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Music and Gender

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Henry Wadsworth Longfellow once said that “Music is the universal language of mankind.” Music is common to every culture across the globe, and although varied in tempo, rhythm, or melody, it has shown to be surprisingly consistent in the effect it has on a listener.

This is why music is a perfect medium to examine social issues. A plethora of research and opinion pieces exist on how music reflects the tensions, fears, or socioeconomic stability of its environment, but relatively little research has been done on how music connects to a modern hot-button topic--gender. Over the past few decades, Americans have become increasingly self-aware about the concept of gender roles, thanks in part to the success of feminist and LBGTQ groups. Still, the topic remains controversial. Several roadblocks exist for this type of research; by nature, music is non-objective, which makes any attempt to quantify or measure concepts such as “musical taste” difficult.

Music identity based on ethnicity, age, and class has been the topic of many studies. However, little research exists on the effect gender has on musical preference. The non-objective nature of music taste, combined with an ever changing genre landscape, has made it difficult to create an unbiased analysis. This project seeks to add to the small amount of existing research on gender and music preference using statistical analysis from a novel survey conducted by the author. It is not the intention of the author to use this experiment to “prove” set differences between genders. Rather this data is used to capture a snap-shot of present day social conventions, and provide commentary on possible causes and consequences for the findings.

For methodology, a survey was provided to a sample of respondents across social media, with questions designed to reinforce or possibly contradict current beliefs about the relationship between music and gender. Four hypotheses were designed based on previous literature on the

topic, and were each analyzed. The results are discussed in light of current research on gender roles and social norms.

Review of Previous Literature:

In the last decades, there has been a shift away from music "snobs", i.e. those who prefer exclusively highbrow genres such as classical or opera, towards music "omnivores." (Peterson & Kern) Peterson and Kern found over the course of a decade, the upper class had become interested in a wider range of music genres. They theorized this change reflected movement away from exclusionary politics and pop-culture vilification. In 2001, White expanded upon research in music taste variety, finding that omnivorousness was positively related to higher class, higher age, and being female. (White) The claim that women display more omnivorous taste in music than men has been reinforced with research by Purhonen, Gronow, and Rahkonen, who found women preferred significantly more music genres than men on average. (Purhonen et al.) Therefore it is of particular interest of this experiment to test whether women on average display wider and higher preference for music genres than males.

In addition to reflecting cultural norms, music also plays a key role in adolescent development. Miranda notes in his research on music that adolescents can use music to develop their social image, shape their peer group, or establish their ethnic identity (Miranda).Boehnke and Münch proposed seven functions of music relating to adolescent development , which inspired this experiment's second hypothesis. (more on that later). (Boehnke & Münch) Aside from just guiding adolescent development, dissonance in youth culture is often reflected in the emergence of new music genres, such punk in the late 70's or grunge during the mid-80's. As with almost any form of media, the developmental role of music is often gendered. Strong notes

the existence of a "cultural sieve" that genders certain genres of music, historically designating genres such as rock, punk, grunge, or indie as masculine while designating pop, R&B, and other similar genres as feminine (Strong).

Many also theorize neurological and psychological differences in how men and women listen to music—Sergeant and Himonides theorizes that differences in personality characteristics resulting from social norms cause males and females to experience music differently (Sergeant & Himonides, 2014)—they note neuroticism, often stereotyped in females, tends to result in more intense experiences of music related notions, (Liljeström et al.) and that females show greater sensitivity to "aversive" musical stimuli, such as heavy metal. (Nater et al.) Koelsch goes a step further, claiming males and females react have different neurological reactions to music, building his claim off of fMRI data. (Koelsch et al.)

The claims made in these studies inspired me to create 4 hypotheses, which are outlined below.

Methodology:

To start the project, I developed four major hypotheses to test claims made in previous research articles—namely that females were more omnivorous than males, females spent more time listening to music than males, males and females have statistically different reasons for listening to music, and that males and females prefer different genres.

Starting hypotheses:

- Hypothesis 1 – Being female is positively related to omnivorousness
- Hypothesis 2 – Being female is positively related with time spent listening to music

- Hypothesis 3 – Males and females listen to music for different reasons
- Hypothesis 4—Males and females prefer different genres of music

To test these I hypotheses, I developed a survey questionnaire designed to produce enough data for viable analysis. The full questionnaire is included below in the next two pages.

Music Genre Preference Questionnaire

What is your age group? *

- 19 and under
- 20 - 29
- 30-39
- 40-49
- 50 +

What is your gender? *

- Male
- Female
- Other:

Please specify your ethnicity

- Asian / Pacific Islander
- Black or African American
- Hispanic or Latino
- Native American or American Indian
- White
- Other:

On average, how much time do you spend listening to music each day?

- Under an hour
- 1 - 2 hours
- 3 - 4 hours
- 5 or more

Please select the answers that most closely reflect the reasons you listen to music

- Regulate mood/Relieve Stress
- Dance/Physical Activity
- Social purposes/Interpersonal-relationships
- Distraction
- Personal identity
- Aid productivity

Alternative

The following questions list several music genres. Please indicate the extent you like listening to each of them.

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

Blues

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

Classical

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

Country

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

Electronic/Dance

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

Folk/Blue-grass

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

Hip-Hop/Rap

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

Indie

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

Jazz

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

Metal

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

New Age

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

Pop

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

Punk

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

Religious/Gospel

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

Reggae

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

Rock

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

Soul/R&B

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

Soundtrack/Theme songs

	1	2	3	4	5	
Strongly Dislike	○	○	○	○	○	Strongly Like

Questionnaire methodology:

The questionnaire was constructed to be as simple as possible while providing enough data to answer at least the four starting hypotheses. Questions 1-3 established some characteristics of the sample group that could potentially be used for blocking. Question 4 asked the respondent how much time they spent listening to music a day, and was aimed at answering hypothesis 2. Question 5 asked the respondent to select the answers which most closely matched the reasons why they listened to music. This question and its listed answers were aimed at addressing hypothesis 3. Questions 6-23 asked the respondent to indicate the extent they enjoyed listening to 18 music genres on a Likert scale from 1 to 5, with 1 being "Strongly Dislike" and 5 being "Strongly Like." The genres were chosen to match previous research, and represented a combination of three online music database's (Wikipedia, Discogs, and Allmusic) lists of fundamental genres. This series of questions aimed to address both hypotheses 1 and 4.

It was decided the most efficient and cost-effective method of survey was social media. Considering the low complexity of the survey, face-to-face interviews and phone interviews proved egregious. A simple written survey would suffice. Written mail surveys were considered too slow and costly. Initially, the plan was to conduct the survey via email, but the limited number of available addresses restricted the sample population, potentially resulting in bias. This left social media as the best option due to:

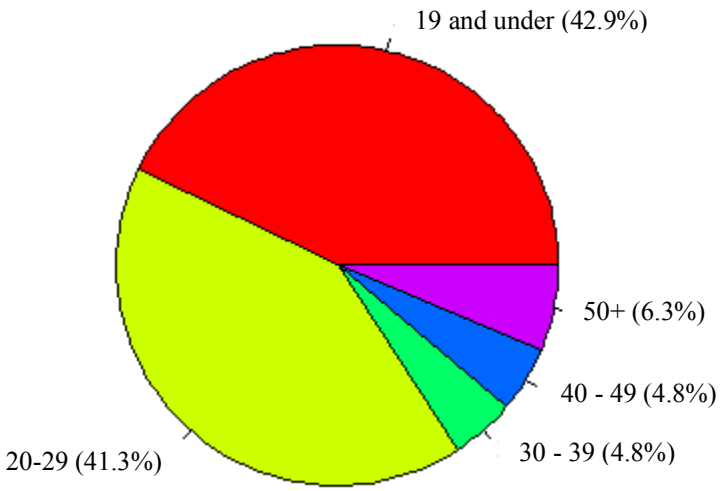
1) Anonymity

2) Sample population size

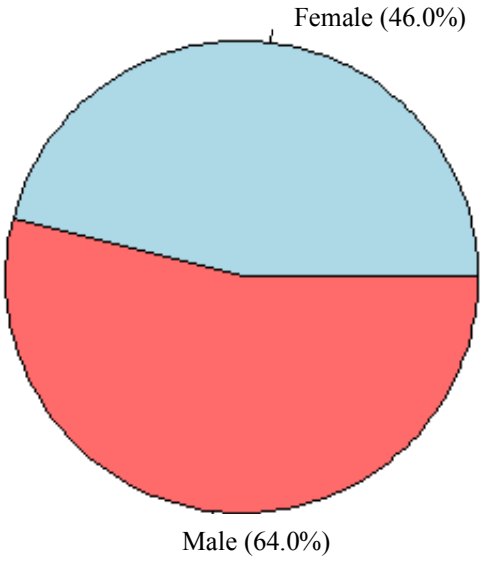
3) Cost effectiveness and efficiency

Therefore the questionnaire was distributed publicly through social media sites Facebook and twitter. In total the survey received 63 responses. Listed below are graphics detailing the demographics of the sample group.

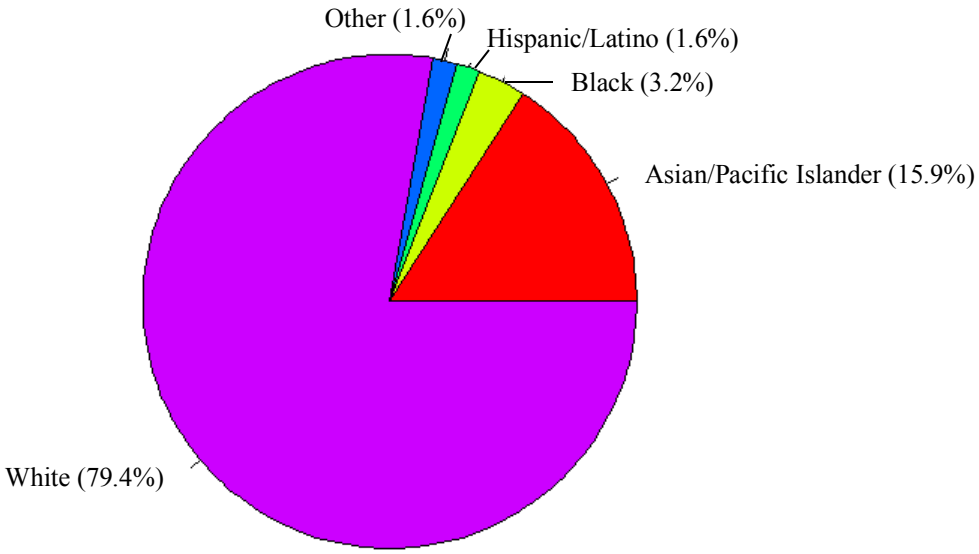
Age Distribution



Gender Distribution



Ethnicity Distribution



Demographics of Sample:

It should be noted that the sample this survey drew from does not reflect average American demographics. The age range is strongly weighted towards people under 30, together making up over 80% of the sample. This bias likely comes from the method of survey—social media caters to a young audience. The gender distribution was slightly skewed male, though not enough to seriously impact the results. The ethnicity displayed some interesting skew—the Hispanic/Latino and Black categories were under-represented relative to average US demographics, while White and Asian/Pacific Islander categories were over-represented. The Asian/Pacific Islander category was particularly large, over three times the national average. If this was a larger study, I would recommend blocking the data using the Ethnicity and Age demographics. At its current stage, however, the sample size is not large enough to accurately adjust to reflect the true population proportions.

Limitations of study method:

As stated previously, the survey was conducted via social media. This presented a few potential problems for analysis

1) That the age range of subjects may not match the age range of the standard population

2) That people with connection to me might be more willing to take the survey than complete strangers.

The first problem was helped by splitting the study into age brackets. Although this would in no sense guarantee the sample would be representative of the total population's age demographic, it would allow me block the results based on age brackets.

The second problem was more difficult to treat, as the survey was completely public. It stands to reason that if people with connection to me were more willing to answer than complete strangers, the answers could be swayed both by region and by the possibility that my friends musical taste differs from the true population. This is why the study uses extra caution testing hypotheses related to age range, omnivorousness, race/ethnicity, and other categories that might reflect the true population of the test, which would be everyone on Facebook.

Even with these difficulties, social media proved to be the most efficient (and cost-friendly) method of survey.

Results:

- Hypothesis 1 – Being female is positively related to omnivorousness

To test omnivorous levels, the study was partitioned into male and female respondents. This hypothesis would be true if females on average gave overall higher ratings to music genres than males. For the research done by Peterson and Kern, this was accomplished by simply asking respondents whether they "liked" or "disliked" certain genres, then comparing the average number of female-liked genres to the average of male-liked genres. (Peterson & Kern) Since my study used a more complex 5-step Likert scale, I had to adjust my definition of omnivorousness to suit my survey. Omnivorousness, in this study, is therefore defined as the total summation across all Likert genre questions for each respondent, i.e:

$$Omnivorousness_i = \sum_{i=1}^{18} X_i$$

where X_i represents the score on a scale of 1 to 5 given by each respondent to genre i. Due to the symmetry of the Likert questions, it was reasonable to assume the data to be of interval form.

Therefore the working hypothesis was that the mean omnivorousness of females was significantly different from the mean omnivorousness of males. The summary of the hypothesis test is written below:

```
> t.test(omniMale,omniFemale)

        Welch Two Sample t-test

data:  omniMale and omniFemale
t = 1.1665, df = 58.576, p-value = 0.2481
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -1.931916  7.331510
sample estimates:
mean of x mean of y
 53.94118  51.24138
```

In contrast to the findings of many of the studies outlined in my literature review section, I found no statistical difference between male and female omnivorousness. In fact, the mean male omnivorousness level of 53.94 was higher than the mean level of 51.24 for females, although this difference would not be significant with any $\alpha<.25$.

- Hypothesis 2 – Being female is positively correlated with time spent listening to music

To test this hypothesis, I performed a chi-square test for independence between the male and female listening times, using the 4 potential answers as categories. The hypothesis in question was:

$$H_0: X \text{ is independent of } Y \text{ vs. } H_A: X \text{ is dependent on } Y$$

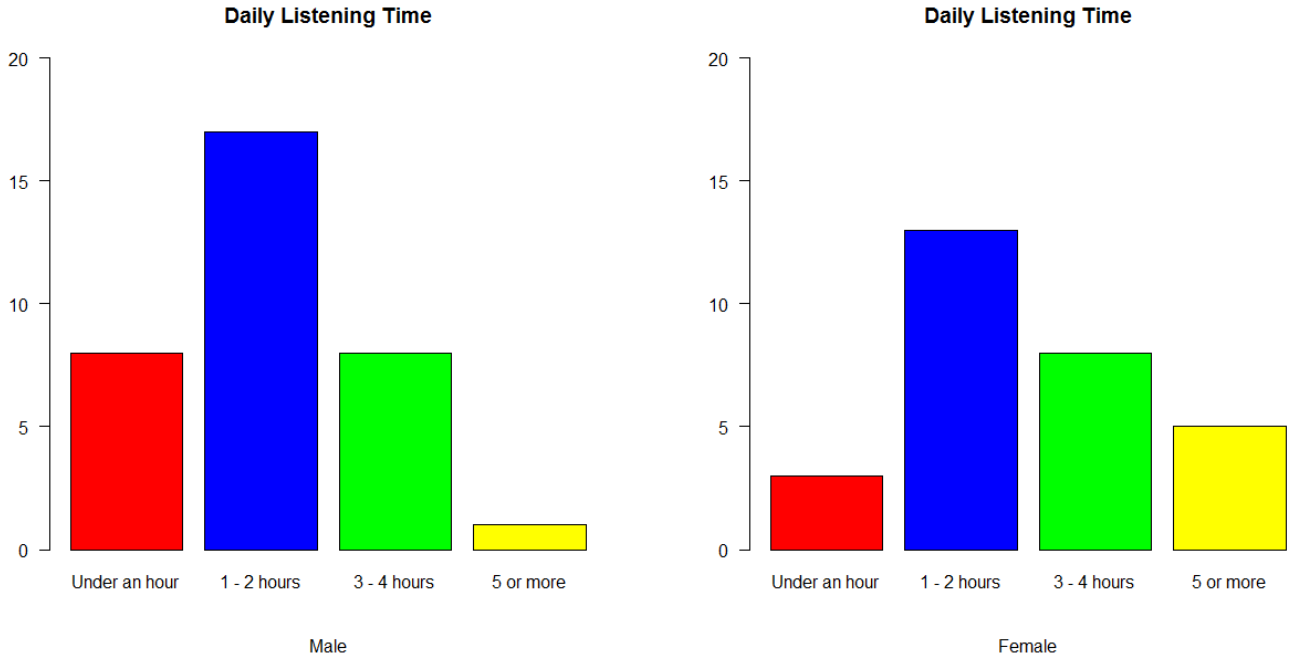
Where X represents the distribution of male answers, and Y the distribution of female answers.

The results are summarized below:

```
> table(data$Listening.time,data$Gender)

              Female Male
  1 - 2 hours     13   17
  3 - 4 hours      8    8
  5 or more        5    1
  Under an hour    3    8
> chisq.test(table(data$Listening.time,data$Gender))

        Pearson's Chi-squared test

data:  table(data$Listening.time, data$Gender)
X-squared = 5.1081, df = 3, p-value = 0.1641
```

The chi-square test resulted in a p-value of .1641, which was not quite small enough to be significant for this experiment.

Daily listening time for music
Male vs. Female



- Hypothesis 3 – Males and Females listen to music for different reasons

Given that question 5 was purely categorical data, I thought it appropriate to use a chi-square test for independence, similar to the method for hypothesis 2. The hypothesis in question was:

$$H_0: X \text{ is independent of } Y \text{ vs. } H_A: X \text{ is not independent of } Y$$

Where X represented the total "successes" (a.k.a.the number of respondents who selected each answer) for each answer in question 5, and Y the total successes for females. The results of the test are listed below.

```
> listeningMale <- c(26,13,16,10,6,9)
> listeningFemale <- c(27,19,13,14,8,5)
> listeningReasons <- as.data.frame(cbind(listeningMale,listeningFemale))
> listeningReasons
  listeningMale listeningFemale
1            26              27
2            13              19
3            16              13
4            10              14
5             6               8
6             9               5
> chisq.test(listeningReasons)

        Pearson's Chi-squared test

data:  listeningReasons
X-squared = 3.3369, df = 5, p-value = 0.6482
```

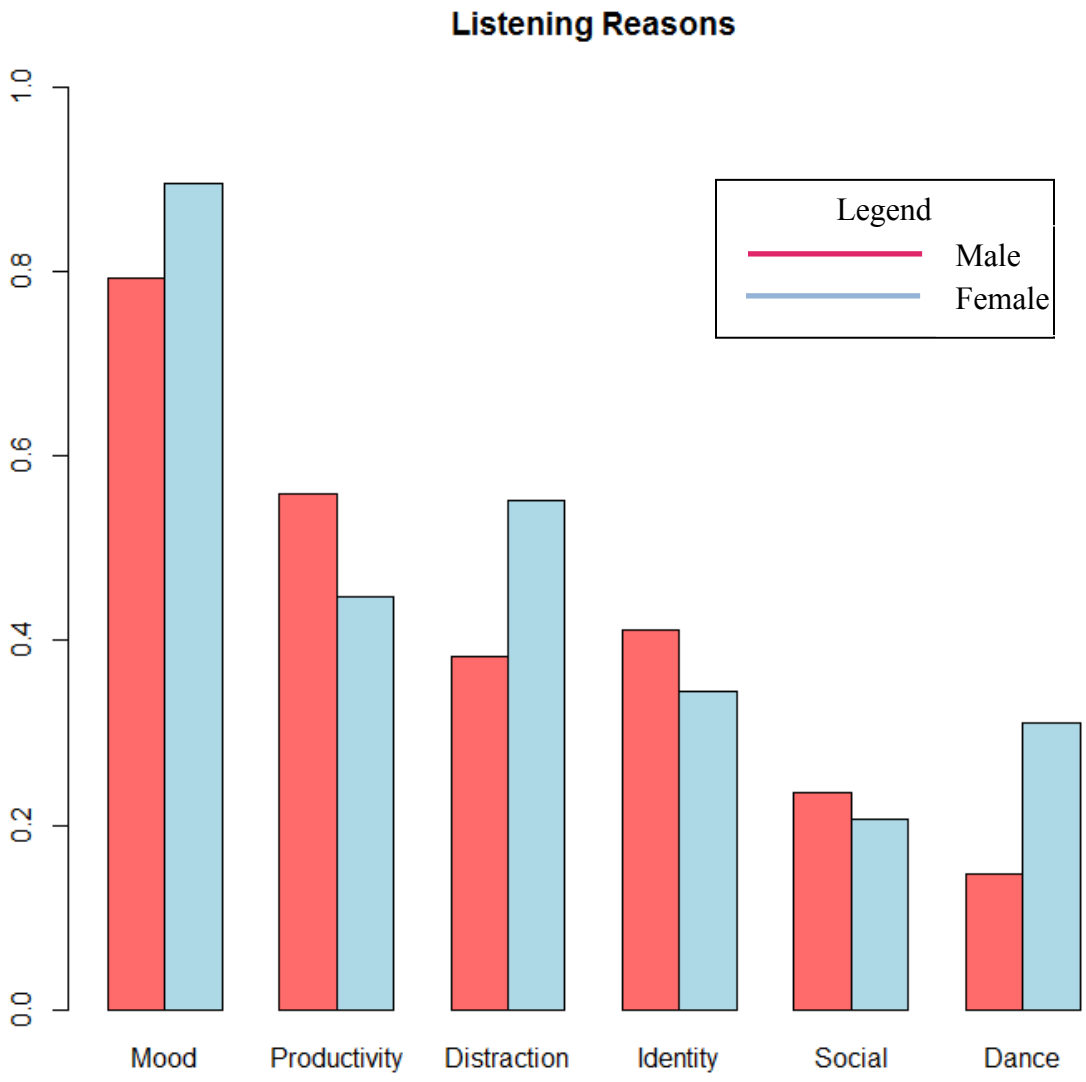
The p-value of 0.6482 was not significant. As an alternate test, and to compare males and females for each answer, I also split the data into six categories, one for each potential answer. I then tested to see if the proportion of answers for males was statistically different than for females for each individual answer, that is:

$$H_0: p_1 - p_2 = 0 \text{ vs. } H_A: p_1 - p_2 \neq 0$$

The sample sizes were reasonably large enough to justify a two-tailed Z-test for independent population proportions. The calculated proportions and the resulting p-values from the tests are listed below:

Comparison of listening reason proportions, male vs. female			
Reason	Male proportion	Female proportion	p-value
Regulate mood/Relieve Stress	0.7941176	0.8965517	0.267473
Aid productivity	0.5588235	0.4482759	0.382118
Distraction	0.3823529	0.5517241	0.178851
Personal identity	0.4117647	0.3448276	0.585754
Social purposes/Interpersonal-relationships	0.2352941	0.2068966	0.78716
Dance/Physical Activity	0.1470588	0.3103448	0.120232

Similarly, though the p-values for the categories “Distraction” and “Dance/Physical Activity” were relatively small, no category justified rejection of the null hypothesis.


Listening Reasons
1.0
0.8
0.6
0.4
0.2
0.0
Legend
Male
Female
Mood
Productivity
Distraction
Identity
Social
Dance

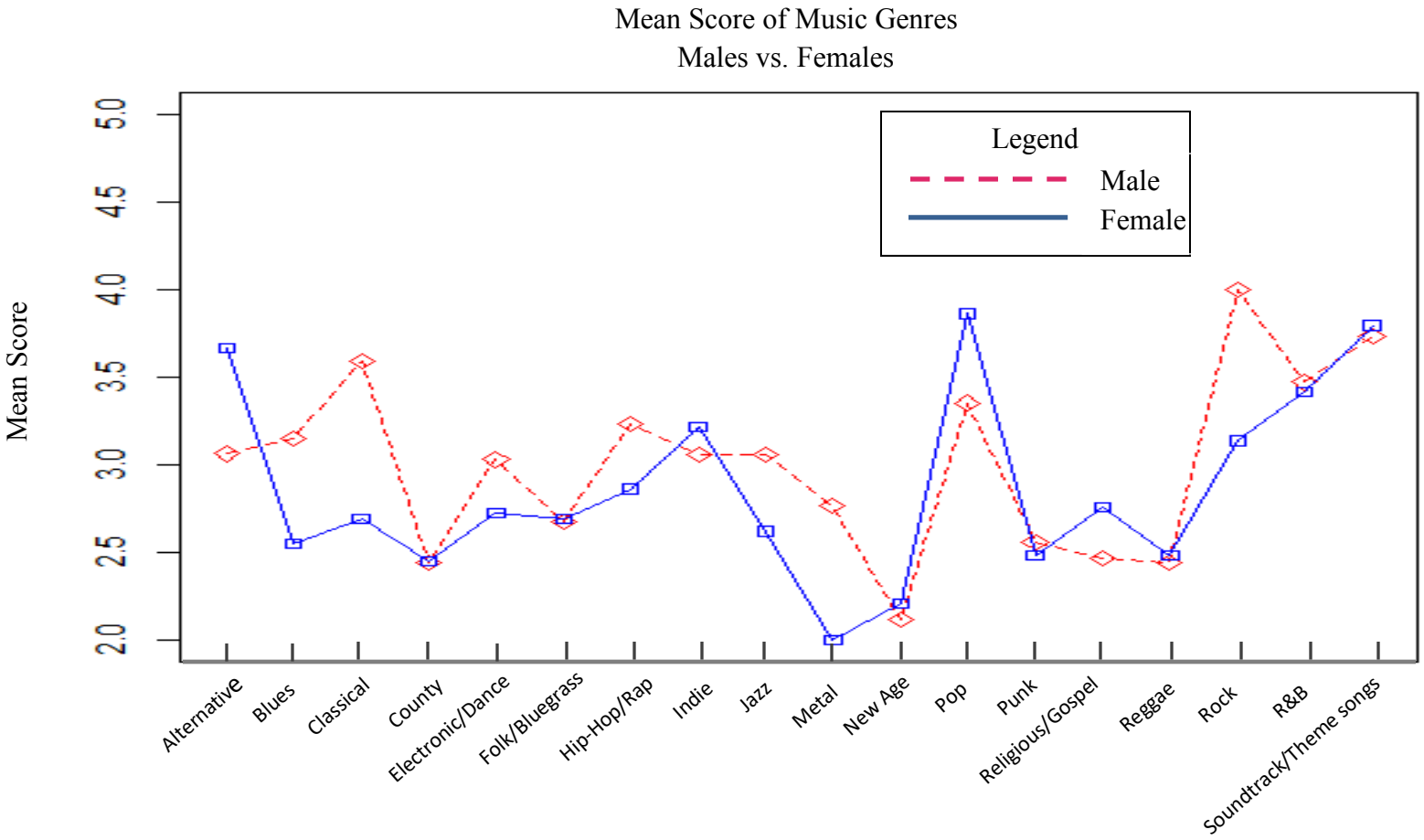
- Hypothesis 4 – Males and females prefer different genres of music

To test this hypothesis, I ran 18 hypothesis tests comparing the mean response of males and females for questions 6-23, which asked participants to "indicate the extent you like listening to each of (the listed genres)" on a Likert scale of 1 to 5: 1 being "Strongly Dislike," and 5 being "Strongly Like." The hypotheses tested if the mean male response for each genre differed from the mean female response, i.e.;

$$H_0: \mu_1 - \mu_2 = 0 \text{ vs. } H_A: \mu_1 - \mu_2 \neq 0$$

Where μ_1 represented the mean male response and μ_2 represented the mean female response. The tests were conducted in parrallel to produce a vector of p-values for each genre. The initial results showed significant differences in the genres Alternative, Blues, Classical, Metal, and Rock at α=.05. However, given the large number of parallel hypotheses, the p-values were re-adjusted using Hommel's method of adjusting for multiple comparisons to correct for data snooping. After the corrections, only Classical showed significant difference at α=.10. The calculated mean ratings for males and females are listed on the following page, along with the unadjusted and adjusted p-value statistics for each test. Results significant at α=.10 are highlighted in yellow.

Comparison of mean Likert scale scores for 18 music genres				
Genre	Mean Rating (male)	Mean Rating (female)	p-value (unadjusted)	p-value (adjusted)
Alternative	3.062500	3.666667	0.04512	0.63168
Blues	3.147059	2.551724	0.02976	0.41664
Classical	3.588235	2.689655	0.005385	.09693
Country	2.441176	2.448276	0.9851	0.98510
Electronic/Dance	3.029412	2.724138	0.2737	0.98510
Folk/Blue-grass	2.676471	2.689655	0.9688	0.98510
Hip-Hop/Rap	3.235294	2.862069	0.3151	0.98510
Indie	3.058824	3.214286	0.6498	0.98510
Jazz	3.060606	2.620690	0.1693	0.98510
Metal	2.764706	2.000000	0.03526	0.49364
New Age	2.117647	2.206897	0.7184	0.98510
Pop	3.352941	3.862069	0.1305	0.98510
Punk	2.558824	2.482759	0.8163	0.98510
Religious/Gospel	2.470588	2.758621	0.4228	0.98510
Reggae	2.441176	2.482759	0.8876	0.98510
Rock	4.000000	3.137931	0.01237	.19792
Soul/R&B	3.470588	3.413793	0.8561	0.98510
Soundtrack/Theme songs	3.735294	3.793103	0.8531	0.98510



Analysis:

To summarize the findings of the research:

Hypothesis 1)

The results of the experiment showed no indication that female respondents were more omnivorous than males. This could be indicative of any of three things: first, this could be a result of random error, which might be smoothed out with a much larger sample size. Secondly, this could actually represent evidence against the claim than women are more omnivorous, and thirdly, that a key difference may have existed between my sample group and the groups represented by the research of Peterson and Kern, White, and Purhonen, Gronow, and Rahkonen. The possibility of random error is present in every experiment, so I will not expound upon it much. I will however, posit an educated guess as to why my results differed from the norm.

Peterson and Kern both note that omnivorousness on average increases over time, and also note that the effect of gender on omnivorousness increases with the respondent's age. (Peterson & Kern) In simple terms, they observed less of a gender-gap between the young than between the old. Perhaps due to the nature of social media, my study was largely biased towards the young, with over 80% of respondents below the age of 30. If omnivorousness has continued to increase over the past two decades, it would stand to reason that the youngest generations may have closed the gender gap. Sadly, I lacked sufficient data in the age categories "30 – 39", "40-49", and "50 +" to justify a model of the correlation between age and the results of the 4 main hypotheses. For future research, I would recommend a study focusing on the correlation between omnivorousness, listening time, listening reasons, or any other music-related factors.

Hypothesis 2)

The chi-square test resulted in a p-value of .1641, slightly too high to reject the null hypotheses. It should be worth mentioning, however, that this test is extremely conservative in the fact it treats the data as nominal rather than interval. Because the possible answers for question 4 constituted ranges of values instead of exact numbers, I deemed it appropriate to use a more conservative test. It is my personal recommendation, after having completed this study, that question 4 should have been a free response where respondents could enter any numerical value.

For an example of how this question could have worked better, I simulated a distribution of free response questions based on the current nominal scale. Assuming, for example, that the average of the category "Under an hour" to be .5 hours, the average of "1 – 2 hours" to be 1.5 hours, "3 – 4 hours" to be 3.5 hours, and "5 or more" to be 5.5 hours, I could run a simple one-sided t-test on the hypothesis:

$$H_0: \mu_{female} - \mu_{male} < 0 \text{ vs. } H_A: \mu_{female} - \mu_{male} \geq 0$$

with the following results

```
> t.test(timeListeningFemaleVec,timeListeningMaleVec, alternative="greater")

        Welch Two Sample t-test

data:  timeListeningFemaleVec and timeListeningMaleVec
t = 2.0867, df = 51.429, p-value = 0.02095
alternative hypothesis: true difference in means is greater than 0
95 percent confidence interval:
 0.1548687       Inf
sample estimates:
mean of x mean of y
 2.637931  1.852941
```

Under the assumption the data is indeed in interval format (the distance or ratio between responses is known) and evenly distributed across answer categories, the p-value would be closer to .02095, allowing the rejection of the null hypothesis at α=.05.

As with the first hypothesis, the failure to reject the null under the chi-square test could be a result of random error, sample bias, or experiment design. It could also be indicative that the age of the sample group affects the gender gap. My educated guess would be that under looser assumptions or different question format the null hypothesis could be rejected. For any future experiments, I strongly recommend questions targeting the amount of time respondents listen to music be made free-response.

Hypothesis 3)

For this hypothesis, I ran both chi-square test for independence and joint z-tests. The chi-square test resulted in a p-value of 0.6482, much too large to reject the null. Similarly, the z-tests resulted in all p-values above .10 (see "Results" section).

As with hypothesis 1, this result could be indicative of possible correlation between age and listening reasons. Out of all 4 hypotheses, this relied on the least previous research. Existing research about gender and listening reasons is scarce, and largely rests in the theoretical realm. Despite this, I had a few studies to which I could compare my results, and see if I had indeed encountered an anomaly.

The six categories I chose as answers for question were based on previous research designed to chronicle the range of music functions. Chamorro-Premuzic and Furnham distilled music listening into three dimensions: emotional use, background use, and rational use. (Chamorro et al.) Boer went even further, splitting music listening to 10 underlying dimensions: friends, emotion, family, venting, background, dancing, focus, values, politic, and culture. (Boer) My answers represented a combination dimensions from these studies, as well as a few others. It is worth noting that in perhaps the most exhaustive of all studies on music function, conducted by Schäfer et al., the resulting dimensions relating to music listening were consistent over age groups and genders. (Schäfer et al.) This study conducted research somewhat similar to my own, but with many more specific categories, using a Likert scale instead the success/failure model I had used. Their study found the dimension "Arousal and mood regulation" the most common listening reason, and "Social relatedness" the least common. This matches the order of popularity in the categories of my own study, with "Regulate mood/Relieve Stress" rating the highest, and

both “Social purposes/Interpersonal-relationships” and “Dance/Physical Activity” tied as the least popular categories. Therefore I believe it is reasonable to assume my failure to reject hypothesis 3 simply mirrors the results of studies such as Schäfer’s, which found consistent listening patterns across genders.

Hypothesis 4)

Based on standard t-tests, males and females displayed different preferences for the genres: Alternative, Blues, Classical, Metal, and Rock at $\alpha=.10$. This, however, did not account for the possibility of data snooping (picking out only certain suitable tests after the fact), so the original p-values were adjusted using Hommel’s method to preserve the strong familywise error rate. After the adjustments, only the Classical genre showed significant difference at $\alpha=.10$.

This result proves interesting, mainly because Classical music tends not to be stereotyped as heavily as Metal, Rock, Blues, or many other genres. Part of this bias may stem from the fact that Classical music has waned in popularity, and is regarded as one of the least popular genres. In addition, the proportion of people who actively dislike Classical music has increased over the last decades. (Lizardo, Omar & Skiles) Because of this, expansive studies on gender specific listening, such as Paul Lamere’s survey of over 200,000 randomly selected subscribers to streaming services, tend to weigh more popular genres heavily when it comes to gender bias. (Lamere) Considering the relative youth of my sample, this trend should have had a major impact on my results. Instead, Classical music was the 3rd highest scoring genre for males, and scored only slightly below average for females.

As to why Classical displayed the largest gender-gap, part of the reason may be due to the implicit bias listeners have about male composers. In their study on the subject, Sergeant and

Himonides found that when presented with blind Classical compositions, respondents assumed the composer to be male approximately 66% of the time. (Sergeant & Himonides, 2016) Even more drastically, in a survey of the 22 largest orchestras between 2014 and 2015, only 14.3% of performances of compositions by a living composer had been written by women. If this number is expanded to account for compositions from all composers, living or dead, only 1.8% of the total pieces performed came from a female composer. (O'Bannon) Given that the most recognizable names in Classical music (Mozart, Chopin, Bach, Beethoven, etc.) are male, it is not particularly surprising that the listening base skews male as well.

Final Remarks:

The largest limiting factor of this study was the sample size. The small amount of respondents over 30 years old made blocking based on age impossible, and thus I could not prove the potential explanation that gender gaps decrease with younger generation. Larger sample size could also have made rejection of the null easier in the case of the Likert scales and listening reasons in particular. I found the format of the "Listening time" question could have enabled more powerful tests, and more specific data. Potentially, I may also have used too many genres—in my desire to provide accessibility with previous studies, I incorporated 18 different genres total. After data-snooping adjustment, many significant p-values could no longer be counted. It would have been wiser to select a smaller list of important genres, rather than try to capture the entire spectrum. However, the findings of this project could help vastly improve the methodology of similar or subsequent studies.

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