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REPLICATION CORNER

The power of nostalgia: Age and preference for popular music

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Abstract

Marketers need evidence to help them select music to promote their products. Ethnicity, social class and/or personality type can distinguish individual music tastes, but age and nostalgia may be the largest determinant of all (North, *American Journal of Psychology, 123*, 199–208, 2010). Research into listener preference for music from different eras has found conflicting results. Papers generally agree that it takes an inverse U shape, but disagree on the era for which people are most nostalgic. The seminal paper found a peak for music released when listeners were 23 years of age (Holbrook & Schindler, *Journal of Consumer Research, 16*, 119–124, 1989), a follow-up 9 years of age (Hemming, *Musicae Scientiae, 17*, 293–304, 2013), and 19 years of age (Holbrook & Schindler, *Musicae Scientiae, 17*, 305–308, 2013). This paper attempts to correct the issues raised by Holbrook & Schindler (*Musicae Scientiae, 17*, 305–308, 2013) by improving the representativeness of the sample and introducing a new analysis technique, the two-lines test. This paper finds support for Holbrook & Schindler, but with a slightly younger age peak of roughly 17 years. Additionally, the larger sample allows investigation of differences by generation, which reveals differences that may be caused by their different current age, and so the relationship with, and interplay of nostalgia and music. The central conclusion of the paper is that people *do* exhibit a preference for music released during their late adolescence/early adulthood. When targeting consumers of a narrow age demographic, music released during this time is more likely to be preferred than any other.

Keywords Music · Nostalgia · Consumer preferences · Two-lines test

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1 Background

Considerable attention has been dedicated to understanding the development and nature of music preferences (see Colley, 2008; Dunn et al., 2012). Findings suggest that age, gender, ethnic background, social class and/or personality type can distinguish individual music tastes (e.g. LeBlanc et al., 1996; Rentfrow & Gosling, 2003; Savage, 2006). Several studies suggest that age may be the largest predictor of music preferences (e.g. Baur et al., 2012; North, 2010). Common findings are that younger listeners are fans of Rock and Pop, while older listeners more often turn to Classical and Jazz (LeBlanc et al., 1996; Savage, 2006).

In further investigating the influence of age, Holbrook and Schindler (1989) found that preferences for popular music are developed during a critical period of an individual's life and that these preferences tend to stay stable over time. The authors regressed a standardized dependent variable of musical preference on an interactive predictor variable termed "song-specific age", which is a measure of a respondent's age at the time that various musical stimuli (i.e. songs) reached popularity in the Billboard Top 10 charts. Two important findings were revealed. First, preferences for popular music and the age someone is when the song was released (conceptualized as "song-specific age" or SSA) follow an inverted U-shape relationship. Second, preferences for popular music peak when an individual is around 23.5 years old. It was concluded that preferences for popular music reflect the tastes acquired during the period of late adolescence to early adulthood. That is, people have highest preferences for music from when they are around 23.5 years old, and lower preferences for music that was released before or after this approximate age.

This study was later replicated with a larger German sample (Hemming, 2013). However, a conflicting preference peak of 8.59 was found, which led the author to conclude that there was no empirical support for the original study. The original authors argued that the replication study did support the original findings due to a number of faults in the replication (Holbrook & Schindler, 2013). Specifically, outliers, most commonly at the tails of the data, should have been removed as they reflect very small sample sizes. Further, the distribution of the replication data was skewed to the right and would have been better suited to a cubic rather than a quadratic equation. Additionally, the cleaning of data points consisting of fewer than 50 individual ratings was arbitrary and resulted in the removal of large parts of data. After these criticisms were resolved in a re-analysis, the preference peak increased to 19.23. Therefore, the preference peak was maintained as occurring "during late adolescence or early adulthood". This conflict forms the core of the present research, which is an additional replication of these studies.

Calls for external validity were only in part answered by Hemming's replication. The original study only gathered data from a convenience sample of 108 respondents and could be expanded to a larger, representative sample. As alluded to by all authors, there are more advanced techniques for examining the relationship between popular music preferences and age, such as two linear regressions rather than a traditional quadratic regression. One alternative is Simonsohn's (2019)

two-lines test, which was developed as a more valid method for detecting a true U-shaped relationship. The test fits two linear regressions for low and high values of x and determines that a U-shape relationship is present if both slopes are significant and of opposite sign. It also establishes a data-driven breakpoint through a "Robin-Hood algorithm", which tests two linear regressions across the data, and then "steals" observations from the "richer" (i.e. more statistically powerful) line until both regressions are as statistically powerful as possible (for more details, see Simonsohn, 2019). While Holbrook and Schindler (1996) had applied two linear regressions through piece-wise linear modelling when examining the generational effect in preferences for films, they had not revisited it in the context of preferences for popular music.

Music consumption has evolved considerably, even since Hemming's replication in 2013, most notably through the rapid rise of music streaming. By way of illustration, the number of users of any music subscription service has increased from 18 million in 2013 to 341 million in 2019 (nearly an 1800% increase). According to industry reports, music streaming is frequently used by 89% of surveyed respondents, while streaming engagement is increasing globally among all ages (International Federation of the Phonographic Industry, 2020). With on-demand access to millions of songs, and sophisticated algorithms to provide personally curated music suggestions, there is greater opportunity for listeners to discover a wider range of music, both new and old. Therefore, a shift in the preference peak or even from an inverted U-shaped relationship altogether is not improbable. This research aims to examine whether a preference for popular music of a specific era still exists and whether it still follows a non-monotonic relationship with age.

2 Method

2.1 Participants

We recruited a large sample through an online panel provider, Toluna. The sample was comprised of 1,036 participants ranging between 18–84 years of age (mean age = 48.6, SD = 17.6, female = 53%). Data collection was conducted through an online survey in February 2019, which also gathered music genre preferences and music media usage data for another study. As shown in Table 1, our sample resembles the general US population as per census data (U.S. Census Bureau Population Division, 2019).

2.2 Research design and task

Thirty-four songs were selected from the 1950 to 2016 Billboard Top 10 charts in two-year intervals. Song selection excludes those in the top three to avoid the influence of potential outliers, i.e. songs that are very popular or well-known. These songs are intended to be representative of their respective year in the Billboard Top

Table 1 Comparison between our sample and US Census data (2019)

	Sample (%)	Sample (*n*)	US Census (%)
Age			
18–24	13	110	9
25–39	26	267	21
40–54	26	267	19
55 +	38	392	29
Region			
Northeast	18	189	17
Midwest	21	218	21
South	38	392	38
West	23	237	24
Gender			
Male	47	490	49
Female	53	546	51
Race			
Caucasian or white	80	825	77
African American or Black	11	113	13
American Indian or Alaskan Native	2	17	1
Asian	4	36	6
Hispanic/Latino/Spanish	6	66	18
Native Hawaiian or Pacific Islander	< 1	7	< 1

10. All songs were trimmed to 30-s excerpts which captured the main essence of the song (part of the verse and chorus). Respondents were exposed to each 30 s excerpt in an individually randomized order. Preference was assessed on an 11-point scale, starting at 0: "I dislike it a lot" and 10: "I like it a lot", with a midpoint included at 5: "I neither like nor dislike". A 'Don't know" option was also provided. Respondents were required to listen to at least 10 s of each song before moving on to the next song. They could rate each song at any time but could not advance to the next until at least the 11th second. The full list of songs appears in the Appendix, Table 2.

3 Analysis

We first calculated the independent variable: song-specific age (SSA). This is a measure of a respondent's age when each of the 34 songs featured in the Billboard Top 10. It is calculated by subtracting each respondents' age from the year that each song was featured in the Billboard charts. For example, if a respondent was born in 1970, their SSA is 30 for the song that was in the 2000 Billboard charts. SSA may also be a negative number, which indicates that a song was released before that respondent's birth (e.g. a respondent born in 2000 has an SSA of -30 for the 1970 Billboard Top 10 Song). As in the original papers, the same SSA consists of different songs due to respondents' age differences. A respondent born in 1970 will

have an SSA of 30 for the song released in 2000, while a respondent born in 1980 will have the same SSA for the 2010 Billboard song. Initial SSA calculations produced 132 unique SSAs ranging from -51 to + 81, with no missing values. Next, individual ratings were standardized by subtracting the mean and dividing by the standard deviation. We then aggregated individual ratings by SSA and calculated the mean standardized rating for each to form the dependent variable. SSA was further recoded as a deviation from their own mean to minimize multicollinearity between the two independent variables. We then regressed mean standardized musical preference on SSA and SSA squared to determine whether the original inverted U-shaped relationship was present. We have also used Simonsohn's (2019) two-lines test on both the aggregated and disaggregated data and summarize these.

4 Results

Upon visual examination, standardized musical preference and song-specific age follows an inverted U-shaped relationship. Due to absolute differences in respondents' age, there were fewer old and young respondents in the sample, and so the extreme low and high SSAs may not be reliable. We removed any SSAs consisting of fewer than 100 individual ratings, and any outlying individual standardized ratings that were identified as using the interquartile method, which leaves 104 SSAs ranging from -38 to 65 for re-analysis. The resulting regression plot for this trimmed data is shown in Fig. 1.

Multiple regression reveals a strong relationship between popular music preferences and song-specific age ($R^2 = 0.71$, $F(2, 101) = 125.8$, $p < 0.001$). This was significant for both song-specific age ($t(102) = 4.0$, $p < 0.001$) and song-specific age

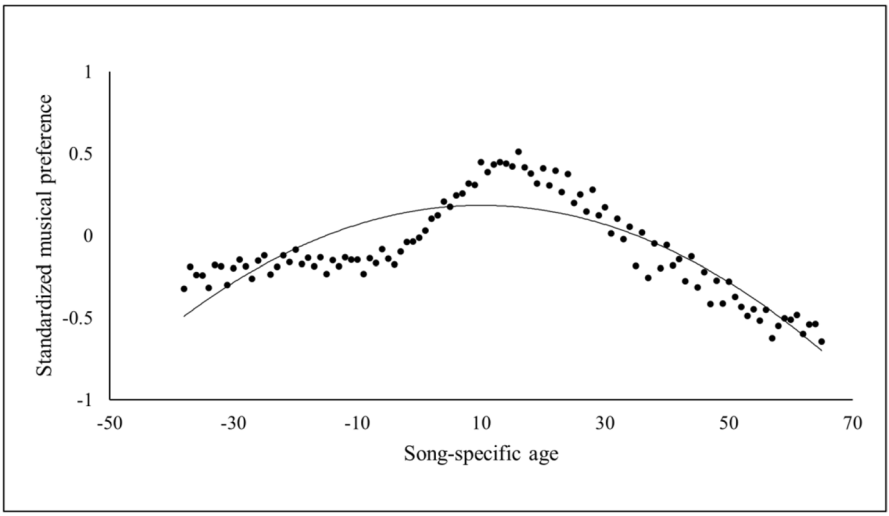

Fig. 1 Relationship between song-specific age and standardized musical preference (preference = -0.00029 * SSA^2 + 0.0059* SSA + 0.16)

squared (t(102) = —15.4, $p < 0.001$). In this instance, peak popular music preferences occurred at 10 years of age. However, the quadratic model fits poorly towards the peak of the observed values, which is affecting the preference peak calculation.

Holbrook and Schindler (2013) suggest applying a cubic model (shown in Fig. 2). The cubic model provides a modest increase in explained variance ($R^2 = 0.71$ for the quadratic model to $R^2 = 0.75$ for the cubic), and the preference peak rises to 17.6 years of age.

We now turn our attention to a two linear regression solution, which is Simonsohn's (2019) two-lines test. An inverted U-shaped relationship was detected for popular music preference and song-specific age. Line one was significant and positive for the low values of x (b = 0.01, z = 11.97, $p < 0.0001$), while the second line was also significant and negative for high values of x (b = -0.02, z = -30.31, $p < 0.0001$, see Fig. 3). The breakpoint indicates that popular music preferences peak when respondents are about 16.8 years old. Visually, this age corresponds with the approximate peak of the observed values. While previously the quadratic regressions failed to provide a reasonable fit towards the peak of the observed values, the two-lines test appears to provide a more feasible age peak.

We also calculated an individual peak for each respondent. When running the two-lines test across the set of individuals, only 136 of 1036 tests (13%) detected a statistically significant result at $p < 0.05$ for both lines, with a peak preference in music released when respondents were 13.4 years of age (SD = 18.8, median = 14.7), somewhat dissimilar to the previous findings. If the significance level is changed to $p < 0.1$ ($n = 189$, 18% of the sample), the new mean for peak preferences is detected at 13 years of age (SD = 19.4, median 14.7), compared with 16.8 (SD = 22.6, median 16.5) for all respondents, regardless of significance of the test. When inspecting a histogram of the breakpoints detected at $p < 0.1$, (see Fig. 4), we see that the mean

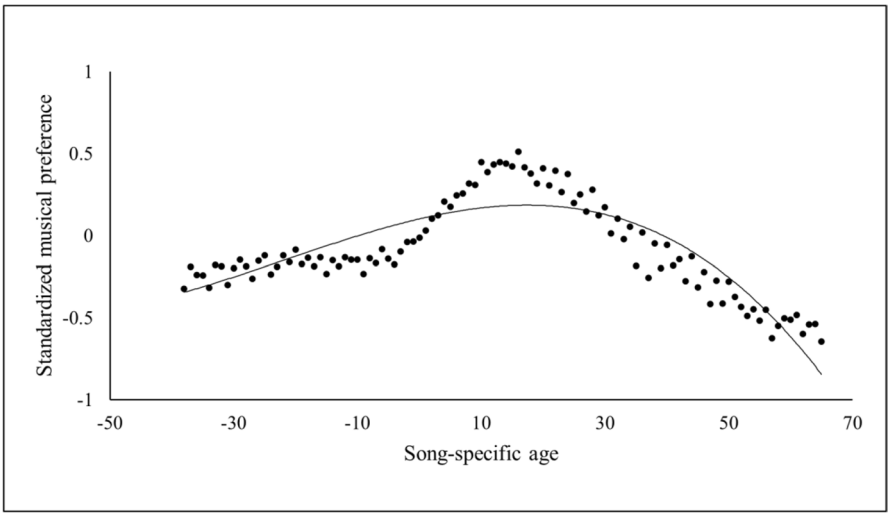

Fig. 2 Cubic relationship between song-specific age and standardized musical preference (preference = -0.0000028* SSA^3 * -0.00018* SSA^2 + 0.0088* SSA + 0.10)

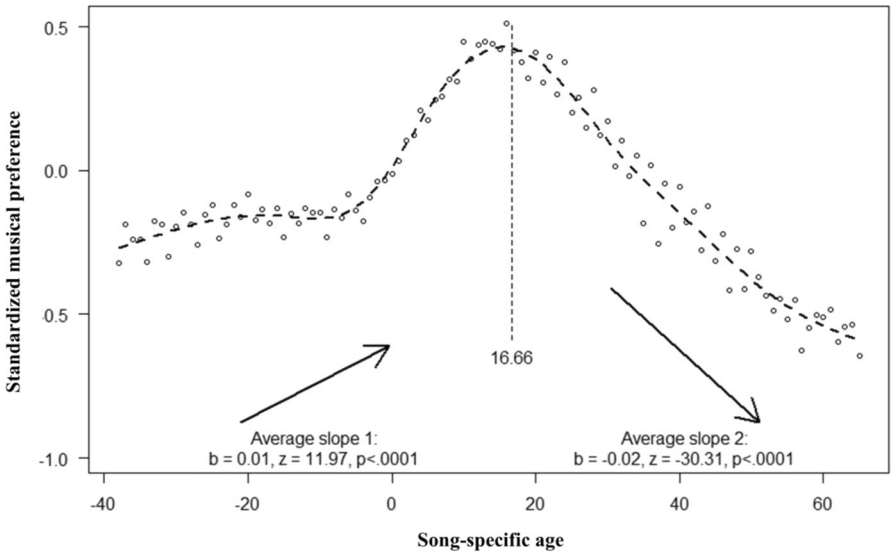

Fig. 3 Two-lines test of the relationship between song-specific age and standardized musical preference

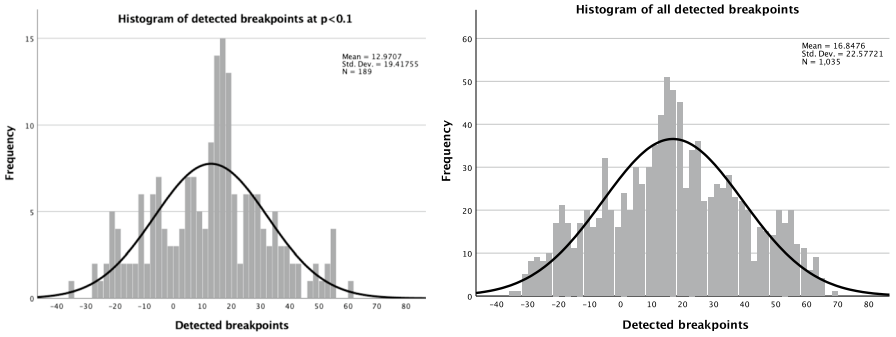

Fig. 4 Histograms of detected breakpoints

does not reflect the data, as it is clustered in the range representing the late teenage years. The mean calculated by using *all* detected breakpoints appears to be more reflective of even the subset of significantly detected breakpoints, and so is our preferred peak in musical preference.

When inspecting a scatter plot of the peaks (see Fig. 5), there are two key patterns to note. The first is that the overall shape of the scatter reflects the relative years of music heard by each respondent. If all respondents reported a peak at a similar age, we would see that the points were arranged in a roughly horizontal line. This is not the case. Second, for respondents with birth year roughly 1970 onwards, the peak in preference has the possibility of being negative, that is, they can prefer songs from before they were born more than others.

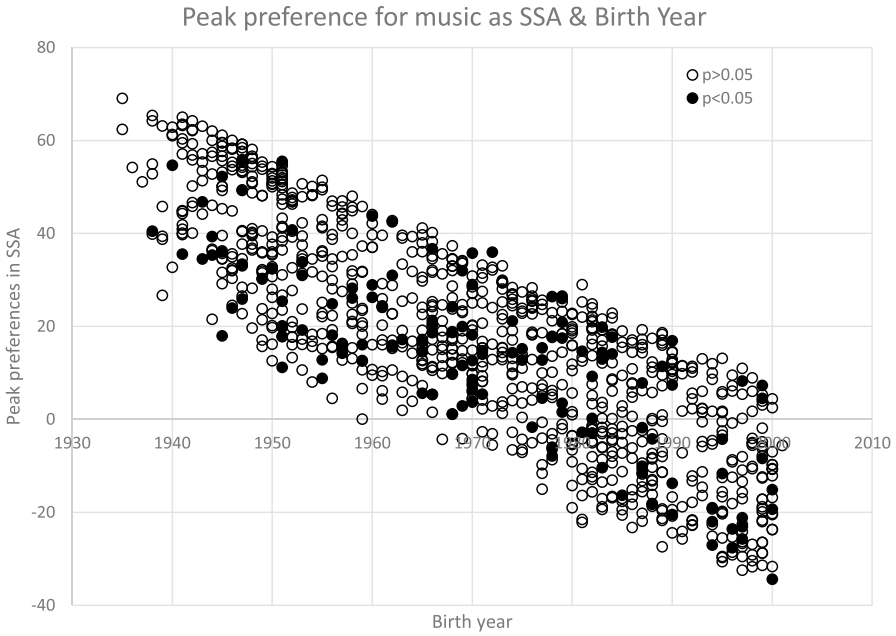

Fig. 5 Scatter and histograms of peak musical preference as detected (or otherwise) by the two-lines test

There are three potential causes for these patterns. The first is that for older respondents, most of the music encountered in this study will have been released long after their young adulthood, and for younger respondents, a great deal of the music will have been released long before they were born: there may be recency effects interacting with nostalgia, or the increased availability of music across all parts of life. The second is that by representing an entire era of music through just a few specific songs, we open ourselves to the variation in quality of the songs themselves, and the variation in musical preference that exists in the population. The third potential cause is that the influence of nostalgia holds different levels of influence over individuals, and individuals vary in their interest in and enthusiasm for, new and old music, or indeed music in general.

5 Discussion

Our replication generalizes Holbrook and Schindler's (1989) original findings concerning the development of popular music preferences. The relationship between popular music preferences and song-specific age is still curvilinear and inverted U. In our analysis, preferences for popular music peak at 16.7 using Simonsohn's two-lines test, or 16.8 using the two-lines test across individuals. That is, individuals prefer music from their mid-to-late teens most, and prefer music released earlier or later in their lives least. While the original study's preference peak at 23.5 years of age was classified as late adolescence or early

adulthood, our research finds a preference peak that occurs earlier, more closely aligned with mid-to-late adolescence, or the beginnings of adulthood. Given the quantum shifts in music consumption and increased accessibility of music offered by digitalization and streaming, a lowering of the peak is conceivable. Increased exposure to music at a younger age and greater availability to music of all ages could be contributing factors to this shift in preferences. Additional research is required to uncover why preferences for popular music are peaking at a younger age. However, understanding these generational differences requires further work and remains an avenue of investigation for future researchers.

Our research further demonstrates the varying effects of model choice. That is, the researcher's decision to use a quadratic, cubic or interrupted regression, will notably impact the location of the curve-maxima. By applying Simonsohn's (2019) robust two-lines test, we validate that the relationship between popular music preferences and song-specific age is still an inverted U. Further, a more plausible preference peak of 16.8 is obtained: and, that it varies by individual, as shown in the individual-level analysis which finds an average peak of 17 years when considering all detected peaks. Perhaps, future work should exclude preferences for tracks released before respondents were born, as this appears to muddy results – and while we acknowledge that fashion moves in cycles of rediscovery and rebirth, people are unlikely to hold actual *nostalgia* (as opposed to mere admiration) for eras they didn't experience.

Our research is not without its limitations. First, musical stimuli are limited to popular music, which means we cannot generalize our findings to more diverse musical selections. Selecting a single song to represent a year introduces noise into the data: the songs chosen are pop, as they are likely to have been heard by the entire community, but individual genres or artists differ in their popularity. Naturally, a more diversified musical corpus can be considered in future work. Additionally, we can only conclude that popular music from one's mid-to-late teens is preferred more than music released before or after. We are unable to understand if this is even the most enjoyed music, only that it is more preferred than popular music released before or after this period of adolescence. We were also unable to validate Hemming's (2013) German replication, as our scope is solely the USA. Observation of this preference peak in different countries, especially those that are non-Western, is required for generalizability. Calls for a longitudinal design were unanswered by our research, which again is an area that should certainly be considered in future work. One potential solution could be exploiting behavioural music data rather than claimed preferences. This may facilitate observation of music preferences individually and how changes play out over time.

We confirm the original study and conclude that preferences for popular music peak during early adolescence or mid-to-late teens, and that newer or older tracks do not command this same level of affection. However, rather than one definitive preference peak, we find evidence for variation in peak preference, with the bulk of people's preferences occurring in the teenage years. Nearly three decades later, we validate Holbrook and Schindler's original research concerning the development of popular music preferences. Their seminal work appears to be a cultural phenomenon rather than an artefact of a single study.

Appendix

Table 2

Table 2 Music stimuli used in the survey and their respective year in the Billboard charts

Song Year	Song Title	Performer/s
1950	Play a Simple Melody	Bing and Gary Crosby
1952	You Belong to Me	Jo Stafford
1954	Sh Boom Sh Boom	The Crew Cuts
1956	My Prayer	The Platters
1958	Patricia	Perez Prado
1960	Running Bear	Johnny Preston
1962	Roses are Red	Bobby Vinton
1964	I Get Around	Beach Boys
1966	The Last Train to Clarksville	The Monkees
1968	People Got to be Free	The Rascals
1970	Raindrops Keep Fallin' on My Head	B.J. Thomas
1972	Lean on Me	Bill Withers
1974	The Sound of Philadelphia	MFSB ft. Three Degrees
1976	Play that Funky Music	Wild Cherry
1978	Stayin' Alive	Bee Gees
1980	Crazy Little Thing Called Love	Queen
1982	Don't You Want Me	Human League
1984	Footloose	Kenny Loggins
1986	Party All the Time	Eddie Murphy
1988	Sweet Child O' Mine	Guns N' Roses
1990	Vogue	Madonna
1992	Under the Bridge	Red Hot Chilli Peppers
1994	All She Wants	Ace of Base
1996	Missing	Everything but the Girl
1998	Crush	Jennifer Paige
2000	Say My Name	Destiny's Child
2002	Dilemma	Nelly ft. Kelly Rowland
2004	Hey Ya	OutKast
2006	Sexy Back	Justin Timberlake
2008	Lollipop	Lil Wayne
2010	California Gurls	Katy Perry
2012	Payphone	Maroon 5
2014	Counting Stars	One Republic
2016	Work	Rihanna

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Data availability The data for this paper were collected by Toluna, a third-party panel provider, during February 2019, across the USA. The authors jointly analysed the data, and it is currently stored in a Dropbox folder managed by the Ehrenberg-Bass Institute for Marketing Science.

Declarations

Ethical approval This research was approved by the University of South Australia's Human Ethics Committee, protocol number 201865.

Informed consent As part of this process, respondents provided informed consent.

Conflict of interest The authors declare they have no financial or non-financial interests.

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