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Cascading Reminiscence Bumps in Popular Music

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Abstract

Autobiographical memories are disproportionately recalled for events in late adolescence and early adulthood, a phenomenon called the *reminiscence bump*. Previous studies on music have found autobiographical memories and life-long preferences for music from this period. In the present study, we probed young adults' personal memories associated with top hits over 5-and-a-half decades, as well as the context of their memories and their recognition of, preference for, quality judgments of, and emotional reactions to that music. All these measures showed the typical increase for music released during the two decades of their lives. Unexpectedly, we found that the same measures peaked for the music of participants' parents' generation. This finding points to the impact of music in childhood and suggests that these results reflect the prevalence of music in the home environment. An earlier peak occurred for 1960s music, which may be explained by its quality or by its transmission through two generations. We refer to this pattern of musical cultural transmission over generations as *cascading* reminiscence bumps.

Keywords

autobiographical memory, music, early memories, episodic memory, aging

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The study reported here is the first to show that music transmitted from generation to generation shapes autobiographical memories, preferences, and emotional responses, a phenomenon we call *cascading reminiscence bumps*. These effects have not been found previously in other domains, which suggests that music may be special, perhaps because of its strong personal and emotional meanings, its prevalence, and its role in social development. For these reasons, music-evoked autobiographical memories may have unique properties. Previous research has found that the music encountered during one's late adolescence and early adulthood has the greatest impact on individuals throughout their lives. Studies of older adults show, for example, that music from their youth is recognized more often, more facts are known about it, and that it evokes more specific autobiographical memories and strong emotions than music from later in life (Schulkind, Hennis, & Rubin, 1999). This general phenomenon is referred to as the reminiscence effect or *reminiscence bump* (Rubin, Wetzler, & Nebes, 1986).

However, childhood (in both humans and nonhuman animals) is a period when a great deal of cultural

transmission and learning occurs (Cavalli-Sforza & Feldman, 1981). Cultural transmission refers to the passing on of knowledge, skills, abilities to communicate, and social norms in a social context rather than biologically. Until an individual is able to select his or her own music, it is likely to reflect his or her parents' choices. For the college-aged listeners who participated in our study, the recorded music their parents favored during their child-rearing years would have been played in the home. In addition, parents may have been involved actively in their children's musical education and directed them to music that they themselves appreciated. These considerations suggest that music-evoked autobiographical memories may be distributed differently over the life span than other kinds of autobiographical memories are.

The reminiscence effect, or bump, grew out of research on the rate at which memories faded over time, usually

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as a monotonically decreasing power function. However, an influential review of studies using older adults revealed a curious pattern, a peak in the otherwise decreasing function (Rubin et al., 1986). Older adults recalled more autobiographical memories from a certain period of life, usually between 10 and 30 years of age, than just before or just after that period, which created a bump in the overall number of memories they recalled across the life span. Rubin and his colleagues defined the reminiscence effect as “an increase in early memories above what would be expected by a monotonically decreasing retention function” (p. 208). The precise location of the bump varies from study to study, but the general pattern is strikingly consistent. It is found using a variety of methods, including free recall and word-cue recall (Crovitz & Schiffman, 1974). The effect is quite consistent across gender, education, and culture (Janssen, Chessa, & Murre, 2005). It is also found for a variety of cues, including autobiographical memories, memory for public events, (e.g., Holmes & Conway, 1999; Janssen, Murre, & Meeter, 2008; Rubin, Rahhal, & Poon, 1998), faces (Bahrick, Bharick, & Wittlinger, 1975), and even the best football players of all time (Janssen, Rubin, & Conway, 2012).

Different explanations have been proposed for the reminiscence bump in older adults. One is that during their late adolescence and early adulthood, they had many first-time experiences that were vivid, emotional, and important milestones (Janssen, Chessa, & Murre, 2007; Janssen, Rubin, & St. Jacques, 2011). These memories may have been encoded more strongly than memories from other times in their lives (Rubin et al., 1998; Rubin et al., 1986). Another explanation is that prototypical life events first come to mind when probed (e.g., Berntsen & Rubin, 2002, 2004; Janssen & Rubin, 2011; Rubin & Berntsen, 2003). Perhaps individuals begin to reminisce about their adolescent and early adult experiences later in life (Rubin et al., 1986; although see Janssen et al., 2011). Additionally, the effect may result from hormonal and other neurobiological changes (Holbrook & Schindler, 1989). It is difficult to test these proposals directly, and they may not be mutually exclusive. However, intuition says that they also apply to music, and, indeed, a number of studies have found the expected reminiscence bump.

In an early study,¹ Holbrook and Schindler's (1989) participants rated how much they liked popular songs from the years 1932 to 1986. They calculated the “song-specific age” as the difference between the participant's birth date and the year of the song's popularity; it ranged from -39 (the songs released well before the younger listeners were born) to 85 (the most recent songs for the oldest listener). The ratings showed a clear inverted U-shaped pattern with a peak at 23.5 years of age. Similar patterns were found for preferences for 18 styles of music

in seven cohorts (Smith, 1994), with all participants showing a preference for music popular during their youths. This study also related music preferences to political memories and values, which reflects the link between music and the broader social context of the time.

In an important extension of these studies to autobiographical memory, Schulkind et al. (1999) greatly expanded the types of questions asked of listeners. Older participants showed generally decreasing familiarity with songs; accuracy of dating songs; recall of titles, artists, and cued lyrics; specificity of memories; and emotionality. In contrast, younger participants showed increases on these measures. These results are consistent with reminiscence-bump predictions. Similarly, another study using young participants found that autobiographical memories summoned by music from early childhood through college showed increases in vividness, specificity, feelings brought back, and emotions felt at the time the memory was encoded and during recall, although the effects were relatively small (Cady, Harris, & Knappenberger, 2008). Negative emotions noticeably increased in middle and high school. Janssen et al. (2007) expanded their study to include favorite books and movies. The temporal distributions of favorite records, books, and movies all exhibited a reminiscence bump, which peaked when participants were between 16 and 20 years old, but the distribution was shifted slightly earlier for music.

Showing the power of music to evoke autobiographical memories, Janata, Tomic, and Rakowski (2007) found that as many as 30% of randomly selected popular songs from a corpus of over 1,500 songs elicited memories that were somewhat or strongly autobiographical. Most of these memories were positive. However, they did not investigate chronological effects. Another study (Barrett et al., 2010) found that nostalgic memories are associated with stronger emotions, both positive and negative, and also more mixed emotions than non-nostalgic memories are. That study also found consistent relationships between mood and personality, on the one hand, and the propensity for nostalgia, on the other. Another study (Janata, 2009) showed a connection between the salience of music-evoked memories and neural activations in medial prefrontal cortex, an area associated with self-referential processes (St. Jacques, Kragel, & Rubin, 2011). For music, activations in medial and lateral prefrontal cortex and temporal lobe depend on the temporal specificity (lifetime period, general event knowledge, or specific event knowledge) of the event (Ford, Addis, & Giovanello, 2011).

In sum, music-evoked autobiographical memories are especially interesting from several points of view. First, music is a very powerful cue for retrieving autobiographical memories, and such memories are associated with

strong emotions and nostalgic feelings. Popular music, which can be dated quite precisely in time, is recognized at a high rate, and listeners know many objective details about it even when they hear clips as short as 400 ms (Krumhansl, 2010). A consistent reminiscence bump appears in late adolescence and early adulthood in many measures, including those for autobiographical memories, preferences, and emotions. Recent studies show neural responses to music-evoked autobiographical memories and effects of individual differences in personality and mood. And perhaps most notable, personal associations between music and important, specific, and highly emotional events are considered one of the basic processes that establishes musical emotions (Gabrielsson, 2001, 2011; Juslin & Västjfall, 2008; Sloboda & O'Neill, 2001).

The study presented here was designed to investigate whether the pattern of music-evoked autobiographical memories and preferences may have changed given the rapid evolution of popular music styles, and music's prevalence, over the last few decades. In the present study, top *Billboard* magazine hits from 1955 to 2009 provided a systematic sample of music. The top two hits from each year were grouped into clips covering 5-year periods, so that each clip contained short excerpts of 10 songs. College-aged participants (average age = 20.1 years) responded on a number of scales. The first was whether they had personal memories associated with the song. If so, they were asked whether the memories were from growing up listening with parents, alone, or with other people. If they had recent personal memories, they were asked whether the memories were from listening alone or with other people. The second group of scales contained baseline measures of whether participants recognized and liked the songs in each clip, as well as what they judged the quality of the songs in each clip to be. The third group asked participants to rate the degree to which they felt the following emotions when listening to the songs in each clip: happiness, sadness, fear, anger, tenderness, nostalgia, and energized. In addition to age and gender, other demographic information was obtained, including parents' years of birth, participants' musical background, and how many hours per week participants spent listening to 14 styles of music, both growing up and currently.

Method

Participants

The 62 participants were 40 women (64.5% of the sample) and 22 men (35.5% of the sample) who were recruited in two ways. Some were recruited via the Psychology Department at Cornell University's Susan

platform, which allows undergraduates to participate in experiments in return for extra course credit. Other participants were recruited by word of mouth through the second author's social networks. Participant age averaged 20.1 years ($SD = 1.30$) and years of musical instruction averaged 6.2 years ($SD = 5.1$); 72.1% reported that they currently played music. The birth year of participants' mothers averaged 1961.1 and of their fathers averaged 1958.5. All but 7 grew up in the United States, and all but 2 were currently living in the United States. The study was conducted in April and May 2012. The protocol was approved by the Cornell University Institutional Review Board.

Stimuli

The survey was created using the Qualtrics Research Suite tools (www.qualtrics.com/). The music choices were drawn from *Billboard*, a weekly magazine covering the latest business activity in the mainstream music industry. Considering the magazine's credibility and history (the Supplemental Material available online contains more information about *Billboard*), the top two singles from every year-end Hot 100 chart since 1955 (including its days as the "Top 100") were included as stimuli in the present study. Participants heard 11 clips, each of which contained the two top songs for every year in a consecutive 5-year period, for a total of 10 songs per clip (1955–1959, 1960–1964, . . . , 2005–2009; see Table 1 for a complete list of songs). The songs' choruses were included to maximize recognition. A practice clip consisted of the third most popular songs from 1970 to 1979 (see the Supplemental Material). The musical clips averaged 48.2 s ($SD = 2.96$).

Procedure

Following the practice session, each participant heard the series of 11 music clips in one of five different random orders. After each clip, participants reported the percentage of songs they recognized, rated how much they liked the songs in the clip overall, and judged their quality. All responses were given on a 10-point Likert-type scale, except for the percentage of songs recognized. Participants also rated the following emotional responses to each clip: sadness, happiness, anger, tenderness, fear, nostalgia, and energized (0 = *clearly does not describe my feelings*, 5 = *somewhat describes my feelings*, 10 = *clearly describes my feelings*). Finally, participants reported whether they had personal memories associated with the music and, if so, whether these memories were from listening with parents, alone, or with other people while growing up or listening alone or with other people recently (0 = *none or not applicable*, 5 = *some*, 10 = *many*).

Table 1. Top Two Songs For Each Year From 1955 to 2009 According to *Billboard* Magazine

1955	Cherry Pink and Apple Blossom White – Perez Prado Rock Around the Clock – Bill Haley & His Comets	1973	Tie a Yellow Ribbon 'Round the Ole Oak Tree – Tony Orlando Bad Bad Leroy Brown – Jim Croce
1956	Heartbreak Hotel – Elvis Presley Don't Be Cruel – Elvis Presley	1974	The Way We Were – Barbara Streisand Seasons in the Sun – Terry Jacks
1957	All Shook Up – Elvis Presley Love Letters in The Sand – Pat Boone	1975	Love Will Keep Us Together – Captain & Tennille Rhinestone Cowboy – Glen Campbell
1958	Volare (Nel Blue Dipinto Di Blu) – Demenico Modugno All I Have to Do Is Dream – Everly Brothers	1976	Silly Love Songs – Wings Don't Go Breaking My Heart – Elton John & Kiki Dee
1959	The Battle of New Orleans – Johnny Horton Mack the Knife – Bobby Darin	1977	Tonight's the Night (Gonna Be Alright) – Rod Stewart I Just Want To Be Your Everything – Andy Gibb
1960	Theme From "A Summer Place" – Percy Faith He'll Have to Go – Jim Reeves	1978	Shadow Dancing – Andy Gibb Night Fever – Bee Gees
1961	Tossin' and Turnin' – Bobby Lewis I Fall to Pieces – Patsy Cline	1979	My Sharona – Knack Bad Girls – Donna Summer
1962	Stranger on The Shore – Mr. Acker Bilk I Can't Stop Loving You – Ray Charles	1980	Call Me – Blondie Another Brick in The Wall – Pink Floyd
1963	Sugar Shack – Jimmy Gilmer & the Fireballs Surfin' USA – Beach Boys	1981	Bette Davis Eyes – Kim Carnes Endless Love – Diana Ross & Lionel Richie
1964	I Want to Hold Your Hand – The Beatles She Loves You – The Beatles	1982	Physical – Olivia Newton-John Eye of the Tiger – Survivor
1965	Wooly Bully – Sam the Sham & the Pharaohs I Can't Help Myself (Sugar Pie Honey Bunch) – Four Tops	1983	Every Breath You Take – The Police Billie Jean – Michael Jackson
1966	The Ballad of the Green Berets – Sgt. Barry Sadler Cherish – Association	1984	When Doves Cry – Prince What's Love Got to Do With It – Tina Turner
1967	To Sir With Love – Lulu The Letter – Box Tops	1985	Careless Whisper – Wham! Like a Virgin – Madonna
1968	Hey Jude – The Beatles Love Is Blue – Paul Mauriat	1986	That's What Friends Are For – Dionne & Friends Say You, Say Me – Lionel Richie
1969	Sugar, Sugar – Archies Aquarius/Let the Sunshine In – Fifth Dimension	1987	Walk Like an Egyptian – Bangles Alone – Heart
1970	Bridge Over Troubled Water – Simon & Garfunkel (They Long to Be) Close to You – Carpenters	1988	Faith – George Michael Need You Tonight – INXS
1971	Joy To The World – Three Dog Night Maggie May – Rod Stewart	1989	Look Away – Chicago My Prerogative – Bobby Brown
1972	The First Time Ever I Saw Your Face – Roberta Flack Alone Again (Naturally) – Gilbert O'Sullivan		

(continued)

Table 1. (continued)

1990	2000
Hold On – Wilson Phillips	Breathe – Faith Hill
It Must Have Been Love – Roxette	Smooth – Santana featuring Rob Thomas
1991	2001
(Everything I Do) I Do It for You – Bryan Adams	Hanging by a Moment – Lifehouse
I Wanna Sex You Up – Color Me Badd	Fallin' – Alicia Keys
1992	2002
End of the Road – Boyz II Men	How You Remind Me – Nickelback
Baby Got Back – Sir Mix-a-Lot	Foolish – Ashanti
1993	2003
I Will Always Love You – Whitney Houston	In Da Club – 50 Cent
Whoomp! (There It Is) – Tag Team	Ignition – R. Kelly
1994	2004
The Sign – Ace of Base	Yeah! – Usher featuring Lil' Jon & Ludacris
I Swear – All-4-One	Burn – Usher
1995	2005
Gangsta's Paradise – Coolio	We Belong Together – Mariah Carey
Waterfalls – TLC	Hollaback Girl – Gwen Stefani
1996	2006
Macarena (Bayside Boys Mix) – Los Del Rio	Bad Day – Daniel Powter
One Sweet Day – Mariah Carey & Boyz II Men	Temperature – Sean Paul
1997	2007
Candle in The Wind – Elton John	Irreplaceable – Beyonce
Foolish Games/You Were Meant for Me – Jewel	Umbrella – Rihanna featuring Jay-Z
1998	2008
Too Close – Next	Low – Flo Rida featuring T-Pain
The Boy Is Mine – Brandy & Monica	Bleeding Love – Leona Lewis
1999	2009
Believe – Cher	Boom Boom Pow – The Black Eyed Peas
No Scrubs – TLC	Poker Face – Lady Gaga

Results

Figures 1a and 1b plot the extent of participants' personal memories associated with music over five and a half decades. For the music released after participants were born, the graph of personal memories shows the typical increasing trend during the period from 1990 to 2009 (approximate ages -2 to 18 , respectively, the latter corresponding to the cutoff year of our selections). These music-evoked memories would presumably contribute to reminiscence bumps later in participants' lives. What was unexpected given the previous literature on musical preferences and autobiographical memory are the two earlier peaks in the figure. The number of memories associated with the music of 1980 to 1984 was higher than for the music of 1975 to 1979, $t(60) = 5.42$, $p < .0001$, and the music of 1985 to 1989, $t(60) = 4.11$, $p < .0001$. As for the earlier bump, there was no statistical difference between 1960 to 1964 and 1965 to 1969, but both of these are higher than 1970 to 1974, $t(60) = 3.16$, $p = .0025$; $t(60) = 3.69$, $p = .0005$, for 1960

to 1964 and 1965 to 1969, respectively. This bump is hard to locate precisely in time and is perhaps best described as 1960 to 1969.

Figure 1a shows the contexts of participants' personal memories when they were growing up. For music released before participants were born, the memories occurred in the context of listening with parents, alone, and with other people while growing up. For music released after they were born, listeners reported fewer childhood memories listening with parents and more listening alone and especially with other people. Thus, over time, they shifted from music chosen by their parents to music chosen by themselves and peers. Figure 1b shows the contexts of recent memories. The gap between the curves means that essentially no recent personal memories are associated with any music except the most recent, which suggests that the earlier music is not in participants' current listening repertoire.

Figure 2a plots judged quality together with personal memories. Unlike the curves in the other figures, the curves in this graph are relatively flat—the correlation

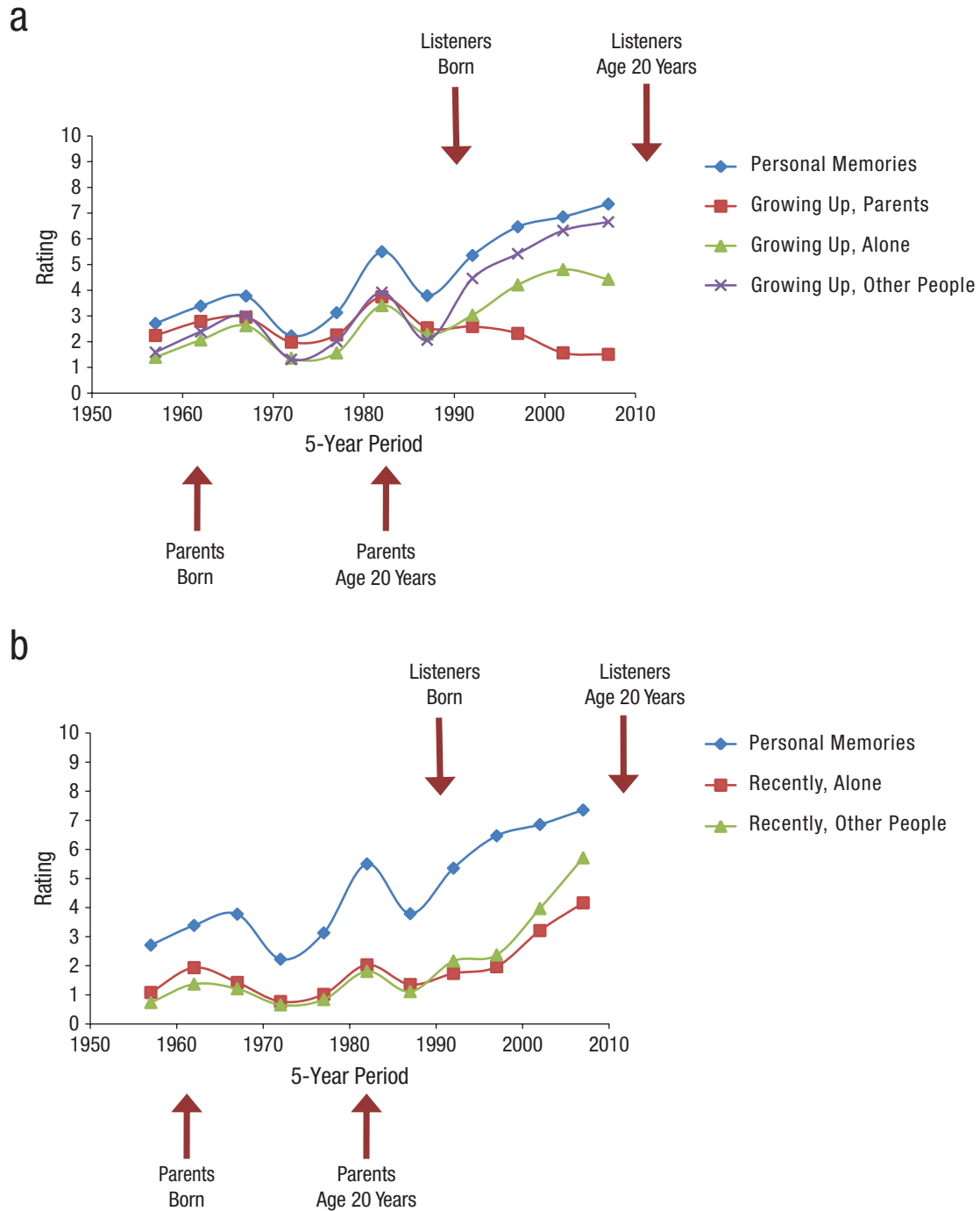


Fig. 1. Mean rating of the extent to which participants had personal memories associated with the songs of each 5-year period and (if they had personal memories) the contexts of the memories. Results are shown separately for (a) memories associated with growing up and (b) recent memories.

between quality and release date was not significant: $R^2(9) = .26$. The bump from 1980 to 1984 is still present, but the magnitude of the bump from 1960 to 1969 is relatively slight—although the bump from 1965 to 1969 is

statistically higher than that from 1970 to 1974, $t(60) = 3.00$, $p = .004$, the bump from 1960 to 1964 is not statistically different. Personal memories were, not surprisingly, correlated with the percentage of songs recognized,

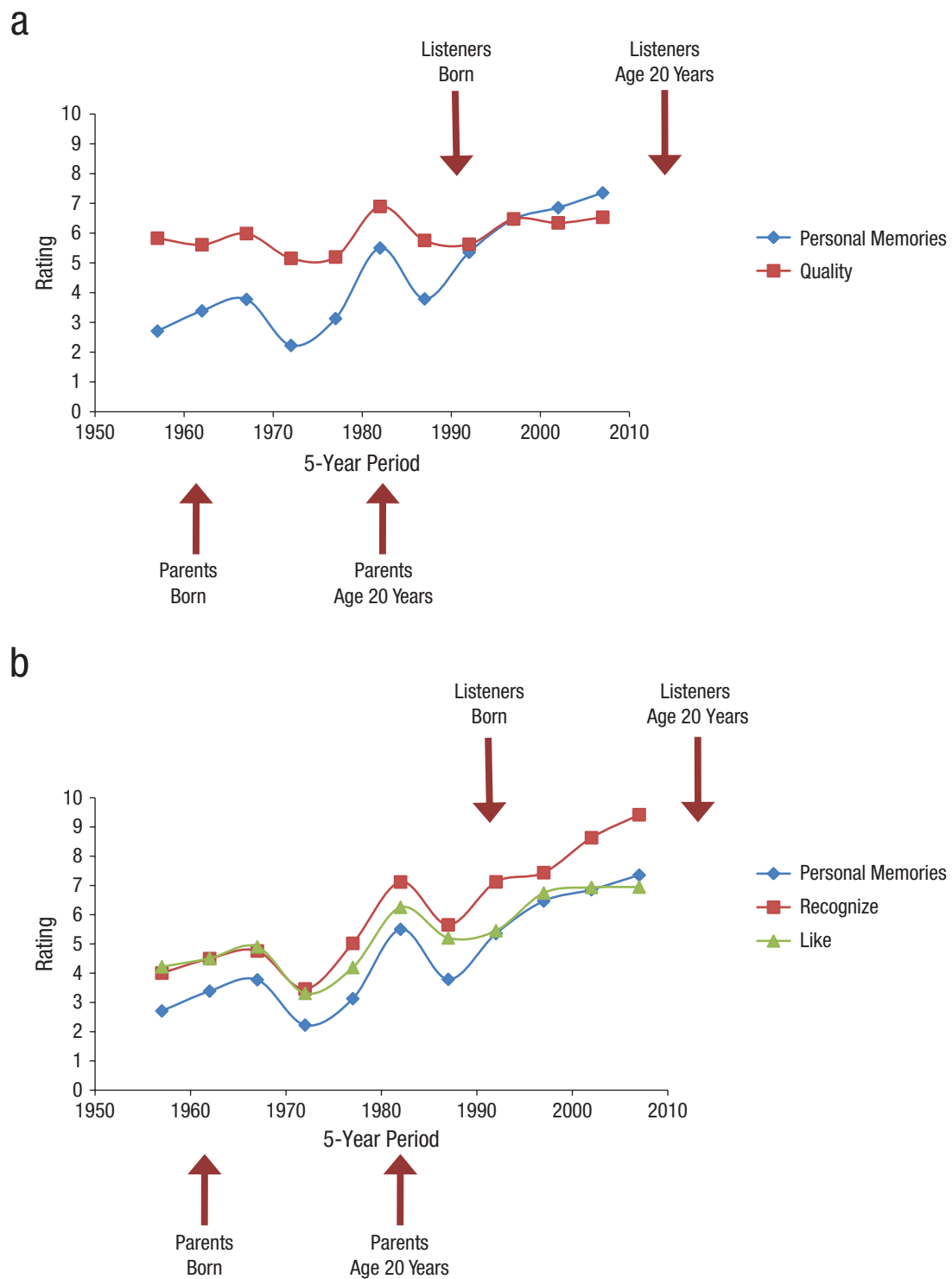


Fig. 2. Mean rating of the extent to which participants had personal memories associated with the songs of each 5-year period, together with (a) the judged quality of the songs and (b) whether participants liked and recognized the songs (after the percentage recognized was converted to the number of songs recognized).

$R^2(9) = .96, p < .0001$ (Fig. 2b, which shows the percentage of songs recognized converted to the number of songs out of 10 recognized). Personal memories also

correlated with whether participants liked the songs, $R^2(9) = .95, p < .0001$; that is, they liked the music that evoked personal memories.

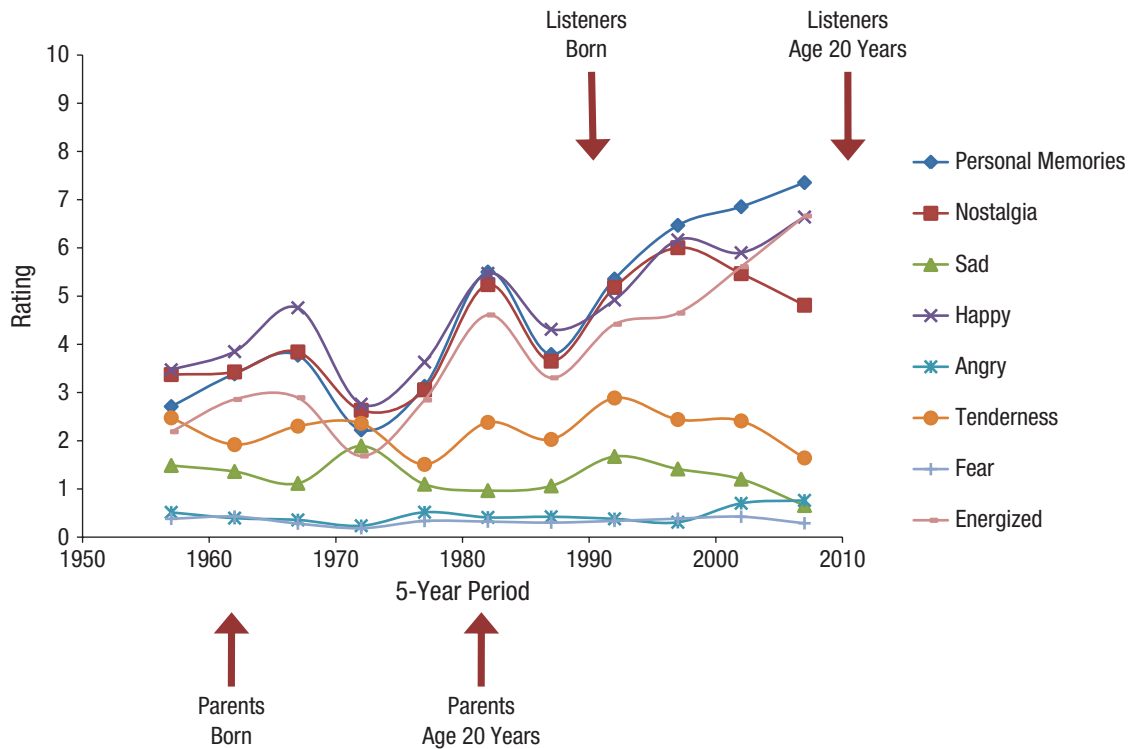


Fig. 3. Mean rating of the extent to which participants had personal memories associated with the songs of each 5-year period, together with how much of seven emotions the songs made the participants feel.

As Figure 3 shows, personal memories correlated with participants' ratings of how energized, $R^2(9) = .96$, $p < .0001$, and happy, $R^2(9) = .95$, $p < .0001$, the songs made them feel, although there was a dip in early adolescence for how happy they felt. The curve for how nostalgic the songs made listeners feel tracked the curves for how energized and happy the songs made listeners feel until the last decade. Statistically, nostalgia was a mixture of happiness, sadness, and tenderness, which shows the mixed nature of nostalgic feelings. Feelings of tenderness and sadness decreased over the last two decades. Although the overall level of anger was low, it increased during the same period, and it correlated with recent personal memories when listening alone, $R^2(9) = .58$, $p = .0065$, and with others, $R^2(9) = .56$, $p = .0082$. These effects likely reflect changing musical styles. Finally, energized correlated with both angry, $R^2(9) = .43$, $p = .028$, and happy, $R^2(9) = .89$, $p < .0001$, which suggests that both measure heightened activity.

The number of hours participants spent listening to different styles of music when growing up and currently was very similar over the two time periods, $R^2(13) = .70$, $p < .0001$, although there was the expected shift toward more recent styles (see Fig. 4). Participants listened only

slightly more currently (33.8 hr per week) than when they were growing up (32.1 hr per week). Both of these measures indicate the stability of listening habits over time. We found some gender differences in our data as well, but note that our sample may not be representative. Females listened more to music than men did both while growing up (40.3 vs. 23.8 vs. hr per week, respectively) and currently (42.4 vs. 25.3 hr per week, respectively). They gave higher ratings on the percentage of songs recognized, nostalgia, the extent of personal memories, listening alone while growing up, and listening with others recently, perhaps because women generally have a stronger engagement with music than men do. Females listened to a narrower range of styles than men did, disproportionately to pop (growing up: 26.7% vs. 17.1% of listening time, respectively; currently: 22.9% vs. 14.9% of listening time, respectively) and rock (growing up: 11.4% vs. 9.3% of listening time, respectively; currently 9.6% vs. 6.71% of listening time, respectively). Males listened more to rap and hip hop than women did both while growing up (19% vs. 10% of listening time, respectively) and currently (22% vs. 15% of listening time, respectively) and listened to a somewhat wider range of styles. Perhaps because of this, males reported a wider

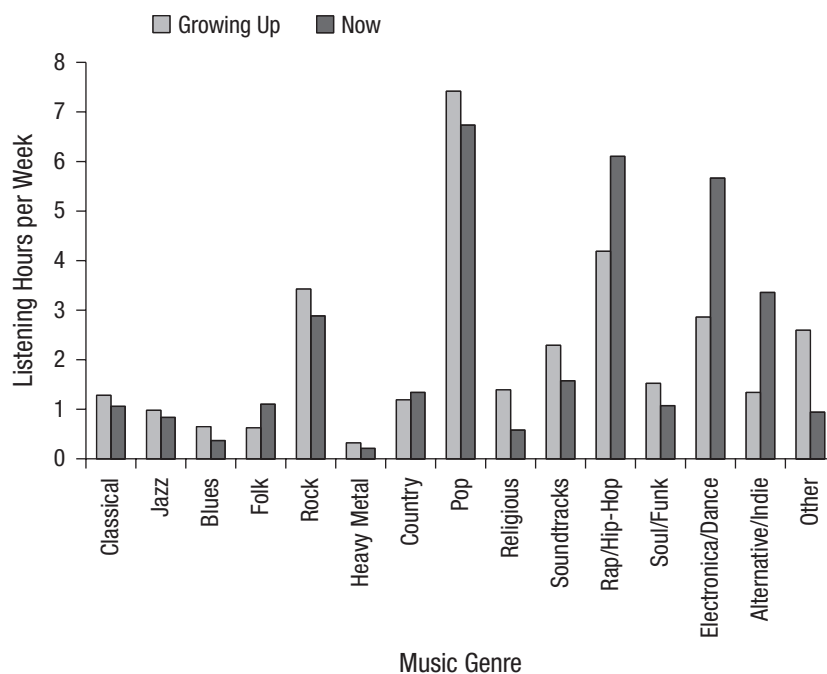


Fig. 4. Mean hours per week spent listening to music as a function of the type of music and time frame of listening (growing up and currently).

range of emotions: sadness, anger, tenderness, and fear were all higher, $t_s(10) = 5.28, 5.93, 5.05, 6.46$, respectively, all $p_s < .001$, in men than in women.

Discussion

This study probed college-aged listeners' responses to music from 1955 to 2009. For music popular after participants were born, we found the typical rapid increase in the number of personal memories associated with that music. Over time, these memories were more from contexts in which participants were listening alone and with other people, and less from listening with parents. Recent music evoked feelings of nostalgia less often than older music did, as would be expected given that nostalgia is related to events in the past. The number of memories participants associated with songs from the different 5-year periods correlated strongly with whether they recognized and liked the music, and whether it made them feel happy and energized. Increases in these measures were also found in previous studies of music-evoked autobiographical memories and preferences (Holbrook & Schindler, 1989; Schulkind et al., 1999; Smith, 1994) and have been largely attributed to how recently the music was popular.

What was striking in our study, however, was that these same response measures showed two distinct bumps for the music from 1960 to 1969 and from 1980 to 1984, music that was popular before our participants were born. This challenges the conventional idea that musical preferences and associated autobiographical memories increase monotonically with time for younger participants. Rather, these participants exhibited something like a reminiscence bump for music released in two time periods before they were born.

The bump for music popular from 1980 to 1984 might be explained in terms of intergenerational influences. Our participants' parents were born on average in 1960, so 1980 to 1984 was when their parents averaged 20 to 25 years of age. According to previous research, this would be the time when their parents' preferences were established. One assumes, therefore, that this music was played during parents' child-rearing years and made an imprint on our listeners when they were children. Additional support for this hypothesis comes from the questions about the context of their personal memories for this music. The personal memories associated with this music were from when participants were listening with parents, alone, and with other people while growing up. Participants' feelings of nostalgia were also strong

for the music of their parents' generation. However, that same music was not associated with recent memories, which implies that this music is not in participants' current listening repertoire. Other considerations suggest that the effect is not simply due to the frequency with which participants heard this music, including the similar number of hours listening to different styles of music when participants were growing up and recently.

Interpreting the bump for 1960 to 1969 is less straightforward. Schulkind et al. (1999), using music grouped into 10-year periods, found a similar bump for 1965 to 1974, as seen in Figure 5. They attributed this to the possibility that music of this era is of better quality and thus has stayed longer in the listening repertoire as "classic rock." Alternatively, or in addition, the effect may reflect intergenerational transfer when their listeners were young. Their study was conducted in 1997 when the participants averaged 19 years; thus, they were born approximately in 1978. Music from 1965 to 1974 would be from the time when their parents' preferences were formed and thus probably played at home when the participants were growing up. So there are two possible explanations for the effect found in their study: the quality of the music and intergenerational transmission.

One might speculate that the bump for 1960 to 1969 in our study is in part a case of transmission, but through two generations. The statistics locate it somewhat later

than when participants' grandparents' preferences typically would have been formed. Assuming that the grandparents were 25 when their children were born, they would have been 25 to 35 during the 1960s. However, because of the quality of the music, as suggested by Schulkind et al. (1999), the grandparents might have continued to listen to popular music later in their lives than other generations did, and thus passed it on to our participants' parents, who heard this music when they were young. One might also note the introduction of compact cassette tapes in the 1960s, which made music more reproducible and portable. Thus, some combination of the quality of the music, transmission through two generations, and its increased availability might account for the effect. Or it could be just that the quality of the music was higher, in which case it will show up in future studies.

A recent article (ter Bogt, Diesling, van Zalk, & Christenson, 2011) also showed intergenerational continuity of musical preferences, which the authors defined as "the connection between the preferences of parents developed *when they were younger* and the *current* tastes of their children" (p. 302; italics in original). Parents' earlier preferences for pop and classical music affected their adolescents' current preferences. Continuity, defined as ter Bogt et al. defined it, had not been found in previous studies for other domains. The authors suggest that music

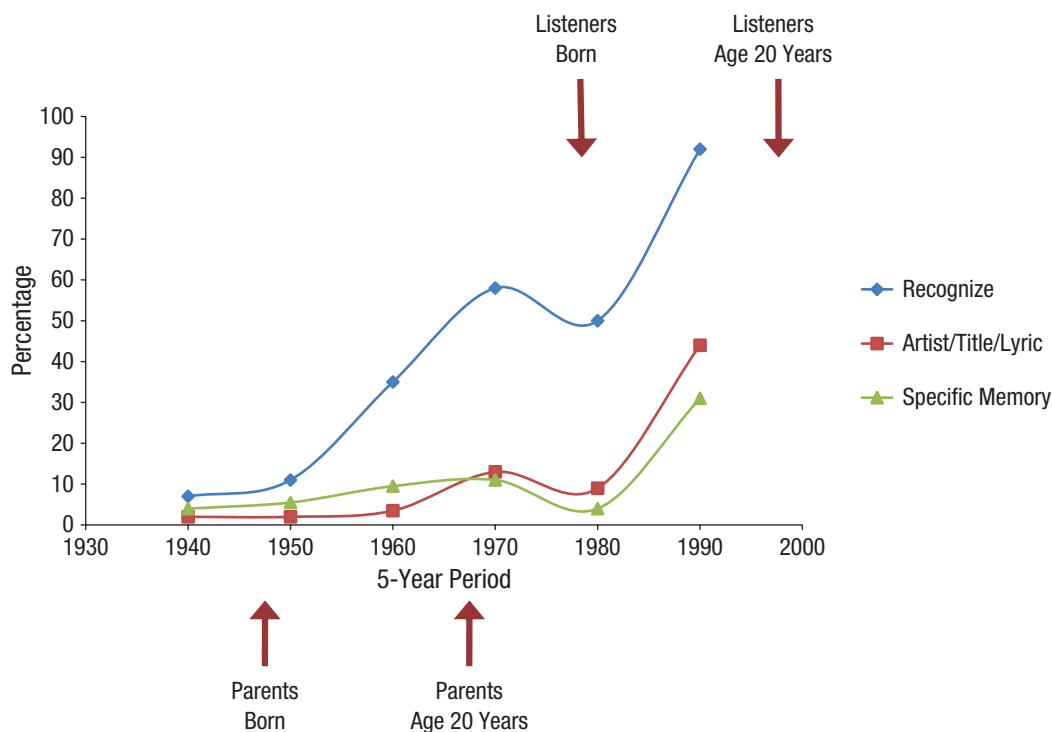


Fig. 5. Mean ratings from Schulkind, Hennis, and Rubin (1999, Figs. 1, 3, and 5) of the percentage of songs that listeners were familiar with; a combined measure assessing recall of title, artist, and cued lyrics; and the percentage of songs that elicited a specific memory. The ages of participants' parents indicated here are approximate.

might be special because parents actively or passively expose their children to music of their own era, focusing on certain songs, artists, and albums. However, Svob and Brown (2012) found intergenerational transmission of life stories. When participants reported events from a parent's life, there was a bump for events that occurred when their parents were in their twenties.

An intriguing question is whether memories associated with events before birth are more semantic than episodic in character. Rubin (1998) suggested this possibility because these events are known only from indirect sources. He noted that for some domains, such as entertainment, current events, and recall of presidents, the functions are quite level for events before birth. This is consistent with the idea that knowledge about these domains is not associated with personal autobiographical events. In contrast, our participants reported having personal memories associated with music from before they were born, and these memories were clustered at distinct points in time. Moreover, our participants were able to report the contexts in which the memories occurred, specifically, with whom they were listening. In addition, for music both before and after they were born, personal memories were all closely related to whether they made participants feel happy and energized, emotions typical of music-evoked autobiographical memories. However, the question remains as to whether there is a shift from semantic to episodic memories with the recency of the music (or any other domain). Unfortunately, the most extensive content analysis of musical autobiographical memories (Janata et al., 2007) does not take a chronological approach.

Finally, mention might be made of an intriguing parallel between autobiographical memories for music and for odors, which, like music, have qualities that are difficult to verbalize but are associated with highly emotional, vivid, specific, and generally pleasant autobiographical memories. Older adults cued by odors reported most autobiographical memories in the first decade of life, unlike memories for pictures and words, and memories from this time evoked stronger emotions and a feeling of being brought back in time than memories from later in life did (Willander & Larsson, 2006). Hippocampus and prefrontal cortex are implicated in odor-evoked memories (Larsson & Willander, 2009) in a way that is similar to how they are implicated in music-evoked memories (Ford et al., 2011; Janata, 2009; Plailly, Tillmann, & Royet, 2007). The special connection between music and smell is tentative until further research is done, but it suggests that new findings in the study of autobiographical memory might come from considering nonverbal domains that are especially salient in early childhood.

What mechanisms are involved in establishing autobiographical memories in childhood? Are they similar to those that have been proposed to account for

the reminiscence bump in late adolescence and early adulthood? Music plays a central role in childrearing cross-culturally, such as in lullabies, play songs, and teaching songs, as well as other less formal musical interactions. Infants exhibit well-developed abilities for processing music, for example, perceiving changes in melodic contour, rhythm, and phrasing. Many physical and physiological changes occur during childhood, which is a period of rapid learning and formative, first-time experiences. Parents transmit knowledge and skills and may use music to convey personal values and define family and cultural identities. These considerations all suggest that music heard during childhood, likely reflecting the tastes of previous generations, would make a lasting impression on children's autobiographical memories, preferences, and emotional responses.

Author Contributions

C. L. Krumhansl and J. A. Zupnick designed the study. C. L. Krumhansl reviewed the literature, analyzed the data, and prepared the manuscript. J. A. Zupnick created stimulus materials and the survey, collected and analyzed data, and contributed to the manuscript.

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Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Supplemental Material

Additional supporting information may be found at <http://pss.sagepub.com/content/by/supplemental-data>

Note

1. Prior to the study by Holbrook and Schindler (1989), Bartlett and Snelus (1980) played songs from each decade from the 1920s through the 1970s to middle-aged (average age = 45.2 years) and older participants (average age = 65.4 years). They found that middle-aged participants recognized more recent music than the older participants did. The study did not include younger participants and will not be considered further.

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