Music and Pedagogy: The Role of Cultural and Demographic Variables

Music is a universal language.[1] Globally, people spend an average of 20.8 hours per week listening to music.[2] Music is everywhere, and it has more to offer than just catchy tunes that bring us all together. Recent research suggests that music has a special relationship with our brains and is involved in a number of neurological responses. Our brains' cortices play a central role in processing music. Notably, various structures of the brain that are stimulated by music, such as the amygdala and the hippocampus, are linked to emotional reactions and memory, suggesting music could play a role in regulating emotions and aiding memory.

Music is a key component of human nature and communication.[3] It can transmit stories from one generation to the next in diverse forms including ballads, folks songs, national anthems, and nursery rhymes. Over time, the uses of music have expanded. Today it is used in a wide variety of cultural settings, ranging from celebrations to funerals. People listen to music when shopping, traveling, exercising, relaxing, socializing, and when alone. Indeed, music "has been used as a peripheral persuader, a manipulative tool, and a powerful societal unifier."[4]

Not only does music have communicative properties, but many researchers have touted music as a pedagogical tool with a wide range of applications across a variety of educational settings.[5] Concepts as basic as the ABCs and the "Handwashing Song" are taught through song in schools, and many children's television shows, including Sesame Street, Mister Rogers' neighborhood, and Barney and Friends, have incorporated music to teach children cognitive lessons.[6] Songs have also been used to promote learning in higher education such as using progressive rock to teach social theory or historical songs to teach history.[7] In addition, there is mounting evidence that music can support information retention among patients with

neurodegenerative diseases that affect memory, including Alzheimer's Disease.[8] Melissa Leggieri and colleagues explain how music can enhance autobiographical memory and promote recall of involuntary memories—memories that can be retrieved automatically by a cue.[9] They describe how the ability of music to improve memory and other cognitive functions might be attributed to a more general improvement of one's mental state, by modulating emotions and evoking positive responses.

Of course, how individuals respond to music is generally conditioned by their relationship to the music. Like many studies that have investigated the relationship between music and memory, research by Elodie Fraile and colleagues points to the importance of respondents' personal connection as an important factor in determining the effectiveness of music as a cognitive and social intervention.[10] Their research found that personalized song teaching sessions positively impacted the autobiographical memory abilities of Alzheimer's Disease patients. Many other studies have stressed the importance of one's personal connection to music. For example, Renate Ysseldyk and colleagues found that listening to music that threatens one's religious identity can undermine performance on memory tasks and contribute to increased feelings of hostility. Meanwhile, music that is consistent with one's social identity can promote positive cognitive and social responses.[11]

While most studies on the relationship between music and memory have focused on music as a direct tool to stimulate learning, several recent studies have examined the potential effects of background music. For example, Tram Nguyen and Jessica A. Grahn assessed the effects of background music ranging in mood on memory performance and underscored the link between one's emotional state and cognitive processes, including memory.[12] The researchers found that listening to low arousal music led to greater recall and increased word recognition. However,

compared to silence, background music did not significantly lead to improvements in verbal memory performance.[13] In a parallel study, Sarah Reaves and colleagues undertook research looking at the impact of background music on visual associative memory among both young (ages 18-30) and older (ages 60-75) adults. Their results showed that for older adults there was evidence of significant cognitive impairment when performing the tasks with background music. For the younger adults, however, there were no differences in memory accuracy between any condition and silence. The subjective ratings showed that participants felt as though the musical rain (computer generated random vowel sounds) was more distracting than either music or silence, and all participants rated music as more distracting than silence.[14] These findings point to the disparate impacts of music as a pedagogical tool, depending on how it is employed.

Even as music often has a positive effect on learning overall, the results are not consistent. For example, Sandra L. Calvert examined how visual and auditory elements that go into televised content affect recognition of educational material using various television vignettes from the "Schoolhouse Rock!" Series.[15] Research participants were divided into four treatment conditions: 1) visual with singing, 2) visual with prose, 3) audio with singing, and 4) audio with prose. The outcome measures examined included: 1) multiple choice recognition, 2) picture sequencing, and 3) verbatim recall. The study found that singing had a negative impact on recognition of verbally presented content, as the music may have functioned as a distraction and participants may have allocated their processing efforts of the songs to a relatively superficial level. Put simply, the participants paid more attention to the sound of the music than to the words at the expense of the content's deeper, semantic meaning. Calvert concludes that verbatim memory and order of visual events may favor songs, while comprehension of verbal material

may favor a spoken presentation.[16] This finding implies that examining the relationship between music and learning may require separate attention to both recall and comprehension components.

While there has been considerable research seeking to explain the relationship between music and learning, what is missing in previous studies is attention to the role of socio-cultural and demographic variables in understanding these associations. In addition, most studies have failed to bridge the gap between qualitative and quantitative research. This study expands on previous research using a multi-methodological approach to bring in the voices of underrepresented groups and to explore the role of key socio-cultural and demographic variables, including gender, race/ethnicity, and nativity. Given that previous research has shown that one's personal relationship to music influences memory and learning,[17] it is expected that variables such as race/ethnicity, gender, and nativity will impact how one feels about both musical lyrics as well as different genres of music. These variables will then, in turn, influence performance on memory and cognitive tasks.

Methods

All research was carried out in accordance with relevant guidelines and regulations. Using Google forms, a survey questionnaire was developed that included: 1) socio-demographic questions, 2) assessment questions combining elements of recall and comprehension, and 3) open-ended questions that asked respondents to reflect on the experiment.

All three audio variants (rap, country, and read versions) were obtained through audio recordings on YouTube,[18] and were edited to cover only the Preamble (each audio lasted approximately 40 seconds). An invitational video and letter were prepared and sent out with detailed information about the experiment. A snowball sample of 91 participants (56 female, 35 male; 8–84 years, mean age = 36.75, SD = 19.91) was recruited through an email invite, social

media (e.g., Facebook), and word of mouth. Associates of the researcher working in academic settings helped to recruit student participants by distributing the researcher's recruitment video. Each respondent completed the study on their own. Although the study did not solicit information about respondents' residence, recruitment was largely directed towards those living in New York City and surrounding suburbs, but it extended to other areas in the United States and even abroad (e.g., India). To incentivize participation, respondents were given the option of participating in a lottery for a cash prize (there were two prizes: $50 or $25). The majority (62 percent) entered the raffle.

Participants were randomly assigned to one of the three aforementioned conditions and required to provide informed consent (or parental/guardian consent for minors) before proceeding with the experiment. After providing information concerning their demographic background (age, gender, race, etc.), participants completed a series of questions to gauge their familiarity with the text (including a pretest) before proceeding with the memory test. Next, participants would listen to a randomly assigned audio and subsequently answer a series of recall and comprehension questions. After completing the assessment, the subjects participated in a reflection exercise about the experiment. The reflective questions intended to probe deeper into the role of cultural variables, one's personal connection to the music, and enjoyment.

In the quantitative analysis of the data, descriptive statistics (bivariate tables) and inferential statistics (t-tests and linear regression) were used to ascertain the relationships between a variety of cultural and demographic variables and performance on the assessments. Linear regression was used to explore the independent effect of each of the variables. Finally, for the qualitative data analysis, the open-ended questions from the reflections were systematically analyzed and

coded thematically to assess the role of socio-cultural variables in influencing performance on assessment tasks. Obvious typos in the written responses were corrected.

Results

The key intervention for this experiment was an audio that included the full text of the preamble of the U.S. Constitution. The Preamble of the US Constitution states:

> We the People of the United States, in Order to form a more perfect Union, establish Justice, insure domestic Tranquility, provide for the common defense, promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity, do ordain and establish this Constitution for the United States of America.

The preamble was presented across three different modalities: (1) a rap version song, (2) a "Schoolhouse Rock!" country style version of the song, and (3) a recording of a person reading the preamble (in a monotone voice).[19] (The "Schoolhouse Rock!" variant was initially part of an animated musical educational set of short films that originally aired from 1973 to 1984.) Each video was edited to include only the section covering the Preamble. After respondents were randomly assigned to listen to one of these modalities, they participated in a cognitive assessment about the Preamble and were asked open-ended questions about the experiment. Overall, 31 (34.1 percent) were randomly assigned to the read version, 32 (35.2 percent) to the "Schoolhouse Rock!" country style version, and 28 (30.8 percent) to the rap version.

Quantitative Results: Bivariate Comparisons and T-tests

Table 1 shows how respondents performed on the assessment according to key cultural and demographic indicators. There were a total of ten possible points on the memory recall and 4 possible points on the comprehension component of the assessment (a total of 14 points overall). While there were minimal differences by gender, respondents who were born in the United States averaged nearly 1 point higher on the assessment compared to those who were foreign-born ($p \leq .10$). Insofar as race/ethnicity was concerned, respondents identifying as White had the

highest scores on the assessment, while those identifying as members of underrepresented groups, especially Native American, Black, and Latinx respondents, had the lowest scores. (The differences between White people and both Black and Latinx people were statistically significant.) The data also reveal that older respondents out-performed younger respondents.

Figure 1 shows the mean performance of respondents according to the type of intervention. As shown, respondents who were given the rap version of the intervention had the lowest scores on the assessment, whereas those who were exposed to the "Schoolhouse Rock!" country style of the Preamble of the Constitution had the highest scores. The latter performed more than 1 point higher, on average, than those who were given the rap version and the total score difference between the two groups was statistically significant ($p \leq .10$; one-tailed). Meanwhile, the version of the assessment that involved a recording of a person reading the Preamble fell in between both (on both memory and recall tasks), but was closer to the "Schoolhouse Rock!"/country version.

Table 1
Mean Scores on Performance Tests According to Socio-Demographic Variables

	Gender			Nativity	
	Female	Male		Foreign-born	Born in the US
Mean Score (Memory)	4.86	4.66	Mean Score (Memory)	4.38	5.00
Mean Score (Comprehension)	1.46	1.71	Mean Score (Comprehension)	1.28**	1.71
Mean Score (Combined)	6.32	6.37	Mean Score (Combined)	5.66**	6.71
Sample Size (n)	56	35	Sample Size (n)	32	59
*p≤.10; **p ≤.05; ***p ≤.01 (one-tailed independent samples t-test).					

	Race/Ethnicity					
	African American/ Black	American Indian/ Native American	Asian/ Pacific Islander	Caucasian/ White	Hispanic/ Latina/ Latino/ Latinx	Mixed Race
Mean Score (Memory)	4.33	3.00	4.18	5.02	4.87	5.5
Mean Score (Comprehension)	1.08**	1.50	1.55	1.94	0.80	1.50
Mean Score (Combined)	5.42*	4.50	5.73	6.96	5.67***	7.00
Sample Size (n)	12	2	11	47	15	4
*p≤.10; **p ≤.05; ***p ≤.01 (one-tailed independent samples t-test; each group was compared to Caucasian/Whites).						

	Age				
	8 to 17	18 to 29	30 to 59	60 to 82	All Respondents
Mean Score (Memory)	3.28	4.65**	5.45***	5.31**	4.78
Mean Score (Comprehension)	1.44	1.38	1.72	1.75	1.56
Mean Score (Combined)	4.72	6.03*	7.17***	7.06**	6.34
Sample Size (n)	18	26	29	16	91
*p≤.10; **p ≤.05; ***p ≤.01 (one-tailed independent samples t-test; each group was compared to young persons ages 8 to 17).					

Source: Spring 2023 Music and Memory Survey.

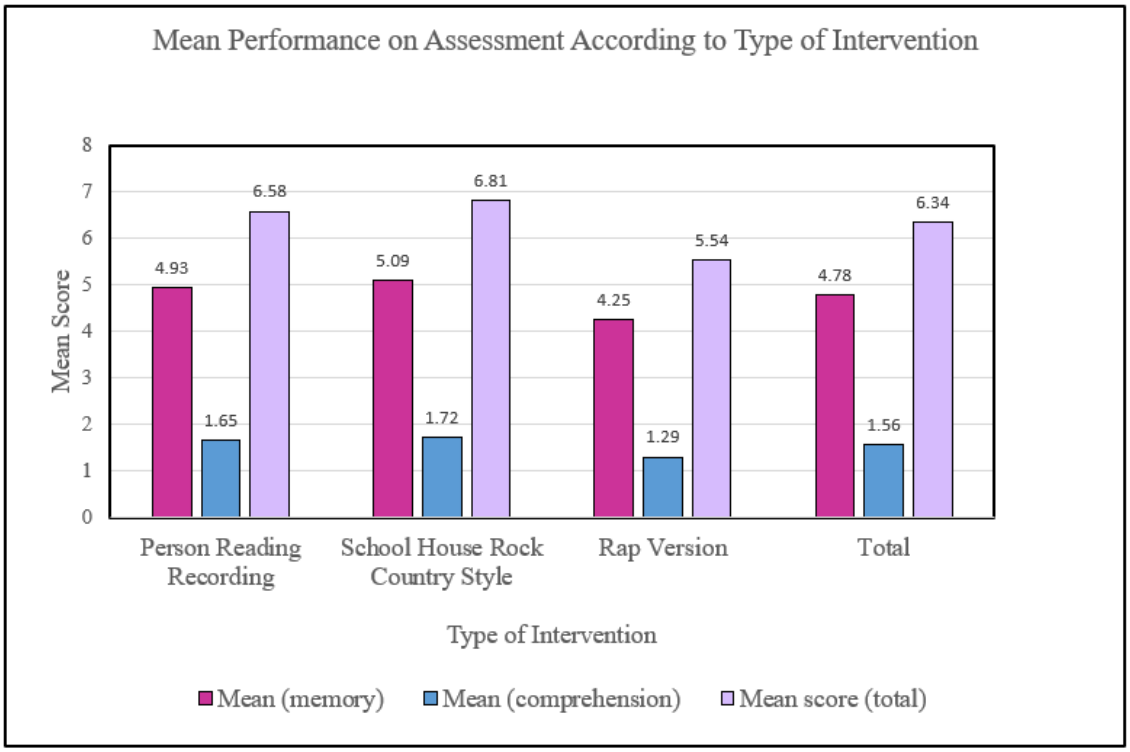

Figure 1. Mean assessment performance scores by audio intervention (reading, rap, or country version).
Source: Spring 2023 Music and Memory Survey.

Table 2 shows how respondents performed on the assessment according to their attitudes towards the intervention as well as their familiarity with the Preamble. It is evident that those who really disliked their audio performed the worst, whereas those who really liked it performed the best. In between the two extremes there was a lot of variation, but no discernible pattern. Meanwhile, increased familiarity with the Preamble was associated with improved performance on the assessment.

Table 2
Mean Scores on Performance Test according to Attitudes toward Audio and Familiarity with Preamble of U.S. Constitution

	On a scale of 1 (really disliked) to 9 (really liked), please rate the audio you just listened to.								
Performance Task	1	2	3	4	5	6	7	8	9
Mean (Memory)	2.33	4.00	3.33	5.50	4.75	4.79	5.29	4.25	6.00
Mean (Comprehension)	0.33	1.83	1.78	1.33	1.08	1.93	1.29	1.50	2.25
Mean Score (Combined)	2.67	5.83	5.11	6.83	5.83	6.71	6.57	5.75	8.25
Sample Size (n)	3	6	9	6	12	14	20	8	12
	On a scale of 1 (completely unfamiliar with it) to 9 (have it memorized), please rate your knowledge of the Preamble of the U.S. Constitution.								
Performance Task	1	2	3	4	5	6	7	8	9
Mean (Memory)	2.29	3.56	4.45	5.12	5.36	6.29	6.75	9.50	7.70
Mean (Comprehension)	0.86	1.63	1.45	1.69	1.50	1.43	1.75	4.00	2.67
Mean Score (Combined)	3.14	5.19	5.91	6.81	6.90	7.70	8.50	13.50	10.30
Sample Size (n)	14	16	11	16	14	7	8	2	3

Source: Spring 2023 Music and Memory Survey.

Figure 2 shows respondents' ratings of the audio they listened to according to race/ethnicity and mode of audio intervention. Overall, the findings show relative consistency across racial and ethnic groups in terms of the order of liking the audios, with the country ("Schoolhouse Rock!") version receiving the highest ratings. While it was thought that the racial/ethnic groups would exhibit differences in preferences, the only notable deviation was that individuals who identified as Latinx rated the rap video on par with the country audio, and rated the read version considerably lower. For all other groups, the rap audio was rated the lowest. It is unclear what may account for this finding, but approximately half of the Latinx population was foreign born

(47.7 percent) and it may be that native Spanish speakers prefer having information in English presented in musical form rather than prose.

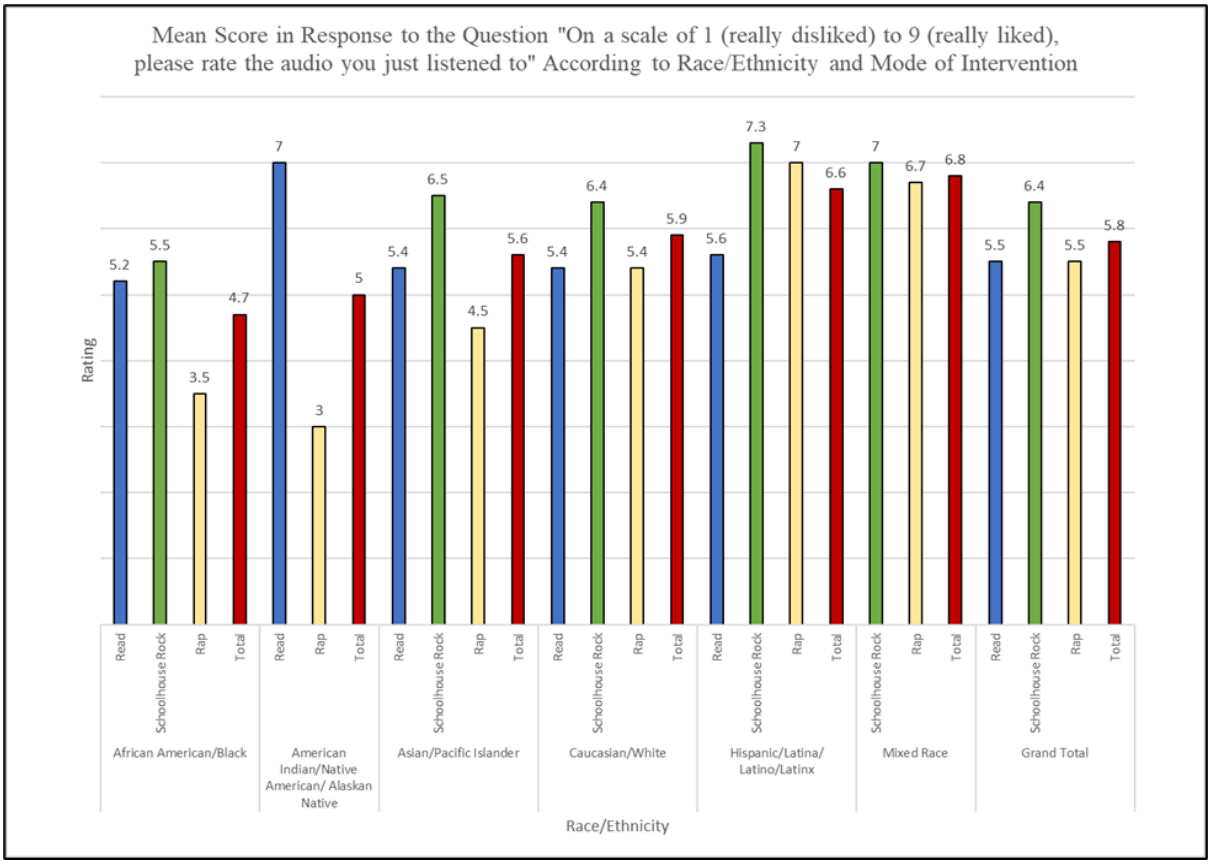

Figure 2. Mean score according to race/ethnicity and audio mode of intervention (reading, rap, or country version).
Note: Because of the limited number of Native American and Mixed Race respondents, all audio variants are not represented for those groups.
Source: Spring 2023 Music and Memory Survey.
.

Given the association between the cultural and demographic indicators and performance on the assessment, it is possible that this variation is related to respondents' attitudes towards the intervention and/or knowledge of the Preamble. Table 3 explores this possibility. Although there were not meaningful differences in performance according to gender, females were more likely to report higher levels of familiarity with the Preamble, whereas males reported more positive

sentiments towards the audios. Black participants were the most likely to express high levels of dislike for the audio—25 percent of them scored the audio at the lowest level possible (no other racial/ethnic group rated the audio so low). Conversely, a total 15.63 percent of participants assigned to the country audio rated it at the highest level, compared to 12.90 percent of those who listened to the reading and 10.71 percent of those who listened to the rap version.

In terms of the cultural variables (nativity and race/ethnicity), there was no consistent pattern. Asian participants reported the lowest levels of familiarity with the Preamble, but this likely reflects a high concentration of Asian participants in the sample who were born or living abroad (91 percent), especially in India. Setting aside the Native American respondents due to the low sample size (n=2), the White participants reported the highest level of knowledge. Those who were native born were more knowledgeable about the Preamble, while those who were foreign-born responded more positively to their audios.

Not surprisingly, older respondents were more knowledgeable about the Preamble, likely a reflection of their experience and exposure. They also had the highest scores on the pre-test, where scores ranged from 0-2 (a 2 was a perfect score). Those under age 18 were the least knowledgeable, and they also had the most negative attitudes towards the audios.

Table 3
Mean Scores on Attitudes towards Audio, Familiarity with Preamble, and Pre-test Scores by Socio-Demographic Indicators

	Gender				Nativity	
	Female	Male			Foreign-born	Born in US
Mean Knowledge	4.13*	3.51		Mean Knowledge	3.69	4.00
Mean Liking	5.68	6.08		Mean Liking	6.09	5.66
Mean Pre-test	1.42	1.31		Mean Pre-test	1.35	1.39
*p≤.10; **p ≤.05; ***p ≤.01 (one-tailed independent samples t-test).						

	Race/Ethnicity					
	African American/ Black	American Indian/ Native American	Asian/ Pacific Islander	Caucasian/ White	Hispanic/ Latina/ Latino/Latinx	Mixed Race
Mean Knowledge	3.58	4.50	2.81**	4.34	3.60	3.25
Mean Liking	4.67*	5.00	5.64	5.48	6.60	6.75
Percent Hated	25 percent	0 percent	0 percent	0 percent	0 percent	0 percent
Percent Loved	8 percent	0 percent	9 percent	17 percent	13 percent	0 percent
Mean Pre-test	1.45	1.50	1.18	1.38	1.40	1.50
*p≤.10; **p ≤.05; ***p ≤.01 (one-tailed independent samples t-test; each group was compared to Caucasian/Whites).						

	Age			
	8 to 17	18 to 29	30 to 59	60 to 84
Mean Knowledge	2.67	3.88**	4.03**	5.06**
Mean Liking	4.67	5.46	6.55***	6.06**
Mean Pre-test	0.94	1.44***	1.55***	1.44*
*p≤.10; **p ≤.05; ***p ≤.01 (one-tailed independent samples t-test; each group was compared to young persons ages 8 to 17).				

Source: Spring 2023 Music and Memory Survey.

Quantitative Results: Bivariate Regression Results

Table 4 provides the regression results from the analysis. When all the variables are entered into the models, only a few remain statistically significant and the most important predictor of performance on the assessment is the respondent's performance on the pretest.

In addition, whether or not participants connected with the audio seemed to be a key factor in performance. Thus, for example, if people reported that they really liked the audio, i.e., they rated the audio as a "9" on a scale of 1 to 9, they were significantly more likely to do well on the assessment, especially the cognitive component. Although only about half of the sample was comprised of people self-identifying as White, two thirds of participants who rated the audio at the highest level were White. Meanwhile, familiarity with the assessment did not have a significant impact on comprehension.

Finally, it is noteworthy that respondents who self-identified as Latinx averaged the lowest for the comprehension component of the assessment. This may reflect linguistic barriers, which seem likely to have more of an impact on comprehension as opposed to memory-based tasks.

Table 4
Regression Results: Assessment Outcomes According to Audio, Sociocultural and Demographic Measures, and Control Variables

	Memory Score		Comprehension Score		Combined Memory and Comprehension	
Variable	Unstandard B	Coefficient Std. Error	Unstandard B	Coefficient Std. Error	Unstandard B	Coefficient Std. Error
Constant	0.427	1.189	1.840***	0.662	2.268	1.573
Reference (Reading)	--	--	--	--	--	--
Rap	-1.176**	0.569	-0.279	0.317	-1.456*	0.753
Schoolhouse Rock!	-0.595	0.538	-0.235	0.299	-0.830	0.711
Reference (Male)	--	--	--	--	--	--
Female	0.241	0.495	-0.023	0.276	0.218	0.655
Reference (Born outside US)	--	--	--	--	--	--
Born in the US	0.797	0.570	0.299	0.318	1.097	0.754
Reference (US is not home country)	--	--	--	--	--	--
US is home country	-0.389	0.904	-0.653	0.504	-1.042	1.196
Reference (White)	--	--	--	--	--	--
African American or Black	-0.354	0.802	-0.497	0.447	-0.851	1.061
American Indian or Native American	-2.465*	1.482	-0.333	0.825	-2.798	1.960
Asian	0.209	0.815	-0.107	.0.454	0.102	1.078
Hispanic or Latina/Latino/Latinx	0.150	.0.633	-1.017***	0.352	-0.867	0.837
Mixed race	0.900	-1.108	-0.273	0.614	0.627	1.459
Reference (Children, 0-17)	--	--	--	--	--	--
Young adults (18-29)	0.280	0.752	-0.246	0.419	0.034	0.995
Middle aged adults (30-59)	0.658	0.741	-0.339	0.412	0.329	0.980
Older adults (60 to 84)	0.580	0.778	-0.280	0.433	0.300	1.029
Moderate feelings about audio (rated 2-8)	--	--	--	--	--	--
Hated audio (rated at the lowest level	-0.895	1.712	-0.884	0.953	-1.779	-2.264
Loved audio (rated at the highest level)	0.802	0.658	.797**	0.367	1.598*	0.871
Pretest score	3.002***	0.394	.534**	0.219	3.002***	0.394
Variance explained	R^2 = .559		R^2 = .277		R^2 = .513	
*p≤.10; **p ≤.05; ***p ≤.01						

Source: Spring 2023 Music and Memory Survey.

Qualitative Results: Thematic Analysis of Responses

There were four open-ended questions in the survey:

1. Please reflect on how you felt listening to the audio. In particular, how did you feel about the audio you listened to? Were there particular aspects of it that you liked or didn't like (voice, elements of the audio, tempo, etc.)?
2. Do you feel that your racial or ethnic background or gender played any role in terms of how you felt about the audio (voice, elements of the audio, tempo, etc.)? If so, please describe.
3. Please reflect on how you felt listening to the content of the audio. In particular, how did you feel about the content (lyrics, words, information) you listened to? Were there particular aspects of it that you liked or didn't like (phrases, items included/excluded)?
4. Do you feel that your racial or ethnic background or gender played any role in terms of how you felt about the content (lyrics, words, information) of the audio? If so, please describe.

Table 5 shows the key themes that emerged in the responses to the four open-ended questions which were pooled together and thematically analyzed for patterns. Altogether, seven key themes emerged in the written comments as outlined in Table 5, which also shows the key themes according to frequency, as well as by the demographic characteristics of respondents (race/ethnicity and nativity). The findings also shed light on how responses in each of the thematic areas linked to assessment performance. These themes can be grouped into 3 broad areas including: 1) inequality, 2) likability/appropriateness, and 3) elements of audio style.

Table 5
Key Themes that Emerged in Responses to Open-ended Questions

Theme	Percent People of Color	Percent Foreign-born	Mean Score on Assessment	Sample Size (n)
Racism/Discrimination	80 percent	100 percent	7.2	5
White Privilege	0 percent	0 percent	12.4	5
Patriotic Sentiments	33 percent	22 percent	6.9	9
Hated/Disliked	46 percent	33 percent	5.1	15
Enjoyment/Nostalgia	51 percent	37 percent	7.2	41
Tempo Too Fast/Music Distracting	52 percent	42 percent	4.9	33
Audio Inappropriate for Content	0 percent	20 percent	7	5
Total	49 percent	35 percent	6.3	91

Source: Spring 2023 Music and Memory Survey.

Inequality

For a number of respondents, the notion that the US government has worked to "insure domestic tranquility" and "secure the blessings of liberty to ourselves and our posterity" did not resonate with their experience. The results from the assessment (see Table 1) showed that members of underrepresented groups, particularly Native American and Black participants, had the lowest scores on the assessments. This may have resulted to some degree from the text of the Preamble which may have seemed insincere to minorities. Several respondents, particularly Black women, indicated that they felt that the content of the Preamble, which espouses justice for all, did not fully capture their experiences. Although these comments were a minority, they may have some bearing on how people responded to the audio, which may in turn have implications for retention and understanding. Indeed, Ysseldyk and colleagues showed that one's religious identity can moderate the effects of listening to religious music on memory, and songs that conflict with one's identity can adversely impact one's memory.[20] Thus, for example, a 20-year-old Black woman from Haiti stated:

> As a Black woman I can say that the message provided in the audio does not apply to everyone in the population, especially minority groups. Truthfully, I had a hard time validating the words I was hearing because when I look around and see the things that are happening, and how people are treated and constantly oppressed for factors of their identity that are outside of their control, I saw this audio as wishful thinking.

Likewise, a 23-year-old Black woman who had immigrated to America from the Congo stated:

> [T]he message . . . was corny to me as well. To be quite honest it does not reflect the reality of how the government conducts itself. The song talks about perfect unity and serving the welfare of the people and country but while no country is perfect, this song just failed to capture how the country really is. I guess it [gives] a false sense of hope.

Similarly, a 59-year-old Asian Indian woman reflected on the Preamble and stated, "I know it did not include everyone and that bothered me."

Meanwhile, several respondents, largely those who self-identified as White, indicated that they recognized that they had privilege, and that the content of the Preamble did not necessarily apply to everyone. For example, a 54-year-old White woman distilled the comments of many when she stated, "As a privileged White woman, I know that I have enjoyed the blessings of liberty. But I also know that is not easy for all Americans to say." It's worth noting that the respondents who were self-aware of their privilege performed very well on the assessment (mean score of 11.7). Meanwhile those who expressed hostility towards the content of the Preamble did not perform as well (mean score of 7.3), but they still did better than the average overall (mean score of 6.3).

Finally, some respondents expressed patriotic sentiments towards the Preamble, such as a 23-year-Black male who stated, "I somehow enjoyed the audio in a way it felt very patriotic but in a very calm and passive manner." In general, those who felt patriotic listening to the audio were more likely to be white and native-born, and they did slightly above average overall on the assessment.

Likability

Those who expressed negative sentiments towards the audio in their written reflections (n=15) typically indicated they simply did not like it or found it boring. These written sentiments were most common among those who listened to the read version (60.0 percent of respondents who articulated negative comments), followed by the rap version (26.7 percent) and finally, the country version (13.3 percent). For example, a 38-year-old Native American woman stated, "I didn't like the audio lol." Overall, however, it is noteworthy that foreign-born respondents were especially likely to express these sentiments.

In contrast, those who indicated that they enjoyed the audio (n=41) were most likely to have listened to the country version (39.0 percent of respondents who articulated positive comments), followed by the read version (34.2 percent), and the rap version (26.8 percent). For example, a 20-year-old white female who listed to the country version stated, "I liked it. I felt that it was very catchy and . . . a memorable and fun way to teach students about the Preamble." Often those who expressed positive sentiments towards the audio were older respondents in the sample, such as a 54-year-old white female who stated, "I love this audio clip. I grew up hearing it in between Saturday morning cartoons."

Elements of Style (tempo, etc.)

A significant number of respondents (n=33) indicated negative views about various elements of the audio (e.g., voice, tempo, etc.). Those who responded that they found the music distracting or the tempo too fast were especially likely to have listened to the musical variants. Of those who expressed such concerns, 42.4 percent had listened to the rap version, 39.3 percent had listened to the country version and 18.2 percent had listened to the read version. A 46-year-old white female who had listened to the rap version illustrated these kinds of sentiments when she stated,

"It was difficult for me to focus on the content of the audio because the beat was distracting." Interestingly, those who indicated that they felt the audio was inappropriate for the text had listened to one of the musical forms (rap or country), but especially the country version.

Discussion

The results from this research show that the way in which information is delivered has an important bearing on the retention and comprehension of material. In particular, when participants were presented with information about the Preamble in the form of an upbeat country audio or in a monotone narrative, they performed better than when presented with a rap version. Meanwhile, there were no significant differences in performance between the read version of the audio and the country version. Moreover, the regression results revealed that participants performed significantly better on both memory and cognitive tasks when they reported that they especially liked the audio. These findings suggest that presenting information in ways that are well-received by participants will likely better promote learning.

Many key socio-cultural and demographic variables were significantly related to performance on the assessment. In particular, members of underrepresented groups averaged lower scores on the assessment, as did participants who were younger and foreign-born. However, in the regression models, which controlled for a wide range of variables including performance on a pre-test, the impact of race and ethnicity was largely eliminated. The findings showed that many of these differences were linked to variation in familiarity with the Preamble (and therefore performance on the pretest). Meanwhile, individuals who self-identified as Latinx had lower scores than White participants on the comprehension assessment. These results may be related in part to linguistic barriers. Further research should explore the kinds of challenges that individuals who speak English as a second language encounter when performing cognitive tasks

that emphasize comprehension. The findings from the qualitative data analysis also suggest that members of underrepresented groups may feel hostility towards information that does not align with their personal experiences. This research supplements prior studies demonstrating the importance of individuals' relationship to music[21] by pointing to the importance of socio-cultural variables as important factors influencing cognitive tasks.

While in principle the Preamble of the US Constitution promotes justice, in practice that has not been the experience of many members of underrepresented groups. The qualitative data from this study demonstrated that the message of the Preamble was not received positively by all participants, especially Black women. That said, educators need to be sensitive to the fact that there is often a gap between principle and practice, especially as it relates to the experience of underrepresented groups. The explicit acknowledgment of this gap will likely help students from diverse backgrounds to better engage with and understand controversial texts. Further research is needed to better understand how to effectively bridge these gaps. Meanwhile, this research provides insights into strategies that may be effective in incorporating audios into instruction, including the importance of aligning the mode of presentation with student tastes.

Finally, there are a number of directions for future study that can build on the findings from this research. Although the results from this study point to the importance of mode of audio delivery as a key variable in influencing the retention of information and comprehension, more research is needed to disentangle the key elements of delivery modes that matter. The three modes used in this study had distinctive voices and each used a different tempo. For this particular study, respondents performed worse on the assessment after listening to the rap version of the Preamble, but they performed equally strong whether the song was read aloud or sung in an upbeat, country style (the "Schoolhouse Rock!" version). Moreover, peoples' feelings about

the audio were shown to influence performance, including how they responded to various elements of style (such as tempo, etc.). For this reason, future studies will need to disentangle the effects of such variables as voice, tempo, and tune in impacting memory tasks.

ENDNOTES

1. Samuel A. Mehr, Manvir Singh, Dean Knox, Daniel M. Ketter, Daniel Pickens-Jones, S. Atwood, Christopher Lucas, Nori Jacoby, Alena A. Egner, Erin J. Hopkins, Rhea M. Howard, Joshua K. Hartshorne, Mariela V. Jennings, Jan Simson, Constance M. Bainbridge, Steven Pinker, Timothy J. O'Donnell, Max M. Krasnow, & Luke Glowacki, "Universality and Diversity in Human Song," *Science* (New York, N.Y.), 366, no. 6468 (2009). https://doi.org/10.1126/science.aax0868
2. Frances Moore, "Engaging With Music. International Federation of the Phonographic Industry (IFPI)," (2022). https://www.ifpi.org/ifpi-releases-engaging-with-music-2022-report/
3. Matthew M. Cirigliano, "Musical Mnemonics in Health Science: A First Look," *Medical Teacher* 35, no. 3 (2013), e1020–e1026. https://www.tandfonline.com/doi/pdf/10.3109/0142159X.2012.733042
4. Cirigliano, "Musical," e1020-e1026.
5. Jarl A. Ahlkvist, "Sound and Vision: Using Progressive Rock to Teach Social Theory," *Teaching Sociology* 29, no 4 (2021), 471–482. https://www.jstor.org/stable/1318948; Donna M. Binkiewicz, "Tunes of the Times: Historical Songs as Pedagogy for Recent US History," *The History Teacher* 39, no. 4 (2006), 515–20. https://doi.org/10.2307/30037071; Sandra L. Calvert. "Impact of Televised Songs on Children's and Young Adults' Memory of Educational Content," *Media Psychology* 3, no. 4 (2001), 325–342. https://www.tandfonline.com/doi/abs/10.1207/S1532785XMEP0304_02; Cirigliano, "Musical," e1020-e1026.; Gregory Crowther, "Using Science Songs to Enhance Learning: An Interdisciplinary Approach," *CBE life sciences education* 11, no. 1 (2012), 26–30. https://doi.org/10.1187/cbe.11-08-0068; Patricia Purnell-Webb & Craig P. Speelman, "Effects of Music on Memory for Text," *Perceptual and Motor Skills* 106, no. 3 (2008), 927–957. https://doi.org/10.2466/pms.106.3.927-957; Claudia S. Salcedo, "The Effects of Songs in the Foreign Language Classroom on Text Recall, Delayed Text Recall and Involuntary Mental Rehearsal," *Journal of College Teaching & Learning (TLC)* 7, no. 6 (2010). https://doi.org/10.19030/tlc.v7i6.126
6. Calvert, "Impact," 325-342.; Purnell-Webb & Speelman, "Effects," 927-957.
7. Ahlkvist, "Sound," 471–482.; Binkiewicz, "Tunes," 515–20.; Cirigliano, "Musical," e1020-e1026.; Crowther, "Using," 26–30.; Salcedo, "Effects," online.
8. Elodie Fraile, Daisy Bernon, Isabelle Rouch, Elodie Pongan, Barbara Tillmann, & Yohana Lévêque, "The Effect of Learning an Individualized Song on Autobiographical Memory Recall in Individuals with Alzheimer's Disease: A Pilot Study," *Journal of Clinical and Experimental Neuropsychology* 41, no. 7 (2019), 760–768. https://pubmed.ncbi.nlm.nih.gov/31142196/; Carol A. Prickett, & Randall S. Moore, "The Use of Music to Aid Memory of Alzheimer's Patients,"

Journal of Music Therapy 28, no. 2 (1991), 101–110. https://psycnet.apa.org/record/1992-43827-001

9. Melissa Leggieri, Michael H. Thaut, Luis Fornazzari, Tom A. Schweizer, Joseph Barfett, David G. Munoz, & Corinne E. Fischer, "Music Intervention Approaches for Alzheimer's Disease: A Review of the Literature," Frontiers in Neuroscience 13, (2019), 1-8. https://www.frontiersin.org/articles/10.3389/fnins.2019.00132/full

10, Fraile et al., "Effect," 760-768.

11. Renate Ysseldyk, Talib Karamally, Ashleigh Kelly, Thomas A. Morton, & S. Alexander Haslam, "They're (not) Playing our Song: (Ir)religious Identity Moderates the Effects of Listening to Religious Music on Memory, Self-Esteem, and Mood," *J Appl Soc Psychol* 51, (2021), 838-849. https://onlinelibrary.wiley.com/doi/abs/10.1111/jasp.12804

12. Tram Nguyen & Jessica A. Grahn, "Mind your Music: The Effects of Music-Induced Mood and Arousal across Different Memory Tasks," *Psychomusicology: Music, Mind, and Brain* 27, no. 2 (2017), 81–94. https://psycnet.apa.org/record/2017-25049-001

13. Nguyen & Grahn, "Mind," 81-94.

14. Sarah Reaves, Brittany Graham, Jessica Grahn, Parissa Rabannifard, & Audrey Duarte, "Turn off the Music! Music Impairs Visual Associative Memory Performance in Older Adults," *The Gerontologist* 56, no. 3 (2016), 569–577. https://doi.org/10.1093/geront/gnu113 (2016).

15. Calvert, "Impact," 325-342.

16. Calvert, "Impact," 335-342.

17. Fraile et al., "Effect," 760-768.; Ysseldyk et al., "Playing," 838-849.

18. Abby Countryman, "Preamble Rap with Miss C," *YouTube video* (2022). https://www.youtube.com/watch?v=qhgMWUUFx04; TimelessReader, "Preamble to the U.S. Constitution – Hear and Read the Full Text," *YouTube video* (2012). https://www.youtube.com/watch?v=pQYhGKT6vCQ; U.S. Chronicle, "The Preamble of the Constitution Schoolhouse Rock," *YouTube video* (2023). https://www.youtube.com/watch?v=OqvLi7qZ_yU

19. Countryman, "Preamble Rap."; TimelessReader, "Preamble."; U.S. Chronicle, "Schoolhouse Rock."

20. Ysseldyk et al., "Playing," 838-849.

21. Fraile et al., "Effect," 760-768.; Ysseldyk et al., "Playing," 838-849.