

Temporal distribution of favourite books, movies, and records: Differential encoding and re-sampling

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The reminiscence bump is the effect that people recall more personal events from early adulthood than from childhood or adulthood. The bump has been examined extensively. However, the question of whether the bump is caused by differential encoding or re-sampling is still unanswered. To examine this issue, participants were asked to name their three favourite books, movies, and records. Furthermore, they were asked when they first encountered them. We compared the temporal distributions and found that they all showed recency effects and reminiscence bumps. The distribution of favourite books had the largest recency effect and the distribution of favourite records had the largest reminiscence bump. We can explain these results by the difference in rehearsal. Books are read two or three times, movies are watched more frequently, whereas records are listened to numerous times. The results suggest that differential encoding initially causes the reminiscence bump and that re-sampling increases the bump further.

AUTOBIOGRAPHICAL MEMORY

When people speak of autobiographical memory, they are referring to the memories a person has of his or her own life experiences (Robinson, 1986). Autobiographical memory does not only consist of personal memories that are remembered vividly, but also of autobiographical facts (Brewer, 1986). Conway and Pleydell-Pearce (2000; see also Conway, 2005; Conway, Singer, & Tagini, 2004) proposed an autobiographical memory model called the Self-Memory System (SMS). The SMS consists of the working self and the long-term self. The working self refers to the goals a person currently has. The long-term self consists of the conceptual self and the autobiographical knowledge base, which comprises three levels of specificity: lifetime periods, general events, and event-specific knowledge. Lifetime periods contain general events, which can be

single or repeated events. Those general events in turn contain event-specific knowledge. The SMS integrates episodic memories into the autobiographical knowledge base, which is used to form goals in the working self and self-schemas in the conceptual self. Arguably, one part of the autobiographical knowledge base concerns personal information, such as what one's favourite books, movies and records are. We will therefore look at what the temporal distributions of those books, movies, and records can tell us about autobiographical memory.

Several authors have focused on the temporal distribution of autobiographical memory across the life span. Such lifetime distributions tend to have three main components (Conway & Pleydell-Pearce, 2000; Rubin, Wetzler, & Nebes, 1986; Rybash, 1999). The first main component is called childhood amnesia (or infantile amnesia). People recall few events from the first years of

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their life. The second main component is the reminiscence bump (RB). People recall relatively many events from adolescence and early adulthood. The RB is usually followed by a period with fewer memories. Finally, most recalled events are from the last (most recent) few years. This is called the recency effect (or retention effect).

Cermak (1984) considered these recent personal events to be episodic, while he thought that most remote memories were semantic. Episodic memories are generally seen as personal events bound to a spatial and temporal context, while semantic memories or autobiographical facts contain knowledge about personal events (Brewer, 1986; Tulving, 1972). Schooler, Shiffrin, and Raaijmakers (2001) proposed a theory about how episodic memories could lose their contextual information and so become semantic memories. Many theorists assume that episodic memories are progressively modified in neocortical regions until they are independent of the hippocampal complex (e.g., Meeter & Murre, 2004; Murre, 1996, 1997; Rosenbaum, Winocur, & Moscovitch, 2001). This mechanism could explain the Ribot gradient in retrograde amnesia following hippocampal damage. However, Rybash and Monaghan (1999) presented participants with 18 cue words. The participants had to describe for each cue word the memory that came to mind first. Then they had to indicate whether they remembered the event or knew that the event had occurred. Finally, they had to date the events. Rybash and Monaghan found that both distributions had a RB and a retention effect. The RB does not only consist of semantic knowledge, while the recency effect does not only consist of episodic memories.

Research on the temporal distribution of autobiographical memory has mainly focused on the RB and possible effects of age (e.g., Hyland & Ackerman, 1988; Janssen, Chessa, & Murre, 2005; also see Murre & Janssen, 2006). The main problem with comparing the distributions of different age groups is that the recency effect coincides with the RB for adolescents and young adults. To solve this problem, Janssen et al. proposed a method to remove the recency effect and uncover the underlying lifetime distribution. When using this method, Janssen et al. found that the recency effect obscured the RB in the temporal distributions of adolescents and young adults.

There are three general explanations for the occurrence of the RB. The first general explanation is that in certain calendar years more

memorable events happened than in other calendar years. There is some evidence that there are external influences on the temporal distribution of personal events (Conway & Haque, 1999; Jansari & Parkin, 1996; Rubin & Berntsen, 2003; Schrauf & Rubin, 2001). However, the RB is a very robust phenomenon. It is present in the distributions of many different age groups. The locations of the RB of these groups fall on different calendar years, but similar ages (Rubin et al., 1986). This explanation is therefore insufficient, although certain public events may affect the temporal distribution of personal events.

The second general explanation is called re-sampling. It states that at a certain age people start reminiscing about events from the period when they were adolescents or young adults (Rubin et al., 1986). However, this explanation has some theoretical shortcomings. It is unclear why people mainly rehearse events from adolescence and early adulthood and not events from other lifetime periods. Furthermore, Merriam and Cross (1982), Hyland and Ackerman (1988), and Webster and McCall (1999) found no difference in the amount of reminiscing of younger and older people. Finally, the re-sampling explanation is unlikely to be the sole mechanism, because the distributions of adolescents and young adults display RBs too (Janssen et al., 2005).

The third general explanation is called differential encoding. It states that events in adolescence and early adulthood are stored better than in other lifetime periods (Rubin, Rahhal, & Poon, 1998; Rubin et al., 1986). Four mechanisms are given for differential encoding, which are not mutually exclusive. First, there are more novel events in that lifetime period (cognitive account). These first-time experiences are encoded more strongly, because they will be used later on in life as exemplars when people experience similar events (Pillemer, 2001; Robinson, 1992). Second, people form their identity during that lifetime period (identity formation or self narrative account). Conway (2005; also see Fitzgerald, 1988) hypothesises that many self-defining memories, which are vivid and emotional memories of personal events that have a large impact on the identity of a person (Conway et al., 2004), come from adolescence and early adulthood. Third, more transitional events occur during that lifetime period (life scripts account). When people are asked to date their most important personal events, they recall events, such as graduation, wedding, and retirement (Berntsen & Rubin,

2002; Rubin & Berntsen, 2003). These important events are often positive, but sometimes negative. The positive events usually occur in early adulthood, whereas the negative events can occur at any moment in people's lives (Berntsen & Rubin, 2004; Rubin & Berntsen, 2003). Fourth, the events are stored better, because the brain works at an optimum, causing the memory system to work more efficiently in that lifetime period (biological account). This mechanism is supported by results that the RB has been also found in the temporal distribution of public events (Howes & Katz, 1988; Rubin et al., 1998; Schuman, Belli, & Bischooping, 1997; also see Janssen, Murre, & Meeter, 2007).

Our view, however, is that both differential encoding *and* re-sampling influence the RB (Janssen et al., 2005; Murre & Janssen, 2006). Janssen et al. found RBs in autobiographical memory distributions of all age groups, but the size of the RB became larger as participants became older. We concluded that personal events are encoded more strongly during adolescence and early adulthood, causing the RB in the distribution of young adults, and that personal events from adolescence and early adulthood are re-sampled more frequently than events from other lifetime periods, causing the increase in the size of the RB in older participants.

FAVOURITES QUESTIONNAIRE

To examine the role of re-sampling more closely, one could give people an autobiographical memory test and ask them how frequently they had thought of each recalled event. However, people are very poor at judging their past memory performance (Arnold & Lindsay, 2002, 2005; Joslyn, Loftus, McNoughton, & Powers, 2001; Parks, 1999). Therefore, we set up an experiment in which the stimuli have a priori different levels of rehearsal, but still are related to autobiographical memory. In the experiment, participants were asked to name their three favourite books, movies, and records and to indicate when they had encountered these items for the first time. We will look at the effect of the different levels of rehearsal on the recency effect and the RB.

The favourite items can be seen as a part of autobiographical memory in several ways. They can be regarded as vivid personal memories or as autobiographical facts (Brewer, 1986). First, the items can be seen as event-specific knowledge

about single events in the autobiographical knowledge base. For example, a person might prefer the movie *Titanic*, because she went to see that movie with the man she later married. Second, the items can be seen as event-specific knowledge about repeated events. For example, people might name *Abbey Road* as their favourite record, because they often listened to The Beatles when they were at high school. A third way is that the items can be seen as representations of the goals in the working self or self-schemas in the conceptual self. For example, a person might prefer the book *Martin Eden* by Jack London, because he identifies himself with the main character of the book, since he has met similar adversities as the main character. People might also identify themselves with a certain music genre, because it represents the beliefs and attitudes that they have.

The temporal distributions of favourite records, movies, and books have been examined separately by Holbrook and Schindler (1989, 1996), Larsen (1996), Schulster (1996), and Smith (1994), but to our knowledge there has not yet been an experiment in which the distributions of books, movies, and records are compared directly. Larsen examined the temporal distribution of favourite books. He asked older adults to name their favourite book and to indicate when they had read the book. Larsen found that most books came from the previous decade, but also that many other books came from the period in which the participants were between 10 and 40 years old. The temporal distribution of favourite records was examined by Holbrook and Schindler and by Smith. Holbrook and Schindler selected popular music hits from the period 1932–1986 in their first study. They asked participants to rate their preference for each hit on a 10-point scale. Holbrook and Schindler compared preference rating with age at the time the song was a hit. They found a reversed U-shape, which peaked at 24. People preferred music that stems from the period when they were about 24 years old. Smith asked participants to rate their favourability towards different music styles on a 5-point scale. Smith found a cohort effect on the popularity of music styles. He found, for example, that bluegrass, country, and Broadway musicals were the most popular among participants who were born between 1920 and 1930, whereas gospel, folk music, easy listening, and opera were the most popular among participants who were born between 1930 and 1940. Holbrook and Schindler

and Schulster examined the temporal distribution of favourite movies. Holbrook and Schindler used the same design as in their first study. They selected films that had won the Academy Award for Best Picture from the period 1927–1988. They asked participants to rate their preference for each winner on a 10-point scale. Holbrook and Schindler compared preference rating with age at the time that the picture was released. They found that participants preferred movies that were released in the period when they were about 26 years old. Schulster asked participants to name their favourite movies, and asked when they saw these movies for the first time. Schulster found that the average age at which people saw their favourite movie was 27.6 years. Please note that recent movies can skew the average age at which favourite movies are watched for the first time. For example, if a 60-year-old participant recalls two movies that he saw for the first time when he was 15 years old and one movie that he saw for the first time when he was 60 years old, then the average age at which he saw his favourite movies is 30 years. However, the mode of the age at which he saw his favourite movies is 15 years.

In this experiment we ask participants when they encountered their favourite books, movies, and records for the first time. We use these dates to make lifetime distributions. If re-sampling is the sole cause of the RB, we should not find a RB in the temporal distribution of books, since books are hardly rehearsed. If differential encoding is the sole cause of the RB, we should not find any differences between the distributions of the three types of media. Our view is that both differential encoding and re-sampling influence the RB. We hypothesise that differential encoding initially causes the RB in the temporal distribution of autobiographical memory, and that personal events from adolescence and early adulthood are re-sampled more frequently than events from other lifetime periods (Janssen et al., 2005; Murre & Janssen, 2006). Because we assume that favourite items are event-specific knowledge in the autobiographical knowledge base, representations of goals in the working self, or representations of self-schemas in the conceptual self, we expect to find similar recency effects and RBs in the temporal distributions of favourite items. We expect to find that participants will prefer more recent items, which they have encountered for the first time in the previous 5 years, compared to the number of items that they encountered for the first time in any other period.

We also expect to find that participants will name more recent books than recent movies and records, because books are re-sampled less frequently. Furthermore, we expect to find that participants will name relatively more items that they encountered for the first time when they were between 10 and 25 years old than items that they encountered for the first time in any other lifetime period (besides the last 5 years), because personal events are encoded more strongly during that period. We also expect to find that participants will name more records from the period in which they were between 10 and 25 years old compared with books and movies from that period, because records are re-sampled more frequently. Finally, we expect to find no differences in the location of the peak of the RB between the three types of media, because the location is determined by differential encoding.

There is possible cross-contamination between the three types of media in all six directions. There are soundtracks (e.g., *The Bodyguard* by Whitney Houston or *Ascenseur pour L'Echafaud* by Miles Davis), and there are records about books (e.g., *Wuthering Heights* by Kate Bush and *White Rabbit* by Jefferson Airplane). Furthermore, there are books about movies (e.g., *Star Wars: Tatooine Ghost* by Troy Denning), and there are books about records (e.g., *Norwegian Wood* by Haruki Murakami and *High Fidelity* by Nick Hornby). Finally, there are musicals (e.g., *Grease* and *The Sound of Music*), but arguably the most common type of cross-contamination is the movie adaptation (e.g., *The Lord of the Rings* and *Harry Potter*). Therefore, we ask participants first what their favourite movies are.

METHOD

Participants

The test, which we called the Favourites Questionnaire, was administered in Dutch and English via the Internet, where it is available at <http://memory.uva.nl/>. Participants could come into contact with our website in at least four ways: (1) through links on other websites, (2) through search engines, (3) through promotion in traditional media, such as articles in newspapers and magazines, which included our web address, or (4) through word of mouth. At the end of the test, participants could invite relatives, friends, and

colleagues by sending them standardised e-mails. Furthermore, we invited participants who had taken other tests on our website to take this test as well.

The results analysed in this article were gathered between January 2005 and October 2006. During this period 2161 participants answered the questionnaire. The majority of the participants were female (67.89%) and many participants had a college or university degree or an equivalent of a college or university degree (59.89%). Most participants came from the Netherlands ($N=1279$), followed by the United States ($N=406$), United Kingdom ($N=104$), Belgium ($N=66$), Australia ($N=64$), and Canada ($N=54$). The remaining 188 participants came from other countries. The average age of the participants was 35.57 years ($SD=14.46$). We divided the participants into 12 age groups (see Table 1). There were more participants in the young age groups than in the older age groups, $\chi^2(11, N=2161) = 11.00, p = .50$. However, this unequal distribution will not affect the results, because we will look at the relative proportions within each age group. We did not ask for socioeconomic status or ethnicity.

Procedure

Before participants started the test we emphasised that the experiment was genuine and serious. Participants were asked to provide their informed consent. Then they had to give some personal information, such as their date of birth, level of education, how many times a week they read the newspaper and watched the news, their e-mail address, and a username and password.

TABLE 1
The number of participants for each age group

Age group	<i>N</i>
16–20 yrs	365
21–25 yrs	378
26–30 yrs	237
31–35 yrs	214
36–40 yrs	177
41–45 yrs	176
46–50 yrs	203
51–55 yrs	176
56–60 yrs	126
61–65 yrs	56
66–70 yrs	31
71–75 yrs	22

They could also use this username and password to log in at other tests on our website, such as the Daily News Memory Test (Meeter, Murre, & Janssen, 2005) and the Galton-Crovitz test (Janssen et al., 2005, 2006; Murre & Janssen, 2006). If a participant had registered at those tests, then he or she could log in directly at this test.

After the participants had registered or logged in, they were given the instructions. When they had read the instructions they were asked to give the titles and directors or leading actors of their three favourite movies. To help the participants as much as possible, we added some links to websites about movies, so they could recover the title and the director more easily. Providing the participants with websites to look up the names of the directors, authors, or artists made it easier for us to identify the items, but it might have affected the participants' answers to the questions about the years in which they encountered the items for the first time in the direction of the release dates of the items. When the participants did not know the title, the director, or the leading actor, they were asked to enter a question mark. They were also asked to select from a drop-down menu the year in which they saw the movies for the first time. The drop-down menu had options from 1930 to 2005. On 1 January 2006, we also added the option "2006". When participants did not recall the year in which they first watched the movie, they could select a question mark from the drop-down menu, which was the last option. For each movie, the participants also had to select from a drop-down menu how often they had seen the movie. The drop-down menu had options ranging from "once" to "more than a 1000 times". This last question was added during the course of the experiment and was therefore not answered by all participants. Subsequently, they were asked to name their three favourite books, the year in which they read the books for the first time, and how often they read the books. Finally, they were asked to name their three favourite records, the year in which they heard the records for the first time, and how often they had listened to the records.

After the participants had entered their favourite movies, books, and records, they were asked how many new movies they had watched recently. We explained that we were asking for movies that they had not seen previously—the movies did not necessarily have to be released recently. They could enter the number of movies

and select the corresponding time unit from a drop-down menu, containing the options “a week”, “a month”, and “a year”. Furthermore, they were asked how many new books they had read recently. Finally, they were asked how many novel records they had recently bought, received, or downloaded. We mentioned explicitly that we were not asking how many new records they had listened to on the radio. These three questions were added during the course of the experiment and were therefore not answered by all participants.

After the participants had indicated how many new movies, books, and records they had encountered recently, they were debriefed. We told them briefly about the purpose of the questionnaire. They were given the opportunity to send us remarks or questions and they could invite relatives, friends, and colleagues to take the test as well by sending them a standardised e-mail.

RESULTS

We will examine the role of rehearsal by testing which medium has the strongest recency effect, from which lifetime period most items are preferred, which medium has the strongest RB, and which medium participants encounter the most at different ages. The participants reported a total of 19,449 items. However, 816 items were not dated, leaving 18,633 items. The items consisted of 1646 different movies, 2548 different books, and 3428 different records. The 20 books, movies, and records that were named most frequently are given in Tables A1, B1, and C1 of the Appendices.

Recency effect

Participants had to select how often they had encountered the preferred items. We found that the participants listened to their favourite records more frequently ($M = 82.34$) than they watched their favourite movies ($M = 5.15$) or read their favourite books ($M = 2.74$). This effect was highly significant, $F(2, 3343) = 182.338$, $MSE = 12540.52$, $p < .001$. Our assumption that records are listened to more frequently than movies are watched and books are read was correct.

When we looked at the recency effect, we first compared the number of items from the last 5 years with the average number of items per 5 years for each age group. We found a recency

effect in the distribution of favourite books, $\chi^2(11, N = 2649) = 3191.64$, $p = .001$, favourite movies, $\chi^2(11, N = 2372) = 852.98$, $p = .001$, and favourite records, $\chi^2(11, N = 2238) = 788.36$, $p = .001$. About 31.7% of the items the participants preferred were from the previous 5 years. Second, we compared the sizes of the recency effect of the favourite books, movies, and records with paired samples t -tests. We found that participants preferred relatively more recent books than recent movies, $t(11) = 3.371$, $p = .006$, and relatively more recent books than recent records, $t(11) = 3.645$, $p = .004$, but not relatively more recent movies than recent records ($p = .241$). Third, we repeated the analyses without the two youngest age groups (i.e., 16–20 and 21–25), because in these age groups the recency effect coincides with the RB. We found that participants preferred relatively more recent books than recent movies, $t(9) = 2.900$, $p = .018$, relatively recent books than recent records, $t(9) = 4.774$, $p = .001$, and relatively more recent movies than recent records, $t(9) = 2.846$, $p = .019$.

Location reminiscence bump

The average ages at which the participants encountered their favourite books, movies, and records for the first time were 26.06, 25.09, and 24.48 years respectively. The differences between the average ages are significant, $F(2, 18630) = 23.901$, $MSE = 163.04$, $p < .001$. However, these averages can be skewed by the presence of recent items. Therefore, we looked at the lifetime period from which most items were preferred. We calculated the proportion of items from each period for each age group. We averaged the proportions of each period. The first four periods are therefore averaged over the 12 age groups, the fifth period (i.e., 21–25 years) is averaged over 11 age groups, and so on. Participants named most items from the period when they were between 16 and 20 years old ($Mode_{books} = 17$, $Mode_{movies} = 18$, and $Mode_{records} = 18$). We did not find any differences between the distributions of favourite books, movies, and records. Figure 1 shows the temporal distributions of favourite books, movies, and records as a function of the age at which the item was encountered for the first time. Furthermore, we have added to the figure the encoding function of autobiographical memory as found in Janssen et al. (2005), which was based on the results of a total of 1958

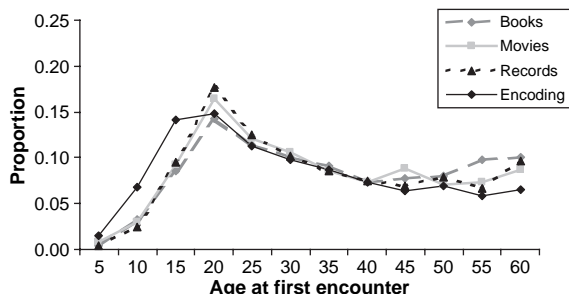


Figure 1. The normalised distributions of favourite books, movies, and records as a function of the age at which the item was encountered for the first time. Age at first encounter denotes the end of a 5-year range (e.g., “20” denotes age range 16–20).

American and Dutch participants. All four distributions are normalised, such that the bins in a curve add up to 1.

Reminiscence bump

When we looked at the RB, we first compared the number of items from the period in which the participants were between 11 and 25 years old with the average number of items per 15 years for each age group. Later, we will compare the number of items from the period when the participants were between 16 and 20 years old, which is the period from which they preferred the most items, with the average number of items per 5 years for each age group.

We found a RB in the distribution of favourite records, $\chi^2(11, N = 3757) = 440.00, p = .001$, favourite movies, $\chi^2(11, N = 3587) = 357.66, p = .001$, and favourite books, $\chi^2(11, N = 3449) = 573.95, p = .001$. About 37.2% of the items that the participants preferred were from the period when they were between 11 and 25 years old. Furthermore, we compared the sizes of the RB (i.e., between 11 and 25 years) of the favourite records, movies, and books. We found that participants preferred more records than books from adolescence and early adulthood, $t(11) = 2.977, p = .013$, and we found that the difference between the preferred movies and books approached significance, $t(11) = 1.992, p = .072$, but we did not find that participants preferred more records than movies from adolescence and early adulthood ($p = .193$). Finally, we omitted the two youngest age groups again, because in these age groups the RB coincides with the recency effect. When we re-analysed the results, we found that

participants preferred more records than books, $t(9) = 3.725, p = .005$, and more movies than books from adolescence and early adulthood, $t(9) = 2.450, p = .037$, but we did not find that they preferred more records than movies from adolescence and early adulthood ($p = .187$). The results per age group showed that the proportion of movies from the period in which they were between 11 and 25 years old was largest in the four oldest age groups (i.e., 56–60, 61–65, 66–70, and 71–75). When we analysed the results of younger and older participants separately, we found that the older participants preferred more movies than books, $t(3) = 3.669, p = .035$, and more movies than records from adolescence and early adulthood, $t(3) = 4.341, p = .023$, but we did not find that they preferred more records than books from adolescence and early adulthood ($p = .234$). The younger participants preferred more records than books, $t(7) = 2.798, p = .027$, from adolescence and early adulthood, but we did not find that they preferred more movies than books ($p = .386$) or more records than movies ($p = .105$) from adolescence and early adulthood.

Second, we compared the number of items from the period in which the participants were between 16 and 20 years old with the average number of items per 5 years for each age group. We found a RB in the distribution of favourite records, $\chi^2(11, N = 1767) = 289.47, p = .001$, favourite movies, $\chi^2(11, N = 1628) = 200.33, p = .001$, and favourite books, $\chi^2(11, N = 1528) = 244.93, p = .001$. About 16.1% of the items that the participants preferred were from the period in which they were between 16 and 20 years old. Furthermore, we found that participants preferred more records than books from the period in which they were between 16 and 20 years old, $t(11) = 4.413, p = .001$, but we did not find that participants preferred more records than movies ($p = .279$) or more movies than books ($p = .336$) from that period. When we dropped the two youngest age groups from the analyses, we found that participants preferred more records than books from the period in which they were between 16 and 20 years old, $t(9) = 3.952, p = .003$, but we did not find that participants preferred more records than movies ($p = .107$) or more movies than books ($p = .250$) from that period. The results of the period in which the participants were between 16 and 20 years old also showed that the proportion of movies was largest in the four oldest age groups. Older participants who were between 56 and 75 years

old preferred more movies than records from that period, $t(3) = 4.756$, $p = .018$, the difference between the number of favourite movies and favourite books approached significance, $t(3) = 2.619$, $p = .079$, but we did not find that they preferred more records than books ($p = .344$) from that period. The younger participants who were between 16 and 55 years old preferred more records than books, $t(7) = 5.552$, $p = .001$, but we did not find that they preferred more records than movies ($p = .189$) or more movies than books ($p = .689$) from that period.

Novel items

At the end of the test participants were asked to indicate how many novel books, movies, and records the participants had encountered recently. The average number of novel books, movies, and records per year for each age group is given in Figure 2. Participants had watched more movies than they had read books, $t(1354) = 12.828$, $p < .001$, they had listened to more records than they had read books, $t(1354) = 9.850$, $p < .001$, and they had listened to more records than they had watched movies, although this effect only approaches significance, $t(1354) = 1.737$, $p = .083$. The effects of age group on the number of novel books, novel movies, and records were significant, $F(11, 1343) = 2.961$, $MSE = 1538.13$, $p = .001$, $F(11, 1343) = 5.631$, $MSE = 3674.92$, $p < .001$, and $F(11, 1343) = 12.090$, $MSE = 10463.49$, $p < .001$. However, when we compared the number of novel items that adolescents and young adults (i.e., 16–30 years old) had encountered to the number of novel items that middle-aged and older adults (i.e., 31–75 years old) had encountered recently, we

found significant differences for the number of novel books, $t(1353) = -3.031$, $p = .002$, the number of novel movies, $t(1353) = 6.779$, $p < .001$, and the number of novel records, $t(1353) = 9.705$, $p < .001$. Adolescents and young adults had recently read fewer books, but they had watched more movies and had listened to more records than middle-aged and older adults recently had. Participants who were younger than 31 years had watched more movies than they had read books, $t(499) = 13.571$, $p < .001$, they had listened to more records than they had read books, $t(499) = 11.445$, $p < .001$, and they had listened to more records than they had watched movies, $t(499) = 4.221$, $p < .001$. Participants who were older than 30 years had also watched more movies than they had read books, $t(854) = 5.948$, $p < .001$, and had listened to more records than they had read books, $t(854) = 2.239$, $p = .020$, but they had watched more movies than they had listened to records, $t(854) = -2.576$, $p = .010$.

DISCUSSION

In this experiment the temporal distributions of favourite books, movies, and records were compared directly for the first time. We found a clear RB in each of the different media types. The average ages at which participants encountered their favourite books, movies, and records for the first time were between 24 and 26 years. These results are consistent with Schulster (1996), whose participants were older than those in this experiment. However, recent items skew the average ages at which people encountered the items for the first time. We found recency effects in the distributions of favourite books, movies, and records. The proportion of books from the last 5 years was greater than the proportion of movies or records from the last 5 years. It is possible that participants prefer books that they have read recently, since we have demonstrated that books are rehearsed less frequently than other types of media, such as movies and records.

Because there were many recent items that skew the average ages at which participants encountered their favourite items for the first time, we looked at the temporal distribution of favourite books, movies, and records, rather than the average age. We found RBs in the distributions of favourite books, movies, and records. All three distributions peaked when the participants were between 16 and 20 years old.

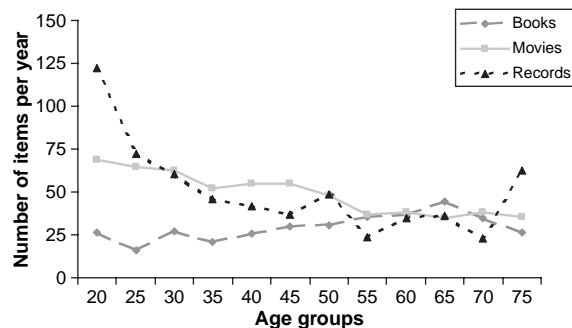


Figure 2. The average number of novel books, movies, and records per year for each age group. Age group denotes the end of a 5-year group (e.g., “20” denotes age group 16–20).

These distributions are similar to the temporal distribution of autobiographical memory (e.g., Janssen et al., 2005; Rubin et al., 1986; Rubin & Schulkind, 1997; Rybash, 1999). We did not find any difference between the distributions in terms of location of the peak of the RB, but we did find that the proportion of favourite records that were listened to for the first time in the period in which the participants were between 11 and 25 was larger than the proportions of favourite books and movies that were read or watched for the first time in the period in which the participants were between 11 and 25 years old. Participants preferred mainly records that they had listened to when they were adolescents and young adults, because we have demonstrated that records are rehearsed more frequently than other types of media, such as movies and books.

The results appear to support our view that the RB is caused by both differential encoding *and* re-sampling. Items, such as books, movies, and records, are stored best between the ages 11 and 25. Items that are not rehearsed frequently, such as books, are more likely to be forgotten, causing a large recency effect and a small RB in their distribution. Items that are rehearsed frequently, such as records, are less likely to be forgotten, causing a small recency effect and a large RB in their distribution. If re-sampling was the sole cause of the RB, we should not have found a RB in the distribution of books, since books are hardly rehearsed. If differential encoding was the sole cause, we should not have found differences between the three types of media in the size of the RB.

An alternative explanation for the results could be that difference in the size of the RB is caused by the difference in the number of novel items. We found a strong decrease in the number of novel records as participants became older. This decrease was stronger than the decrease in the number of movies. In other words, it is possible that participants preferred more records (than movies) from adolescence and early adulthood, because they had encountered a larger proportion of records (than the proportion of movies) in those periods.

The levels of rehearsal are not the only difference between books, movies, and records. Music is associated more with time periods than literature and cinema. For example, punk music is associated with the late 1970s, whereas grunge music is associated with the early 1990s. Smith (1994) found a cohort effect of popularity of

genres of music—certain styles of music were popular among people who were born in certain periods. Music may therefore play a greater role in the formation of identity. The result that the proportion of favourite records from adolescence and early adulthood was larger than the proportion of favourite books and movies was only found in the distributions of participants born after 1950. For the participants who were born before 1950, the proportion of movies from the period in which the participants were adolescents and young adults was larger than the proportion of books and records. This is possibly due to a cohort effect based on the availability of the different types of media in the 1940s and 1950s. Although we did not ask older adults how many books they read, how many movies they watched, or how many records they listened to when they were between 11 and 25 years old, we did find that younger participants had recently listened to more records than they had watched movies, whereas older participants had recently watched more movies than they had listened to records. However, there is no evidence in earlier research (Larsen, 1996; Holbrook & Schindler, 1989, 1996; Schulster, 1996; Smith, 1994) or in the results of this experiment that the three types of media have their influences on the identity formation at different ages, since the modes (i.e., the location of the peak of the RBs) of the three types of media fall in the same age period.

Imagine yourself being stranded as a castaway on a desert island. Which three records would you want to have with you? If you could only take three books with you, which books would those be? In this experiment, we looked at what distributions of favourite books, movies, and records can tell us about the role of differential encoding and re-sampling in autobiographical memory, since the preferred items can be seen as a part of autobiographical knowledge base. They can be regarded as event-specific knowledge about single or repeated events or as representations of the goals or the self-schemas in the conceptual self. Even favourite books, although they are generally read only two or three times, are stored better in adolescence and early adulthood than in prior or subsequent lifetime periods. This result gives support for the differential encoding hypothesis. However, people preferred more records, which are listened to numerous times, than books from adolescence and early adulthood. This result gives support to the re-sampling hypothesis. Therefore we suggest an

interaction between differential encoding and re-sampling. Autobiographical memory is encoded more strongly in adolescence and early adulthood. These personal events thus have a larger likelihood of being recalled than personal events from other lifetime periods, making them even more resistant to forgetting, each time they are recalled.

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APPENDIX A

TABLE A1

The 20 most popular books, the number of the instances, and the mean and mode of the ages at which participants had read the book for the first time

	<i>Title</i>	<i>Author</i>	<i>N</i>	<i>M</i>	<i>Mode</i>
1	Harry Potter*	J. K. Rowling	176	23.18	19
2	The Da Vinci Code	Dan Brown	143	30.50	25
3	The Lord of the Rings*	J. R. R. Tolkien	127	19.81	17
4	The Bible		54	16.50	6
5	De Ontdekking van de Hemel	Harry Mulisch	49	32.45	19
6	Angels and Demons	Dan Brown	45	31.91	23
7	The Secret History	Donna Tartt	39	24.51	19
8	Pride and Prejudice	Jane Austen	34	18.46	15
9	One Hundred Years of Solitude	Gabriel García Márquez	29	23.66	22
10	Flowers In The Attic	V. C. Andrews	24	21.92	12
11	To Kill A Mockingbird	Harper Lee	22	17.18	16
12	Catcher in the Rye	J. D. Salinger	21	16.71	17
13	De Donkere Kamer van Damokles	W. F. Hermans	21	18.48	16
14	The Hobbit	J. R. R. Tolkien	19	18.11	10
15	1984	George Orwell	18	17.11	18
16	Kruistocht in Spijkerbroek	Thea Beckman	18	11.94	12
17	Wuthering Heights	Emily Brontë	17	20.06	16
18	Sophie's World	Jostein Gaarder	15	25.20	16
19	Le Petit Prince	Antoine de Saint-Exupéry	15	18.27	12
20	Memoirs of a Geisha	Arthur Golden	14	21.50	23

*We have collapsed series or sequels in this table, but they are not collapsed in the analyses.

APPENDIX B

TABLE B1

The 20 most popular movies, the number of the instances, and the mean and mode of the ages at which participants had watched the movie for the first time

	<i>Title</i>	<i>Director</i>	<i>N</i>	<i>M</i>	<i>Mode</i>
1	The Lord of the Rings*	Peter Jackson	168	30.59	21
2	Titanic	James Cameron	89	21.97	13
3	Pulp Fiction	Quentin Tarantino	79	21.48	19
4	The Sound of Music	Robert Wise	65	13.46	12
5	The Godfather*	Francis Ford Coppola	58	22.93	21
6	The Green Mile	Frank Darabont	58	26.98	16
7	One Flew Over the Cuckoo's Nest	Milos Forman	57	23.82	21
8	Dirty Dancing	Emile Ardolino	55	17.55	13
9	Harry Potter*	Chris Columbus	55	29.60	20
10	The Shawshank Redemption	Frank Darabont	53	25.66	22
11	Gone with the Wind	Victor Fleming	53	15.59	18
12	The Matrix*	Andy and Larry Wachowski	51	24.69	14
13	Star Wars*	George Lucas	48	16.46	13
14	Grease	Randal Kleiser	46	11.54	11
15	Le Fabuleux destin d'Amélie Poulain	Jean-Pierre Jeunet	44	29.05	22
16	Pretty Woman	Garry Marshall	39	24.31	20
17	Schindler's List	Steven Spielberg	39	28.31	16
18	West Side Story	Jerome Robbins and Robert Wise	37	17.22	15
19	The Sixth Sense	M. Night Shyamalan	29	31.83	30
20	Pirates of the Caribbean	Gore Verbinski	29	24.07	20

*We have collapsed series or sequels in this table, but they are not collapsed in the analyses.

APPENDIX C

TABLE C1

The 20 most popular records, the number of the instances, and the mean and mode of the ages at which participants had listened the record for the first time

	<i>Title</i>	<i>Artist</i>	<i>N</i>	<i>M</i>	<i>Mode</i>
1	Dark Side of the Moon	Pink Floyd	28	21.11	19
2	Jagged Little Pill	Alanis Morissette	26	20.38	22
3	The Joshua Tree	U2	27	17.52	18
4	Sgt. Pepper's Lonely Hearts Club Band	The Beatles	25	16.28	18
5	The White Album	The Beatles	21	15.77	16
6	Hotel California	The Eagles	18	20.06	22
7	Come Away with Me	Norah Jones	18	22.06	18
8	The Wall	Pink Floyd	16	21.13	16
9	Bridge over Troubled Water	Simon & Garfunkel	16	23.06	17
10	Abbey Road	The Beatles	15	16.07	20
11	Californication	Red Hot Chilli Peppers	15	18.53	15
12	Thriller	Michael Jackson	14	16.79	13
13	OK Computer	Radiohead	14	20.36	20
14	Nevermind	Nirvana	14	16.07	18
15	A Rush of Blood to the Head	Coldplay	14	21.79	15
16	Ten	Pearl Jam	13	15.92	17
17	Songs about Jane	Maroon 5	12	24.50	16
18	Little Earthquakes	Tori Amos	11	17.91	21
19	Revolver	The Beatles	11	16.91	12
20	Blonde on Blonde	Bob Dylan	11	17.91	17