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The distribution of early childhood memories

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The quantitative distribution of autobiographical memories for the first decade of life is described. The distribution, based on over 11,000 autobiographical memories from age 10 and younger from published studies, is nearly identical for males and females, for participants of different ages, and for different methods of collecting data, including using words to cue memories from anywhere in the lifespan or from just the childhood years, exhaustive listing of all early memories, and interviews.

INTRODUCTION

In recent years, many articles have collected original data, reviewed existing theories, or proposed new ones to account for the distribution of memories from early childhood (Bruhn, 1990; Eacott & Crawley, 1998, 1999; Fitzgerald, 1991; Habermas & Bluck, in press; Howe & Courage, 1993; Pillemer, 1998b; Pillemer & White, 1989; Usher & Neisser, 1993; Welch-Ross, 1995; West & Bauer, 1999; Wetzler & Sweeney, 1986). I will not add to this empirical or theoretical literature. Rather I will summarise the quantitative data and use them to answer four questions. First, what is the shape of the distribution of autobiographical memories over the first decade of life? Second, do the results depend on the method used? Third, are there gender differences in the distribution? Fourth, as suggested by the folklore on reminiscence in older adults as well as the observation that literature about childhood is often written later in adulthood (Salaman, 1970), do people of different ages have different distributions?

Four basic methods have been used to obtain distributions of early memories. In an example of the first, which I will call the *exhaustive-search method*, Waldfogel (1948) had participants spend two sessions, each almost 1.5 hours long, separated by about seven weeks, recording experi-

ences up to their eighth birthday. He then tabulated the number of unique, non-repeated memories for each person as a function of age. In another example of the exhaustive-search method, Crovitz and Harvey (1979) had students spend four hours a week for each of 12 weeks listing memories of episodes that occurred before age 8. The second method is the *word-cued method* first used by Galton (1879), modified and revived by Crovitz and Schiffman (1974), and now used commonly in autobiographical memory research (Franklin & Holding, 1977; Rubin, 1982; Rubin & Schulkind, 1997). Words are used to cue single memories and no mention is made of specific target periods of life. The third method, which Fitzgerald (1991) termed the *focused method*, modifies the word-cued method by asking for memories from a particular period. As an example, in the Crovitz, Harvey, and McKee (1980) study, undergraduates spent up to three minutes trying to recall an autobiographical memory from before age 8, cued by each of 20 nouns. The fourth method is an intensive personal *interview* to elicit memories, as used in the Thorne (1995) study.

Table 1 presents all the data that I could find on the distribution of *early* childhood memories, as opposed to age of the *earliest* childhood memory. Although much of the literature addresses the

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TABLE 1
Number of memories as a function of the reported age of the memory

Study	Age ^a		N ^b	Reported age at event											
	Gender			0	1	2	3	4	5	6	7	8	9	10	
<i>Exhaustive search method</i>															
Crovitz & Harvey	21	–	18	6	8	36	61	145	271	337	326				
Waldfoegel	20	F	76	1	12	63	264	526	848	1051	1267				
		M	48	0	3	24	88	318	557	689	776				
<i>Word-cued method</i>															
Franklin & Holding	30	F	10	0	0	0	2	0	4	1	2	6	3	1	
		M	10	0	0	0	1	3	3	1	4	1	2	0	
	40	F	10	0	1	2	3	0	7	3	5	3	4	7	
		M	10	1	0	2	0	2	1	4	4	2	0	7	
	50	F	10	0	0	2	2	12	3	5	8	5	3	7	
		M	10	0	1	1	0	1	4	10	8	15	5	11	
	60	F	10	0	1	0	0	1	1	4	3	5	2	5	
		M	10	0	0	1	0	0	3	6	5	10	2	6	
	70	F	10	0	0	0	0	1	3	7	4	7	2	5	
		M	10	0	1	0	1	1	11	8	6	14	15	11	
	Rubin, Experiment 1	18	–	48	1	0	2	7	13	39	59	52	75	61	123
	Rubin & Schulkind	20	F	12	0	1	1	3	6	8	11	8	19	21	12
M			8	0	0	0	5	6	9	12	12	15	28	22	
Biased ^c	20	F	11	0	3	3	10	17	23	37	32	48	37	64	
Biased ^c		M	9	0	0	0	3	20	16	22	31	26	33	31	
	35	F	12	0	0	0	1	4	3	8	5	6	5	12	
		M	8	0	0	0	0	1	5	4	3	2	2	7	
	70	F	13	0	0	4	3	5	6	10	4	6	8	8	
		M	7	0	1	0	5	6	7	13	5	8	4	6	
	73	F	7	0	1	2	0	2	4	6	13	14	6	7	
		M	13	2	1	1	1	1	12	12	13	12	15	10	
	20	F	16	2	2	3	9	30	35	45	36	37	26	20	
		M	4	0	1	0	0	0	1	5	3	1	2	4	
Rubin, Wetzler, & Nebes	20	–	20	0	1	1	2	7	10	14	10	3	4	7	
	71	–	20	0	0	1	1	7	7	6	4	9	6	7	
<i>Focused word-cued method</i>															
Crovitz, Harvey, & McKee	21	–	18	0	0	10	23	30	72	67	88				
Crovitz & Q., Experiment 1	20	–	155	0	0	8	35	110	184	195	222				
	Experiment 2	20	–	44	0	0	1	13	26	41	47	44			
Fitzgerald	10	–	8	0	3	11	26	79	125						
<i>Interview method</i>															
Thorne	23	F	48	0	0	1	6	13	22	23	25	18	24	20	
		M	47	0	0	0	6	15	17	10	17	22	20	22	

^a The age of participants in most studies is the mean or nominal age of the group, with college undergraduates assumed to be 20 years old.

^b N is the number of participants whose data contributed to the row.

^c Participants in the biased condition were given instructions that biased them towards having earlier memories.

issue of the earliest childhood memory, there is little data provided by this question, because, by definition, each participant can provide only one memory. I therefore restrict my empirical summary to the distribution of early childhood memories. Table 1 gives an abbreviated reference that unambiguously refers to a reference listed at the end of the paper, and notes the method used to

collect the data, the age of the participants, and the gender of the participants, if there was a report by gender. Most of the data were taken from tables and figures in published articles, but some were made available by the researchers. The *Reported Age at Event* column refers to the age the participants reported themselves to be at the time of the event noted in the memory, with a zero

indicating a date prior to their first birthday, a one indicating memories dated as occurring when the participant was one year old (i.e. after their first birthday but before their second), and so forth.

The following procedures were used to provide values to plot to for ages 0–7 and for ages 0–10. All data listed in Table 1 were used, except for the Fitzgerald (1991) study, which was excluded from all analyses because it lists memories only to age 5. For the values to age 7, all studies (except the Fitzgerald study) were added for ages 0–7 and converted to proportions by dividing by 10,118, the total number of memories up to age 7. These eight proportions therefore sum to 1.00 and they are the most reliable because they are based on the greatest number of studies. The eight proportions for ages 0–7 are: .0013, .0037, .0167, .0548, .1314, .2211, .2700, and .3010. The calculations for ages 0–10 were slightly more complex because not all studies contributed to all ages. The studies that provided data for all years between 0 and 10 had a total of 2396 memories, 51.13% of which were from ages 0–7. The sum of the values for ages 8, 9, and 10 were each divided by the total number of memories (i.e., 2396) to create proportions. The eight values given earlier in the paragraph for ages 0–7 were then multiplied by .5113 so that the total proportion of memories from ages 0–7 would be what it was in the studies that provided data to age 10. This results in a set of 11 values that sum to be 1.00. These 11 proportions for ages 0–10 are: .0007, .0019, .0085, .0280, .0672, .1130, .1380, .1539, .1624, .1419, and .1845.

TableCurve 2D (1994) was used to find a good fit to the data. Of its 105 two-parameter functions (many of which were excluded because they involved taking the reciprocal or logarithm of time, which here included a zero value), the best fitting equation for both the 8 points up to age 7 and the 11 points up to age 10 listed in the previous paragraph had the form $y = 1/(a + be^{-t})$, where a and b are constants, y is the proportion of memories, and t is age in years. For the data up to age 7, the values of a and b were 3.08 and 241.25, and the equation accounted for 99.63% of the variance. For the somewhat more variable data up to age 10, the values of a and b were 5.90 and 493.77, and the equation accounted for 97.97% of the variance. The a and b parameters are about twice as large in the 11-point as the 8-point data set because the proportion values to be predicted are about half as large. The equations provide an excellent mathematical description of the data. Their theoretical value is less clear because there

Figure 1. The distribution of autobiographical memories from early childhood aggregated over available studies.

is only one independent set of data being fit and there was no *a priori* theoretical motivation for any particular equation (see Rubin, Hinton, & Wenzel, 1999, and Rubin & Wenzel, 1996 for a discussion of this issue).

Figure 1 presents the proportion of early memories listed over the first decade of life. Given the arbitrary nature of the curve fit, the line on Figure 1 was drawn through the values from 0–7. After age 7, when fewer studies contribute to the proportion and the data are more variable, the line was drawn using the equation. Although the plot after age 7 becomes much more variable, I included years 8, 9, and 10 to show that there is a decrease in the slope of the function before age 11.

Figure 2 shows the results from the word-cued, focused, interview, and exhaustive-search

Figure 2. The distribution of autobiographical memories from early childhood for each of four methods of data collection.

methods separately up to age 7, which is the age to which the focused and exhaustive-search methods have been used. The values are the proportion of memories up to age 7 at each year, and the line fit is the set of eight proportions given three paragraphs earlier that were based on all the data up to age 7. There is little difference among the four methods. The differences that do exist do not seem to be reliable in that no method is higher or lower than the others for a period of time. A possible exception is the interview method, which is higher for years 3, 4, and 5, but which is also based on the least data and so is the most variable. Thus, within the accuracy of the combined studies included here, all methods produce similar results and the distribution therefore cannot be attributed to the method used.

Figure 3 shows each gender separately using the same method of combining studies that went to age 7 with those that went to age 10, but using the values for each gender separately. Consistent with other analyses of the distribution of autobiographical memories over the lifespan (Rubin, Schulkind, & Rahhal, 1999), gender differences are at best very small. Females might have slightly more memories for ages 2, 3, and 4, but it is not clear whether this difference is reliable because the original studies did not include measures of variability at each value. At most of the other points up to age 7, where the data become more variable, the points for males and females overlap.

Figure 4 shows the age of the participants divided into three groups: undergraduates and

Figure 3. The distribution of autobiographical memories from early childhood shown separately for males and females.

Figure 4. The distribution of autobiographical memories from early childhood shown separately for participants of different age groups.

adults in their 20s, adults in their 30s, 40s, and 50s and older adults in their 60s and 70s. Because the latter two groups had data only from the word-cue method, only data from this method were used for the youngest group. The same line that appears in Figure 1 is used to allow for an easy comparison with the pooled data. Again there appears to be little difference among the groups.

In summary, childhood amnesia, as measured by the distribution of autobiographical memories, is a robust phenomenon that is nearly identical in quantitative terms in studies using different methods and different populations. Of the autobiographical memories reported as occurring before age 11, 1.1% occurred before age 3, with a sharp rise after that point. Two limitations need to be added to these conclusions. First, only the number of early childhood memories has been noted. We know much less about their content, vividness, narrative coherence, the amount of detail included, the sense that the memories were recollected rather than just known (Rybash & Monaghan, 1999), and their other properties. The second limitation is that all the data reviewed were collected in the USA. Data from other cultures would almost certainly be different (Mullen, 1994; Pillemer, 1998a). Given the stability of the USA data reviewed here over a host of methods and populations, any differences should be easy to observe.

REFERENCES

- Bruhn, A.R. (1990). *Earliest childhood memories: Theory and application to clinical practice (Vol 1)*. New York: Praeger.
- Crovitz, H.F., & Harvey, M.T. (1979). Early childhood amnesia: A quantitative study with implications for the study of retrograde amnesia after brain injury. *Cortex*, 15, 331–335.
- Crovitz, H.F., Harvey, M.T., & McKee, D.C. (1980). Selecting retrieval cues for early-childhood amnesia: Implications for the study of shrinking retrograde amnesia. *Cortex*, 16, 305–310.
- Crovitz, H.F., & Quina-Holland, K. (1976). Proportion of episodic memories from early childhood by years of age. *Bulletin of the Psychonomic Society*, 7, 61–62.
- Crovitz, H.F., & Schiffman, H. (1974). Frequency of episodic memories as a function of their age. *Bulletin of the Psychonomic Society*, 4, 517–518.
- Eacott, M. J., & Crawley, R.A. (1998). The offset of childhood amnesia: Memory for events that occurred before age 3. *Journal of Experimental Psychology: General*, 127, 23–33.
- Eacott, M.J., & Crawley, R.A. (1999). Childhood amnesia: On answering questions about very early life events. *Memory*, 7, 279–292.
- Fitzgerald, J.M. (1991). A developmental account of early childhood amnesia. *The Journal of Genetic Psychology*, 152, 150–171.
- Franklin, H.C., & Holding, D.H. (1977). Personal memories at different ages. *Quarterly Journal of Experimental Psychology*, 29, 527–532.
- Galton, F. (1879). Psychometric experiments. *Brain*, 2, 149–162.
- Habermas, T., & Bluck, S. (in press). Getting a life: The emergence of the life story in adolescence. *Psychological Bulletin*.
- Howe, M.L., & Courage, M.L. (1993). On resolving the enigma of infantile amnesia. *Psychological Bulletin*, 113, 305–326.
- Mullen, M.K. (1994). Earliest recollections of childhood: A demographic analysis. *Cognition*, 52, 55–79.
- Pillemer, D.B. (1998a). *Momentous events, vivid memories*. Cambridge, MA: Harvard University Press.
- Pillemer, D.B. (1998b). What is remembered about early events? *Clinical Psychology Review*, 18, 859–913.
- Pillemer, D.B., & White S.H. (1989). Childhood events recalled by children and adults. *Advances in Child Development and Behavior*, 21, 297–340.
- Rubin, D.C. (1982). On the retention function for autobiographical memory. *Journal of Verbal Learning and Verbal Behavior*, 21, 21–38.
- Rubin, D.C., Hinton, S., & Wenzel, A. (1999). The precise time course of retention. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 25, 1161–1176.
- Rubin, D.C., & Schulkind, M.D. (1997). Distribution of important and word-cued autobiographical memories in 20, 35, and 70 year-old adults. *Psychology and Aging*, 12, 524–535.
- Rubin, D.C., Schulkind, M.D., & Rahhal, T.A. (1999). A study of gender differences in autobiographical memory: Broken down by age and sex. *Journal of Adult Development*, 6, 61–72.
- Rubin, D.C., & Wenzel, A.E. (1996). One hundred years of forgetting: A quantitative description of retention. *Psychological Review*, 103, 734–760.
- Rubin, D.C., Wetzler, S.E., & Nebes, R.D. (1986). Autobiographical memory across the adult lifespan. In D.C. Rubin (Ed.), *Autobiographical memory* (pp. 202–221). Cambridge: Cambridge University Press.
- Rybash, J.M., & Monaghan, B.E. (1999). Episodic and semantic contributions to older adults' autobiographical recall. *Journal of General Psychology*, 126, 85–96.
- Salaman, E. (1970). *A collection of moments: A study of involuntary memories*. New York: St. Martine Press.
- TableCurve 2D (1994). [Computer Software]. San Raphael, CA: Jandel Scientific.
- Thorne, A. (1995). Developmental truths in memories of childhood and adolescence. *Journal of Personality*, 63, 139–163.
- Usher, J.A., & Neisser, U. (1993). Childhood amnesia and the beginnings of memory for four early life events. *Journal of Experimental Psychology: General*, 122, 155–165.
- Waldfogel, S. (1948). The frequency and affective character of childhood memories. *Psychological Monographs: General and Applied*, 62(4), (Whole No. 291).
- Welch-Ross, M.K. (1995). An integrative model of the development of autobiographical memory. *Developmental Review*, 15, 338–365.
- West, T.A., & Bauer, P.J. (1999). Assumptions of infantile amnesia: Are there differences between early and late memories? *Memory*, 7, 257–278.
- Wetzler, S.E., & Sweeney, J.A. (1986). Childhood amnesia: An empirical demonstration. In D.C. Rubin (Ed.), *Autobiographical memory* (pp. 202–221). Cambridge: Cambridge University Press.