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Listener Features and the Identification of Emotion in Classical Music

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ABSTRACT

Music has been a part of human development since before speech evolved and is an effective form of communication and expression across the world. In particular, the connection between music and emotions seem to be very strong but not very much understood. Recent studies in the past few decades have just begun to delve into the concrete associations between music and emotion. There have been debates about whether there is a significant difference between the way we identify emotions in music through different listener features (based on the circumstances and the identity of the listener). Our paper aimed to investigate whether there would be a difference in recognizing emotions within classical music depending on different listener features such as age, sex, familiarity with classical music, personality, mental health, and culture (within the Korean American community). Our results show that there are not many significant differences between any of the categories, implying that although subjective experience makes musical experience unique, the intentions of the composer are intact and may be identified throughout all the categories.

Introduction - Music and Emotion

Music has been an integral facet of human experience and has developed within human society as early as 35,000 years ago, making it one of the oldest human activities. Predating language, music is recognized as an effective form of communication and expression among almost all cultures (Gabrielsson and Juslin, 1996). The most notable connection that music has to humans is its relation to our emotions. This relationship can largely be delineated into two aspects: the ability of music to express/suggest emotions and to evoke emotions in the listener. The former is largely dependent on the communicative aspects of the music itself while the latter is based on the subjective ability of the listener (Barthet et al., 2013). According to past studies, music was known to "change emotions, to release emotions, to match their current emotion, to enjoy or comfort themselves, and to relieve stress" (Juslin & Västfjäll, 2008). Neurological studies amongst most studies are finding definite connections between music and diverse brain activity. Participants of neurochemical studies have shown a large variation of responses in the release of neurotransmitters and hormones such as dopamine and serotonin. Music has also been found to be connected to a variety of neurochemical systems such as motivation, immunity, and social affiliation (Chanda & Levitin, 2013). For the purposes of our study and due to the subjective nature of invoked emotions, our study will focus on the ability to identify emotions of the musical piece.

Communication Chain of Music

Conveying emotion through music is an unexpectedly complex process that involves multiple elements such as the composer, the score, the performer, the music itself, and the recipient (Gabrielsson and Juslin, 1996). The recipient or the listener has a musical experience and experiences emotions that come from the composer (Juslin & Västfjäll, 2008). Numerous studies have theorized what factors would contribute to the identification and recognition of an

emotion of a musical piece. Scherer and Zentner propose that there are 4 main factors that influence the emotion that the listener identifies. By examining structural features, performance features, listener features, and contextual features, the researchers laid out a foundation in which emotions are analyzed by the listener. Factors such as performance and contextual features do not involve the direct intentions of the composer from the song itself and will not be examined in our paper.

There are many different musical and technical factors that composers use that affect the emotional expression of the piece of music. The structural features of the song have a great influence on the quality of the music. The simplest and most obvious indicator is the tone that the music produces. The duration, energy, pitch, and harmonic structure of the piece is unique to each musical piece and lays the foundations of the emotion the composer wants to express (Scherer & Zentner, 2001). The earliest studies of identifying emotion by the listeners found that they could identify simple emotions with short tonal sequences presented by the study. “Sad” music was associated with slow, low-pitched melodies with minor chords whereas “happy” music was associated with fast, high-pitched notes with little dissonance (Gabrielsson and Juslin, 1996). If general emotions are generally agreed upon, can there be any differences in the way that listeners’ identify emotions in music due to their unique life experiences? Do certain features of some individuals (such as the listener’s familiarity, personality trait, sex, etc.) help them distinguish emotions in music better than those of other individuals do? To count for affective state (the subjective quality of listening) of the listeners, studies have considered the importance of the listener’s preference, mood, attitude, and personality traits (Gabrielsson and Juslin, 1996). Through these features, there may be differences in the way that listeners understand the music.

Classical Music

Classical Music refers to the Western tradition of songs made from about the 16th to 19th century usually consisting of numerous instruments and complex musical arrangements. The emotional elements are not dependent on the “words, actions, visual displays, or any other non-musical elements” in the musical piece (Simonton, 1993). When audiences listen to classical music, there is often not one word to help listeners identify the emotions of the piece. However, audiences expect emotions solely from the musical elements (Simonton, 1993). Through complex techniques and systematic tools that are used in classical music, audiences can be swayed emotionally and even ideologically. Indeed, there have been many cases throughout history where classical songs have caused riots or been used to express political opinions and/or spread ideas/beliefs (Scherer & Zentner, 2001). For our paper, we have chosen to use classical music for its complexity and clear emotional motifs.

Universal feature

Due to the elusive nature of the relationship between the brain and music, there are still debates on whether the recognition and appreciation of music is a universal concept or a culturally specific trait (Balkwill & Thompson, 1999). There are some theorists who claim that musical meaning is derived through enculturation (cultural context). Through social construction and social interpretation, there are differences in the way that listeners from different parts of the world have different judgments of music (Balkwill & Thompson, 1999). In a study in which subjects were entirely unfamiliar with the cultural aspects and tonal systems of the musical samples, listeners were still able to appreciate the music and relied on more basic perceptual cues like complexity and tempo. Through these signals, listeners were able to identify correct emotional cues (Balkwill & Thompson, 1999).

The effect of music has also been a big interest in communities where social interaction is an issue. For those with autism spectrum disorder (ASD), in which affected people are typically not able to identify social and emotional cues from others, music is one aspect that they can understand with the same ability as that of non-ASD people. In recent studies, high functioning patients with ASD were found to have a higher sensitivity and deeper understanding

of musical conventions. Though ASD individuals may falter in responding to social cues and lack communication skills, they have a fundamental understanding of music shared with non-ASD individuals. This commonality suggests that the recognition of musical cues and musical meaning is fundamentally ingrained in human beings (Molnar-Szakacs et al., 2020).

Methodology

Participants

One hundred nineteen participants from the Tenafly high school community volunteered to fill out an online questionnaire, all of which were included in the final data. Participants had a variety of gender, age, familiarity with classical music, personality types, mental states, empathic abilities, and primary languages. Out of the total 119 participants, 83 were female, 44 were under the age of 18, 55 were familiar/educated in classical music, 69 characterized themselves as introverts, 15 had a diagnosed mental disorder, 69 were determined to be empathetic, and 52 used English as their preferred language. Surveys were sent out randomly to the student body through the social studies department so that every element of the population had a non-zero probability of being chosen. Therefore, the samples in this study can be defined as representative, since voluntary response bias and undercoverage bias were eliminated.

Study Design

Western classical music was primarily chosen as the musical samples to be shown to the participants given a wide variability of familiarity of classical music among the public. Some of the music shows were not representative pieces and therefore less known amongst the general public. Mozart or Beethoven's tunes are universally recognizable and therefore liable to be recognized by participants. Western classical music was also preferred due to its lack of lyrics, avoiding the possibility of subjects to be led to specific emotions through words. Participants were subject only to the audio recordings of the performances to avoid being influenced by visual stimulation from the video performance such as facial expressions and physicality of the conductor and the performers.

In order to identify the authentic emotions the original composers intended to reflect from the music, extensive historical research was done, taking into consideration the environmental factors, as well as the time period, or any other possible factors.

The 7 musical pieces chosen consisted of excerpts of 15-40 s durations and were taken from the following classical orchestral pieces: 1) *Symphony No. 5 in D minor, Op. 47 (1st mvt)* By Shostakovich, 2) *Cello Concerto (1st mvt)* by Elgar, 3) *Cello Concerto No. 1 (2nd mvt)* By Shostakovich, 4) *String Quartet No. 8 in C Minor (2nd mvt)* by Shostakovich, 5) *Salut d'Amour Op.12* By Elgar, 6) "*Nimrod*" from the *Enigma Variations* By Elgar, 7) *Dream of a Witches' Sabbath* from *Symphonie Fantastique* by Hector Berlioz. Excerpt 1 was chosen to evoke the composer's feelings of anger; excerpt 2 was chosen to express grief; excerpt 3 was chosen to show the composer's anger and grief; excerpt 4 was chosen to communicate the composer's suffering through the music; excerpt 5 was chosen to evoke love and affection; excerpt 6 was chosen to evoke solemnity; excerpt 7 was chosen to evoke fear. These emotions were determined after intricate research in the historical background of the composer and the era in which the piece was written, but with some attention to the technical characteristics of the music. After each excerpt, participants were given an emotion and asked if they felt it was the main emotion the excerpt of the classical music embodied.

Of the 7 emotions for each of the 7 excerpts given, emotions given for excerpt 3 and excerpt 5 were intentionally not corresponding to the composer's intentions behind the pieces. In turn, the amount of time participants listened to the excerpts was not controlled, so that they could have any desired amount of time to answer questions.

Results

In this study, 119 participants were tested on their emotion recognition skills in pieces of classical music, through the use of an online questionnaire. For each variable, each consisting of 2 groups, the average number of questions answered correctly were recorded and the difference was calculated. We determined that the 2 sample t-test statistic was needed, because the mean number of questions correct for each variable was used, and the sample size is greater than 30, while the standard deviation of the population is not known. The analysis of the data from the tests evidenced that there are no factors that majorly affect emotional recognition in classical music. Data analysis is shows in Tables 1 and 2.

Statistical analysis

A. Gender

Of the 119 participants, 36 males and 83 females and their results were recorded. After conducting a 2 sample t-test with Gender, we found no significance of Gender, $p = 0.7459$. Although the general accuracy of females (M = 2.590, SD = 1.2595) was slightly higher than males (M = 2.500, SD = 1.4442), their main effect on emotion recognition in music was shown to be not significant after further investigation, shown by values in Table 1.

B. Age

Of the 119 participants, 44 were under the age of 18, and 75 were the age of 18 or older. After collecting data and the results, a 2-sample t-test with Age was conducted. No significance of Age, $p = 0.1287$, on emotion recognition in music was found. However, although the p-value of this variable is large, it was the smallest p-value recorded for all variables, with the general accuracy of those under 18 (M = 2.818, SD = 1.4442) being higher than those 18 or over (M = 2.413, SD = 1.2595).

C. Familiarity

Of the 119 participants, 55 answered that they were either familiar or educated in classical music, and 64 answered that they were not. After collecting data and conducting a 2 sample t-test with Familiarity, $p = 0.8936$, no significance was found. In Familiarity, general accuracy for those that claimed they were familiar with classical music (M = 2.545, SD = 1.3719) was slightly lower than those that claimed they were not familiar with classical music (M = 2.578, SD = 1.2700). However, the p-value recorded showed that familiarity had no main effect on emotion recognition in classical music.

D. Personality Type

Of the 119 participants, 69 participants characterized themselves as introverts, and 50 participants characterized themselves as extroverts. After conducting a 2 sample t-test with Personality Type, we found no significance of Personality Type, $p = 0.1892$. The general accuracy of introverts (M = 2.696, SD = 1.3645), was higher than extroverts (M = 2.380, SD = 1.2271), but overall the large p-value shows that Personality Type has no main effect on emotion recognition in classical music.

E. Mental Disorder

Out of the 119 participants who took the survey, 15 answered that they have been diagnosed with a mental disorder, and 104 answered that they have not. After conducting a 2 sample t-test, we found no significance of Mental Disorder, $p = 0.1831$. However, the discrepancy in the mean value of general accuracy between the two samples was the largest recorded out of all variables; those diagnosed with a mental disorder (M = 3.067, SD = 3.0667) had a higher general accuracy than those that are not diagnosed with a mental disorder (M = 2.490, SD = 2.4904). Additionally,

those that were diagnosed with a mental disorder had the highest general accuracy out of all samples in this study, as seen in Table 2. However, the large p-value suggests that Mental Disorder has no main effect on emotion recognition in music.

F. Empathy

After posing a problem which, if answered, would estimate whether the participant has empathic abilities or not, results showed that of the 119 participants, 69 participants were empathetic, while 50 were not. After conducting a 2 sample t-test, we found no significance of Empathy, $p = 0.1831$. General accuracy of those that were empathetic (M = 2.594, SD = 1.287) was higher than those that were not (M = 2.520, SD = 1.3589), with only a small difference. Overall, the p-value showed that Empathy had a main effect on emotion recognition in music.

G. Cross-Cultural

To all participants, a translated version of the survey was offered, for those that preferred another language over English. Of the 119 participants, 67 preferred Korean, while 52 preferred English. After collecting the results of the 2 sample t-test on this cross-cultural examination, there was no significance of Preferred Language, $p = 0.5114$. Those that preferred English (M = 2.654, SD = 1.356) had a slightly higher general accuracy than those that preferred Korean (M = 2.493, SD = 1.2836). However, the large p-value shows that between Western and Eastern cultures, there is no main effect on emotion detection in music.

Table 1. 2-Sample t-test

	Gender	Age	Familiarity	Personality Type	Mental Disorder	Empathy	Preferred Language
T	-0.3255	1.5363	-0.134	1.321	1.3882	0.3006	0.6588
p-value	0.7459	0.1287	0.8936	0.1892	0.1831	0.7643	0.5114
df	59	74	111	112	17	102	107

Table 2. Emotion Detection Performance Based on 7 Different Listener Features

	Gender	SD		Mental Disorder	
Male (36)	2.500/7	1.4442	Yes (15)	3.067/7	3.0667
Female (83)	2.590/7	1.2595	No (104)	2.490/7	2.4904
	Age			Empathy	
<18 (44)	2.818/7	1.4984	Yes (69)	2.594/7	1.287
≥18 (75)	2.413/7	1.1751	No (50)	2.520/7	1.3589
	Familiarity			Preferred Language	
Yes (55)	2.545/7	1.3719	English (52)	2.654/7	1.356
No (64)	2.578/7	1.27	Korean (67)	2.493/7	1.2836
	Personality Type				
Introvert (69)	2.696/7	1.3645			
Extrovert (50)	2.380/7	1.2271			

Conclusions

Throughout all groups, the ability to identify emotions from complex classical pieces was similar to each other and showed no statistically significant difference. These results confirm that although subjective experience makes musical experience unique, the intentions of the composer are intact and may be identified throughout all the categories in this study.

Limitations

Some of the conflicting research assumes that music does not induce "ordinary" emotions through their psychological mechanisms, but instead through an unidentified and other unique process. In this case, these views are rejected theoretically and empirically, as music is proven to induce many emotions in listeners (Juslin & Västfjäll, 2008). Rigorous research needs to be conducted on identifying the framework for how emotions and music interact to get a comprehensive view on how humans process both.

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