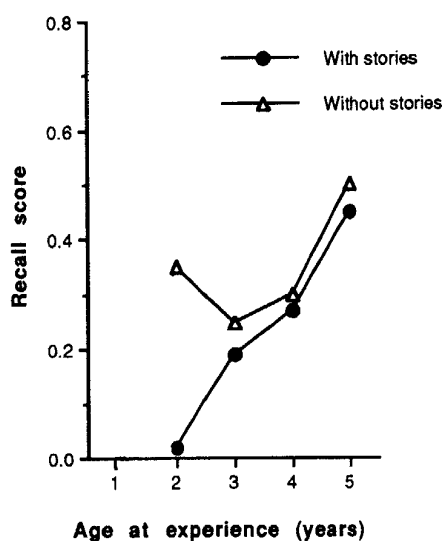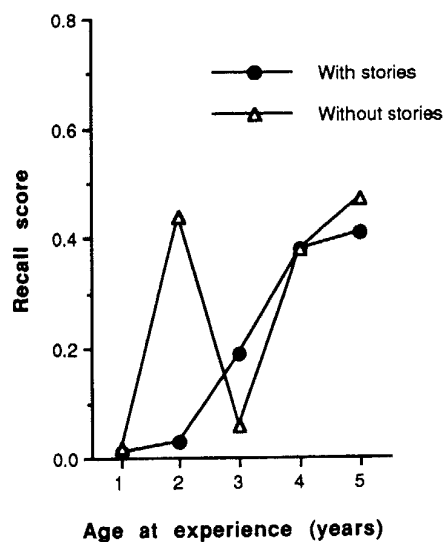
Figure 3. Mean recall scores by age at experience for subjects with and without family stories about four target events.

disputed the age of experience originally given by their children. If the mothers were right, seven of eight age-dating errors were overestimations. Four of these were for the hospitalization event. (The largest discrepancy involved a subject who reported being 5 years old at the time of his hospitalization; his mother said he was only 3.) Two subjects overestimated their ages in dating a family move, and 1 subject overestimated dating the death of a family

member. There were no reported errors in dating sibling births.

Each mother judged the accuracy of every question her child had answered, using the following categories (total number of these responses in each category, summed across all subjects, is in parentheses):

1. My child's memory matches my own (340, 61%).
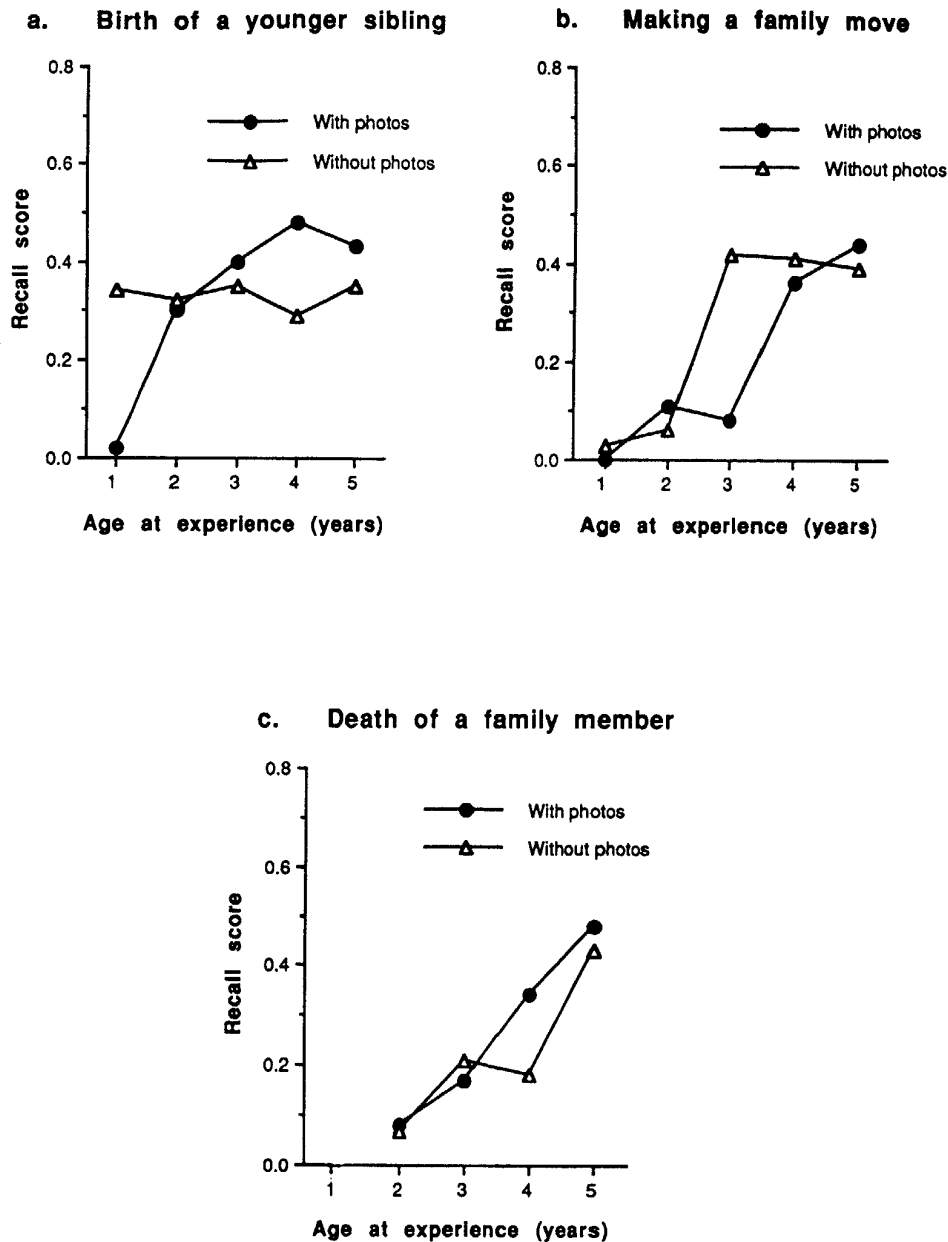2. I believe my child was inaccurate (67, 12%).

Figure 4. Mean recall scores by age at experience for subjects with and without photographs about three target events.

3. Our memories involve different aspects of the event (61, 11%).
4. Although I recalled this differently, s/he may be right (53, 10%).
5. Other (35, 6%).

Inspection of this list indicates that most responses were judged to be accurate and that only a small fraction were definitely wrong.

Conclusions

These results indicate quite clearly that the offset of childhood amnesia, or the earliest age from which an event can be recalled, depends on the nature of the event itself. In particular, the birth of a younger sibling and a hospitalization are significant events in the life of a preschool-age child and are likely to be recalled into adulthood. The offsets for these events occur at age 2, after the second

Table 4

Number of Subjects Who Reported High or Low Recencies/Frequencies of Reviewing Four Target Events

Measure	B	H	D	M	Total
Recency					
More recent	17	13	27	11	68
Less recent	32	37	21	40	130
Total	49	50	48	51	198
$\chi^2(3, N = 198) = 15.94, p < .001$					
Frequency					
More frequent	19	15	19	5	58
Less frequent	30	35	29	46	140
Total	49	50	48	51	198
$\chi^2(3, N = 198) = 12.97, p < .025$					

Note. Each variable was dichotomized at its overall median. Median scores were included with the less recent/frequent group. Data are from subjects who were 2 to 5 years old at the time of the target event. B = birth of a sibling; H = hospitalization; D = death of a family member; M = family move.

birthday and before the third. Thus, some memories are from a substantially ear-lier point in childhood than previous research would have suggested. On the other hand, little or nothing was remembered from events at age 1, before the second birthday.

A second finding of interest involves the differences among the four target events. Rank ordering them by how well they are remembered (when experienced after age 2) puts hospitalization and sibling birth a close first and second, death of a family member third, and family move fourth. Recall for experiences at age 1 also placed sibling birth above family move. The lack of an Event × Age at Experience interaction suggests that all four events may be equally vulnerable to the factors contributing to childhood amnesia.

We were surprised to find that reported affective state at the time of the experience was unrelated to the amount recalled. Whether emotions were judged to have been negative, positive, or neutral, recall remained about the same. However, this finding must be interpreted with caution. Subjects were not asked to report the intensity of their emotions when target events took place, and mothers were not asked to confirm their childrens' emotional states. It may be unwise to put too much weight on these remembered feelings.

Many families document children's life events with stories and photographs. The relationship of these external information sources to lasting adult memories is more complicated than a simple rehearsal hypothesis might suggest. In our data, that relationship depended on the child's age at the time of the experience. Individuals who had been 3 years old or younger recalled less if they had access to family stories or photographs than if they did not. Perhaps the little that is remembered about very early life events becomes confounded with such external information when such information is available. As a result, the subject has no recollections that meet the experimenters' criterion of being actual memories. In this way, family narratives and photographs may actually block memory of very early life events. In contrast, external information sources may strengthen recollec-

tions that are already more substantial in their own right—for example, those from ages 4 and 5.

In another attempt to clarify the role of "rehearsal" in maintaining early memories, we asked subjects to estimate both how recently and how frequently they had talked or thought about the events in question. Here again, the results were complex. The recency estimates were entirely unrelated to memory. Not only were all the correlations insignificant, but the most recently reviewed event (death in the family) is one of the most poorly remembered. The frequency estimates, in contrast, did show positive correlations with recall. This correlation was highest (and independently significant) for the death event. Note, however, that one component of subjects' estimates was the frequency of thinking about the event. Because one can only think about experiences that one remembers (or at least seems to remember), these correlations may reflect an effect of memory on rehearsal rather than an effect of rehearsal on memory.

It is evidently a mistake to think of childhood amnesia as a unitary phenomenon that terminates at some specific age. Our results show that the offset of the amnesia varies with the kind of experience in question. Some events are likely to remain in memory even if they occur at age 2; sibling birth and hospitalization are examples in these data. We do not think the survival of these memories depends on external aids like family stories; if anything, such aids seem to have a negative effect on the earliest memories. We are inclined to take these recollections at face value and attribute their longevity to special factors that vary from one event to the next. The birth of a sibling may be particularly memorable because it forms part of an early and well-structured narrative: "You're going to have a little sister/brother . . . here s/he is. From now on, everything is different." Hospitalization is an extremely unusual event and also a frightening one; the combination may help to make it unforgettable. These hypotheses are admittedly ad hoc; what we know is only that sibling birth and hospitalization are remembered from a very early age.

Conversely, we have shown that little—indeed, usually nothing—is recalled from the first 2 years of life. This applies to all the target events of our study, even the most memorable ones. As noted above, the neural mechanisms serving episodic memory may not be fully mature until about the second birthday. Even in the 3rd and 4th years, only a few specially privileged experiences—here, sibling birth and hospitalization—are likely to persist into adult memory. All other events from this period, even important ones like a death or a move, still fall victim to the pervasive adult amnesia for early childhood. When memories do begin to appear, they are relatively thin and incomplete. In all likelihood, this incompleteness results from poor understanding of the experiences themselves and from their significance. Where there is no schematic understanding of individual events and no schematic life narrative to interrelate them, little recall can be expected.

Our data indicate that what individuals recall about early life events is relatively accurate. The mothers' reports suggest that, if anything, adults may overestimate how old they were at the time of a childhood event. Nevertheless, the details recalled are generally correct. Most important, we have

found that the offset of childhood amnesia, thus the beginning of memory, does not occur at the same age for all events. Going to the hospital or having a new sibling come into one's life are memorable events even when they occur at the age of 2. Other events, even those as important as a move or a death in the family, are not recalled in adulthood unless they occur somewhat later.

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Clarification to Fisk and Rogers (1991)

The article published in the *Journal of Experimental Psychology: General* by A. D. Fisk and W. A. Rogers ("Toward an Understanding of Age-Related Memory and Visual Search Effects," 1991, Vol. 120, No. 2, pp. 131–149) was based on a large portion of data used in a different analysis reported in an earlier article by W. A. Rogers and A. D. Fisk ("A Reconsideration of Age-Related Reaction Time Slowing From a Learning Perspective: Age-Related Slowing Is Not Just Complexity Based," *Learning and Individual Differences,* 1990, Vol. 2, No. 2, pp. 161–179). Each article makes a unique contribution; however, this note is provided to assist individuals considering performing a meta-analysis including those data.——Arthur D. Fisk and Wendy A. Rogers