The Relationship between Culture, Emotion, and Musical Elements

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Preface

Music has been a passion of mine for as long as I can remember. I started band with the clarinet and eventually began piano. I still take lessons, but I am also teaching others to play. Music makes everything seem complete in my life.

This strong attachment to music made this a perfect choice for my senior honors thesis. I am also a psychology major, hoping to someday do research, so I decided to do a research experiment. I began combing the databases for music research that I found interesting. I finally found an article by Balkwill and Thompson (1999) that captured my interest in music and psychology. From the ideas of this article, an experiment began to take shape.

This has been the hardest task in my career here at North Central College because I did most of it on my own, from finding CD players from friends to running experiments by myself. The research for any literature review is endless, and I still feel like I could add so much more. The research into music, culture, and emotion is in its infant stages, but already has a large amount of information to be drawn upon.

I have enjoyed this project, as hard as it has been, and I have some people to thank for their help. Thanks to Dr. Coon for searching PsycInfo online with me. Thanks to Jenna Duffecy and family for two CD players; my cousin, Danielle Anderson, for one player; and my dad, Ray Van Overberghe, and Dr. Sawyer for one player each. Thanks to Phil Linke for a CD player, but also for the use of his computer to make the CD’s and his CD-R’s. Thank you to my mom, Vonnie Seymour, for making so many copies for me. Thanks to Karen Jones for her help that one day I was so disorganized. Thank you to Dr. VanOyen, my second reader, for fitting this thesis into his hectic schedule. Thanks most of all to Dr. Sawyer, thesis advisor, for helping to form these ideas cohesively and
then figure out what all the results meant in the end.
Abstract

The current study examined the relationships between emotions, different cultures, and several musical elements. Participants listened to nine pieces of music - three Hindustani ragas, three Native American pieces, and three Western songs. Joy, anger, and sadness were rated as to their presence in the music on a nine-point Likert scale. Four musical elements - tempo, pitch, rhythmic complexity (RC), and melodic complexity (MC) were rated on the same scale as the emotions. It was hypothesized that relationships would exist between the ratings of the emotions and those for the musical elements, and that the patterns of relationships would be similar regardless of the cultural origin of the music.

In addition, based on previous research, several specific hypotheses were found concerning relationships between specific musical elements and emotions. The main hypothesis was not supported, but some of the sub-hypotheses were found to be significant (i.e., joy as positively correlated to tempo and pitch, and sadness negatively correlated to these same elements).
The Relationship between Culture, Emotion, and Musical Elements

Music and emotional expression are two common means that all humans use to communicate, and cultures use both methods as a way to reach others. Humans tend to become acculturated to the specific tonal system that exists for the culture in which they are raised. Therefore, tonal systems may be culture-specific, but the emotional content of a piece might not be based on the interpretation of the culture that produced it. Elements present within all music may help to convey emotional qualities. There may be some underlying similarities between how emotions are expressed and perceived within music among many or even all cultures.

Music is universal within all cultures, and has developmental and evolutionary considerations in the human species. Training also effects the appreciation and knowledge of music. Furthermore, research has been conducted to determine if there are differences in how the emotions of music are perceived when the pieces are from cultures other than the one in which the listener was raised. The current study is an attempt to clarify previous research findings that perception of musical elements contributes to the emotion present in another culture’s music.

Culture and Aesthetics in Music

Roeckle (1968) did a meta-analysis of studies of musical taste and attitudes. He concluded that musical taste is shaped by one’s culture. The environment affects each person’s taste in music. The general consensus of what is “good” is based on social norms and what experts prefer.

Roeckle refers to a study by M.G. Rigg (1948) concerning the circumstances for which the music is written. Prior to listening to the same song, one group was told that the music was a part of the Nazi regime, a second group was told that the music was
written in the romantic style while a control group was told nothing of the music's nature.
The responses from each group were decidedly different.

Schuessler (1948) found that socio-economic background affected musical taste. He used old songs, classical, jazz, modern classical, old waltz, light classical, popular, and hillbilly music. These eight styles of music were rated: 1) liked a lot, 2) somewhat, 3) disliked, 4) disliked a lot, or 5) undecided. Participants reported their socio-economic status and any musical training they had. Schuessler found that classical music tended to be rated as liked more by women than men. He speculated that this might have to do with the traditional upbringing of boys to believe that certain music (i.e. classical) is more effeminate than other music. Schuessler's research also suggested that those of a higher socio-economic class are more likely to have musical training, which, in turn, affects musical taste. They are more likely to be exposed through training to classical music and, therefore, more familiar with that style of music. Although, training may lead to familiarity, it does not necessarily lead to an affinity towards the musical style. However, Schuessler hypothesized that separation from a specific type may cause a negative reaction towards it.

Johnstone and Katz (1957) found that girls had more of an affinity towards the music that other girls of their neighborhood liked. The more popular the girl was, the more likely that she was to conform to the group's tastes. This led to the suggestion that personal relations help to develop taste in music and musical fads.

In conclusion, growing up in a particular culture and familiarity with the types of music seem to affect the levels of appeal that a person may feel when listening to a piece of music. Social norms seem to dictate what music will be listened to, and training can alter what music is appreciated.
Developmental Considerations

Walker (1996) states that there are no prior biological programs within humans for music. He writes that, when it comes to music, humans appear to be “blank slates” that are shaped by their environment. However, ethnomusicologists argue that there is an innate tendency within humans to make music. They argue that there must be some mechanism of music present in all humans because of its universality.

Huron (1996) suggested that the manner of speech called “motherese” is another example of innate vocalization. “Motherese” is the name for the type of speech women use only with their infants. This type of speech includes higher, ascending pitches when trying to get an infant’s attention and lower, descending pitches when soothing an infant. In this regard, Trehub (2000) found that the majority of infants tested showed a preference for lower, descending pitches in a woman’s voice when being soothed. Mothers and caregivers are not given formal training, such as classes, in this particular style of speech, which suggests that such vocalizations may be innate within humans. However, environment may also contribute to this style of speech as most mothers were exposed to it also as children.

Unyk, Trehub, Trainor, and Schellenberg (1992) found a similarity between infant-directed speech and infant-directed song. They measured 28 lullabies compared to 28 non-lullabies from various cultures. They found lullabies to be higher in pitch with descending pitch intervals. This supports part of Trehub’s later study that infants find descending melodies to be more soothing (2000), thereby linking speech and song.

Music seems to be a capability that is present to some degree at birth and continues throughout life. However, it is difficult to separate the innate qualities from the learned aspects. Human understanding and use of music probably comes from both sides.
Acculturation and Effects of Musical Training

Humans begin hearing sounds before leaving the womb. These sounds often shape the language and tonal system that they adapt. A child can become acculturated to any tonal system it is exposed to repeatedly without the intention of internalizing the sounds. However, children are often only exposed to their parents’ tonal system and become acculturated to those sounds, scales, and modes. Although most cultures use scales as a basis of their musical structure, the intervals between the scale’s pitches vary for each system. The Western system uses two main scales - major and minor - which have the same intervals that occur in a different order, causing major scales to be associated with more happy emotions and minor scales with feelings of sadness and longing (Lynch & Eilers, 1991).

Lynch and Eilers (1991) examined the effects of musical experience on children’s perception of Western scales and non-Western scales. Adults were not used because they have often had much exposure to the tonal system, causing them to be strongly acculturated. Children were chosen for this study to determine if they are already acculturated by the ages of 10-13 years, and the extent to which musical training affected the strength of this acculturation. They hypothesized a difference between musically trained and nonmusically trained children’s detection of changes in pitch of the fifth note in the Western D major pentatonic scale, d minor pentatonic scale, and Javanese pelog scale. The Javanese scale used in this study was the Ngakra Arum version, calculated by Lynch and Eilers from a report by Kunst (1973) done on the country, Java. A pentatonic scale contains the first five notes of the full scale. Musically trained children had at least two years of Western musical training while nonmusically trained children had only had
the standard musical training through school curriculum. None of the children had experience with non-Western music.

The children heard computer-generated recordings based on pitch ratios for the scales. The pentatonic Western scales had seven notes - the first five notes of the full scale were followed by the third note and then, the first note again. The Javanese pelog scale followed the same format. The children heard the regular scales several times before hearing each of the six changed versions. The fifth note of each of the three scales was raised in frequency by a 0.4% difference and by a 1.6% difference, called a mistuning.

All the children did better in detecting mistunings of the fifth note in both Western scales when it was a 1.6% difference, although musical children detected the change significantly better than nonmusical children. Neither group of children performed better than chance when there was a 0.4% difference in any of the three scales. Both groups did not do better than chance when trying to detect either change in the Javanese scales.

Lynch and Eilers (1991) hypothesized that musical acculturation made it more difficult for 10-13 year old children to perceive mistunings when listening to another culture’s tonal system. Humans adapt to their own culture’s system and can hear larger mistunings within their system’s music. They also suggested that previous musical training beyond basic school curriculum produces little effect on whether a child is more or less acculturated to the system they are raised under. Therefore, acculturation must be occurring earlier than fifth grade. Musically trained children, however, can identify incorrect stimuli more easily within their own system if there is a larger difference between the correct and incorrect notes. It seems that little formal training beyond
regular school curriculum may be needed to acculturate children, although training seems to strengthen the acculturation process.

Gerardi and Gerken (1995) found that five-year-olds are no better at identifying happiness within a major song than they are with minor songs when compared to eight-year-olds and adults. Most nonmusically trained people stereotype major songs as happy and minor songs as sad. Five years old is the age of beginning school, which may mean that the ability to accurately identify emotions is learned once school is started. The eight-year-olds in the study showed a significant change that comes with age in identifying the happiness in major songs. While children pointed to either happy or sad face, adults that were tested were to identify the piece as happy or sad in writing. Adults showed very high ratings of happiness with major pieces and easily separated minor melodies. Eight-year-olds seemed to treat minor pieces as less familiar and, therefore, with less ratings of happiness. Children often hear songs in a major melody, making these pieces familiar and easier to rate as happy. Younger children may not have enough cognitive maturity to recognize songs yet, causing the five-year-olds to not differentiate the modalities of major and minor. The training received once school starts seems to affect the identification of major and minor pieces and the emotions often associated with them.

**Emotion and Music**

Rigg’s (1964) review of previous research suggests that fast tempo with higher pitches and low dissonance is rated as happier while fast and loud music with some dissonance is rated as more exciting. A slower tempo and lower pitch, without irregular rhythms and dissonant harmonies characterizes ratings of serious and solemn music. Slow tempo and low pitch with dissonance are related to sad pieces, and these are often
performed in the minor mode.

Behrens and Green (1993) used solo improvisations to test if participants could accurately identify the emotion intended by the performer. There were eight performers - two trumpets, two vocalists, two violinists, and two timpanists. The performers were given a written definition for each of three emotions - sad, angry, and scared to base their improvisations on. They then performed the improvisation with time to rehearse, and were limited to 30 seconds of recording time, and were asked to only convey one emotion in each recording.

Behrens and Green (1993) concluded that the instrument used and the emotion being conveyed did affect the accuracy of the ratings. Voice and violin were rated similarly as effective portrayers of sadness while the trumpet was a moderately accurate conveyer, and the timpani poorly portrayed this emotion. The timpani portrayed anger well while the voice was rated as a poor conveyer of anger. The trumpet and violin had some success at portraying anger. The violin conveyed fear well, while the other three instruments did not.

Gabrielsson and Juslin (1996) came to similar conclusions that certain instruments are better at portraying certain emotions, although they used four pieces already written rather than improvised. They found anger poorly portrayed by the flute, and solemnity was not represented well by the electric guitar. They found the basic emotions of happy, angry and sad to be the easiest emotions to convey to the listener while emotions such as solemnity, fear, and tenderness were not identified highly by participants. They used a control group of music called ‘no expression’ that had a moderate tempo, same dynamics, no vibrato, etc. This control group showed a moderate accuracy in identification as a neutral stimulus.
Gabrielsson and Juslin (1996) warn that emotions are not operationally defined across studies in the same way. This causes difference in each experiment’s results that may be hindering the research from moving forward. Without comparable definitions, the results of various studies are not generalizable to each other. Differences in definition, however, increase the potential that the findings will be more applicable in settings outside of the laboratory.

Behrens and Green (1993) hypothesized that emotional content may be a function of culture based on the speech patterns and physical movements used to convey a particular emotion. The timbre and pitch of each instrument is unique, causing each to be able to convey emotions in a predictable way. Behrens and Green (1993) suggest that the timpani may more accurately portray anger to the participants because of the percussiveness of the Western style of anger - hitting, yelling, and moving fast. Further, the violin can perform glissandos, tremolos, and low, eerie pitches, which are often used in movies to anticipate a scary scene. This may be the reason that the violin was rated so accurately for the scared emotion. Previous research has equated the human voice with sadness, and the violin is often said to sound similar to the voice. This may explain why these two were more accurate in portraying sadness. Behrens and Green set forth the idea that sadness may often be portrayed in Western culture and, therefore, the easiest to identify. It may also be linked to minor keys and other musical characteristics, such as slow tempo and soft dynamics that the performers intuitively added to their improvisation.

**Culture and Emotion in Music**

Balkwill and Thompson (1999) studied the connections between the intended emotion and the emotion perceived by the listeners for twelve Hindustani ragas. Ragas
are especially useful when rating intended emotion because they are performed to specifically portray a given emotion. Ragas are viewed as classical music in northern India, Pakistan, and Bangladesh, and are often based off particular scales. They are traditional songs that have been passed down, but there is still room left for improvisation within them, allowing the performer to personalize the piece (Bor, Rao, van der Meer, & Harvey, 1999). Ragas commonly convey joy, sadness, or peace. Anger is not a common emotion portrayed in Hindustani music as it is meant to be peaceful, but it is a common Western emotion, therefore, it was included in the experiment. Musical elements may be used similarly in all cultures to convey emotion, thereby helping humans to cross cultural barriers to determine the intended emotion of a tonal system to which they are not acculturated (Balkwill & Thompson, 1999).

Balkwill and Thompson (1999) had participants rate each piece across five “psychophysical dimensions” - pitch, tempo, rhythmic complexity (RC), melodic complexity (MC), and timbre. They also rated each piece for one of four emotions - joy, anger, sadness, and peace. They speculated that humans become adapted to the tonal system of their culture. Although acculturated to their own system, participants would still be able to accurately identify the emotions present in another culture’s music using the “psychophysical dimensions.”

Balkwill and Thompson (1999) found that ragas receiving higher ratings of joy had higher tempo and pitch ratings, but were rated low for RC and MC. They found that high sadness ratings corresponded with lower tempo and pitch ratings, but positively correlated with RC and MC. Anger had no significant correlations, except a positive correlation with timbre, which was hypothesized. Peace showed significant negative correlations with all five elements, except pitch. Joy and sadness showed no significant
correlations with timbre.

Balkwill and Thompson (1999) found that participants were able to judge the intended emotion of a piece if it was meant to be joyful, angry, or sad. Peace was not identified accurately. They also had four experts of Hindustani music rate the pieces. Based on their previous knowledge of the tonal system and ragas, the experts were more accurate at identifying the intended emotion than the 30 naive listeners as hypothesized. These experts also rated all 12 Hindustani ragas as low in anger, which is consistent with the idea stated previously that anger is rarely expressed in this peaceful style of music.

Culture, Emotion, and Musical Elements

The current study tested the relationships between emotions and several musical elements (“psychophysical dimensions” of Balkwill and Thompson 1999) for music from different cultures. Participants were asked to listen to several pieces of music - three Hindustani ragas, three Native American pieces, and three Western songs. Joy, anger, and sadness were rated along with tempo, pitch, rhythmic complexity (RC), and melodic complexity (MC).

It was hypothesized that differences would exist in the ratings of which emotion was elicited depending upon the ratings of the musical elements, but that the patterns of relationships would be similar regardless of the cultural origin of the music. Specifically, it was expected that the pieces rated similarly in the emotion elicited would be dependent upon similar ratings of the musical elements. There would be no difference in ratings based on which culture - Native American, Western, or Hindustani - the music was from. It was hypothesized that higher ratings of joy would be positively correlated with faster tempo and different pitch ratings, but negative with rhythmic complexity (RC) and melodic complexity (MC). Sadness ratings were hypothesized to be negatively correlated
with faster tempo and different pitch ratings, and positively correlated with RC and MC; the opposite of joy. Finally, it was hypothesized that anger would show very little or no correlation across the four elements based on the findings of Balkwill and Thompson (1999).

Method

Participants

Participants were 81 North Central College psychology students. One participant was dropped because he did not follow instructions, leaving 80 participants. Some participated for course credit, others on a voluntary basis. There were 24 males and 56 females, ranging in age from 18-37, and they were tested in groups ranging in size from 1 to 6 people.

Materials

Participants each were provided a portable compact disc (CD) player on the table in front of them. Each one was equipped with headphones, and volume was set to a comparable level before participants’ arrival, although they were allowed to change it at the beginning of the CD.
EJay, a computer program used to splice music down into smaller sections based on milliseconds, was employed to create six comparable CD's. The songs were first converted into MP3's and then into wavefiles for this program. After being spliced, they were then reconverted into MP3's to be copied onto a Systemax CD-R Recordable compact disc. Thirty-second intervals of silence were added after each excerpt also to give the participants time to rate each song. This was repeated on all six CD-R's with nine musical excerpts that were partially counterbalanced. Each excerpt was one-minute long with a thirty-second interval between each, making each CD a total of 13 minutes. The pieces chosen for this experiment were without voice, because lyrics may have verbally provided cues to the emotion.

Bach's 'Suite for Solo Cello in D Major BWV 1012/ I: Prelude' on the violoncello was the first Western song (Bach, 1990, track 2). Bach's 'Prelude in C Minor BWV 921' on the lute-harpsichord was also used for a Western song (Bach, 1999, track 5). The first minute of each Bach piece was recorded. Franz Liszt's 'Mephisto Waltz no. 1' on the piano was the third Western song (Liszt, 2000, track 1, CD 2). An excerpt was chosen from the first 2 minutes for its style and agitation.

The Native American songs were also without lyrics. 'Moonlit Stallions' (Tavera-King, 1994, track 9), 'The Holy People' (Spotted Eagle, 1989, track 1), and 'Love Song' (Pewewardy, 1994, track 15) can all be found on the CD "Between Father Sky and Mother Earth," a Narada collection series. The first minute of each Native American piece was used for this experiment.
The Hindustani Ragas were chosen based on the titles used by Balkwill and Thompson (1999) in their study of emotions and music. One raga was chosen from each category of emotion used in their study, and were found in The Raga Guide: A Survey of 74 Hindustani Ragas (1999). The musicians are not given individual credit in this booklet, although the names are listed. ‘Bhairavi’ (CD 1, track 10) was chosen for its association with sadness, and is an all-time favorite raga. It is meant to portray separation from a loved one, but there is much flexibility given with its performance. ‘Khamaj’ (CD 3, track 6) was chosen to convey joy, and is considered a very sensual song. The most common interpretation is that of a lady worshipping the four-headed Lord Brahma while performing the ancient fire ritual. ‘Adana’ (CD 1, track 2) was selected to convey anger with its fast pace. The third minute of each Hindustani raga was chosen for this experiment.

The ragas were the only three pieces chosen for this experiment in which the intended emotion was known. Expert raga performers were asked by Balkwill and Thompson (1999) to identify three angry, three sad, three joyful, and three peaceful ragas. One was chosen from each category except peaceful for the current study because they found no correlations with this emotion. The other six excerpts of Western and Native American music were chosen for their diversity from one another based in tempo, pitch, RC, MC, and instrument (timbre - not rated in this study).
The rating sheet form can be found in Appendix A. Each rating sheet had the corresponding track number at the top to help the participants monitor which track they should be hearing. The experimenter’s instruction sheet can be found in Appendix B. Also, see Appendix A for participants’ instructions, as they were the first paragraph of the experimenter’s instructions. They were not given full instructions and definitions of the musical elements to avoid any time delays caused by referring back to them during the 30-second rating pause on the CD’s.

The participant’s instruction sheet also served as the Informed Consent sheet. The instruction/consent sheet was separate from the packet containing a demographic sheet (CD number, age, class, gender, and musical training), nine rating sheets, and the last page of instructions (please wait quietly while others finish).

Procedure

Six participants were tested at a time to allow the experimenter to watch them to be sure that they followed directions. Participants sat at one of six desk or table set-ups where there was a CD player available. They were each given the instruction/informed consent page and asked to sign it. Participants were then instructed to flip over their packet with the rating sheets that was beneath the consent sheet and fill out the demographic information. They were reread the basic instructions from the instructions/consent page while looking at the first rating sheet (see Appendix B for full experimenter instructions).
Tempo was compared to the beat or pace of a song. Pitch was rated based on if the notes in the excerpt were similar or different. Participants were told to think of ‘Mary Had A Little Lamb’ as a model for similar notes. Rhythmic complexity was rated based on whether or not it was easy to keep or follow the beat by tapping along. Melodic complexity was defined as simple in comparison to ‘Twinkle Twinkle Little Star’, where the melody is repeated. Complex melodies were defined as having no unifying melody throughout. They were told which side of the rows of boxes to mark for each musical element as the instructions were read.

The participants were asked if they had any questions after each musical element was explained. Then, they were told about rating the emotions - joy, sadness, and anger - as they felt they were expressed in the piece. The experimenter asked if everyone knew how to use the CD player in front of him or her. If they had no further questions, they were told to begin.

After completing the nine rating sheets for the nine musical excerpts, the participants received a short instruction sheet asking them to wait quietly until everyone was finished. They were thanked for their participation and debriefed.

Results

Descriptive Measures of Music

Table 1 provides mean ratings, along with standard deviations for the three emotions as a function of culture. Joy was rated higher in the samples of Western and Hindustani music, and lower in Native American excerpts, although significance tests were not performed. Anger had low ratings for all three cultural samples. Sadness was also rated low also across all three cultural samples.
Descriptive Measures of Musical Elements

Table 2 provides mean ratings, along with standard deviations for the four musical elements as a function of culture. The samples of Western and Hindustani music used showed higher moderate ratings across the four musical elements. The excerpts of Native American music, however, showed lower moderate ratings across the four elements.

Correlations of Musical Elements and Emotion

For the Western musical samples, joy showed a significant positive correlation with three musical dimension - tempo, pitch, and MC (see Table 3), while RC had no significant correlation to joy found in the Western samples. Sadness showed significant correlations to the same three musical elements as joy, but they were in the negative direction. Anger showed significant positive correlations with tempo and pitch, but not with RC and MC. All significant correlations found in the Western samples were significant at the 0.01 level.

For the Native American musical samples, joy showed a significant positive correlation with tempo and RC. Sadness showed significant negative correlations only with tempo. Anger had a significant positive relationship to all four musical elements - tempo, pitch, RC, and MC, at the 0.01 level.

For the Hindustani musical samples, Only three significant correlations were found. Joy was positively correlated with tempo and RC, and anger was positively correlated with RC. All other correlations were not significant.

Predicting Emotions from Musical Elements
Multiple regression analysis showed that tempo had the greatest effect when separated from the other musical elements when rating joy and sadness. Tempo was the only variable to account for significant variability in joy ratings (Western - $t = 3.2, p < .01$; Native American - $t = 4.17, p < .001$; Hindustani - $t = 5.21, p < .001$) besides pitch in Western samples ($t = 2.12, p < .01$). It was also the only variable to show significant effect when rating sadness in all nine excerpts (Western - $t = -2.35, p < .05$; Native American - $t = -5.04, p < .001$; Hindustani - $t = -2.08, p < .05$). Tempo also had a significant effect on rating anger in Western samples ($t = 2.90, p < .01$).

Each cultural sample had a different musical element that was better at predicting emotion. The emotion elicited in Western music was best predicted again by tempo ($t = 2.90, p < .05$), but also by pitch ($t = 1.96, p < .05$). Hindustani excerpts were best predicted by RC ($t = 2.36, p < .05$) while angry Native American excerpts were predicted best by pitch ($t = 2.37, p < .05$). MC showed no predictive ability for any of the emotions.

Discussion

It was hypothesized that differences would exist in the ratings of the musical elements related to the emotion elicited, but that the patterns of relationships would be similar regardless of the cultural origin of the music. It was further expected that the pieces would be rated similarly for the same emotion, whether Native American, Western, or Hindustani. This hypothesis was not confirmed.

It was further hypothesized that ratings of joy would be positively correlated with tempo and pitch, but negative with rhythmic complexity (RC) and melodic complexity (MC). Tempo and pitch did show a positive correlation to joy across most of the nine pieces, similar to Balkwill and Thompson’s findings (1999). However, they also found
negative correlations between RC, MC, and joy, whereas the present study showed positive relationships between these two elements and joy. Sadness was hypothesized to be negatively correlated with tempo and pitch, and positively correlated with RC and MC; the opposite of joy, as found by Balkwill and Thompson (1999). The results of the present study show that sadness was negatively correlated with tempo and pitch, but RC and MC showed no significant relationship to sadness, except in the Western samples, where MC was negatively correlated.

Finally, it was hypothesized that anger would show very little or no correlation across the four elements. Anger did show significant positive correlation, however, with tempo and pitch in Western and Native American samples, with RC in Native American and Hindustani music, and with MC in Native American music. The excerpts of music from Native American culture and Hindustani culture were performed on very similar instruments - mostly flute. This may account for some of the lack of correlations found in this study compared to Balkwill and Thompson’s findings of correlations in the ragas (1999). Native American excerpts had more significant correlations with the elements and emotions, which may have been attributed to the repeated hearing of the flute sound.

It seems that tempo was the main musical element that correlated with ratings of emotion. This may be because tempo/beat is easily understood by those without a musical background. None of the other four musical elements stood out as reliable predictors of emotion. Participants had the most difficulty with the concepts of RC and MC, which may have caused them to be lower predictors of emotion. MC and pitch are also very similar elements as both deal with melody variation, which the participants could easily have confused. This may have also caused lower predictability values.

The repeated use of the flute through most of the excerpts may also have caused
the variability in ratings. As stated above, Behrens and Green (1993) speculated on the effects each instrument has on emotional ratings. The lack of diversity in timbre may have caused all of the elements and emotions to be rated similarly. Timbre was not measured in this study because of the lack of correlational evidence found in Balkwill and Thompson (1999). However, with the use of Western samples (utilizing different instruments - the piano and harpsichord), timbre may have been an important variable to include. Timbre was also excluded from this study because it is difficult to explain to anyone, even when they have had musical training.

The current study showed problems with definitions of the four musical elements. Participants had some difficulty with the terms and their definitions. They may not have asked for clarification because others did not ask either or because of lack of interest. One participant informed the experimenter that her background in music did not help her to differentiate the terms from one another. Some participants may also have had some preconception of the meaning of a term or terms, which biased their ratings. Participants may have rated the pieces with different concepts in mind, causing the item rating to not be consistent.

One participant asked after debriefing if they were to rate whether the emotion was present, if they had felt it, or if they thought the performer had intended it. Other participants may also have been confused on how to rate the three emotions. Future studies should clarify this point and the musical elements' definitions.

The Western samples showed the most significant correlations of the three cultures. This supports the claim that humans are acculturated and are better at determining various musical elements within the structure of their own tonal system (Lynch & Eilers, 1991).
Future studies may try testing people individually. The time limits for rating each song after it was finished and group-testing situations limited the current study in not allowing definition in paper form for participants to refer back to. Future studies may try computer testing, which allows participants to take their time rating the excerpts and to have a sheet of definitions if needed for reference. A sample piece rated together before the experiment may also help clarify what should be done.

Future research might also try testing music from a tonal system as the control group and music that is created without the structure of a tonal system as the experimental group. This would show whether the structure of a tonal system affects the consistency of the responses. It would be hypothesized that the music without a tonal system would not have consistent responses whereas the music of a tonal system would show consistency.

A wider range of participants is another suggestions for future research. Other cultures and/or ethnicities may show a difference in their ratings of various cultural music. A wider range of cultural music might also benefit to form further conclusion regarding tempo and its strong relationship with the ratings of emotions. Using whole songs, similar to Balkwill and Thompson (1999) rather than excerpts may also give the participants more time to identify the emotion within a piece.
References


### Table 1

**Means and Standard Deviations for Emotion Ratings as a function of Culture**

<table>
<thead>
<tr>
<th>Culture</th>
<th>Joy</th>
<th>Anger</th>
<th>Sadness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western - Mean</td>
<td>5.39</td>
<td>2.44</td>
<td>2.95</td>
</tr>
<tr>
<td>- SD</td>
<td>2.32</td>
<td>1.96</td>
<td>2.26</td>
</tr>
<tr>
<td>Native Am - Mean</td>
<td>2.53</td>
<td>2.50</td>
<td>2.95</td>
</tr>
<tr>
<td>- SD</td>
<td>1.69</td>
<td>2.04</td>
<td>2.26</td>
</tr>
<tr>
<td>Hindustani - Mean</td>
<td>5.39</td>
<td>1.91</td>
<td>2.42</td>
</tr>
<tr>
<td>- SD</td>
<td>2.14</td>
<td>1.45</td>
<td>1.61</td>
</tr>
</tbody>
</table>
Table 2

Means and Standard Deviations for Ratings of Musical Elements as a Function of Culture

<table>
<thead>
<tr>
<th>Culture</th>
<th>Musical Elements</th>
<th>Tempo</th>
<th>Pitch</th>
<th>RC</th>
<th>MC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western - Mean</td>
<td></td>
<td>6.72</td>
<td>6.26</td>
<td>5.75</td>
<td>5.26</td>
</tr>
<tr>
<td></td>
<td>- SD</td>
<td>1.60</td>
<td>2.21</td>
<td>2.31</td>
<td>2.52</td>
</tr>
<tr>
<td>Native American - Mean</td>
<td></td>
<td>3.00</td>
<td>4.04</td>
<td>3.79</td>
<td>3.31</td>
</tr>
<tr>
<td></td>
<td>- SD</td>
<td>1.47</td>
<td>2.06</td>
<td>2.07</td>
<td>1.80</td>
</tr>
<tr>
<td>Hindustani - Mean</td>
<td></td>
<td>6.63</td>
<td>5.38</td>
<td>5.91</td>
<td>4.98</td>
</tr>
<tr>
<td></td>
<td>- SD</td>
<td>1.49</td>
<td>2.15</td>
<td>1.94</td>
<td>2.12</td>
</tr>
</tbody>
</table>
Table 3

Correlations of Coefficients between Musical Element and Emotion as a function of Culture

<table>
<thead>
<tr>
<th>Element and Emotion</th>
<th>Western</th>
<th>Native Am.</th>
<th>Hindustani</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joy - Tempo</td>
<td>.29**</td>
<td>.28**</td>
<td>.32**</td>
</tr>
<tr>
<td>Joy - Pitch</td>
<td>.25**</td>
<td>.06</td>
<td>.06</td>
</tr>
<tr>
<td>Joy - RC</td>
<td>.14</td>
<td>.17*</td>
<td>.08</td>
</tr>
<tr>
<td>Joy - MC</td>
<td>.20**</td>
<td>.12</td>
<td>.16*</td>
</tr>
<tr>
<td>Anger - Tempo</td>
<td>.24**</td>
<td>.14**</td>
<td>.05</td>
</tr>
<tr>
<td>Anger - Pitch</td>
<td>.20**</td>
<td>.26**</td>
<td>.12</td>
</tr>
<tr>
<td>Anger - RC</td>
<td>.09</td>
<td>.18**</td>
<td>.19**</td>
</tr>
<tr>
<td>Anger - MC</td>
<td>.11</td>
<td>.21**</td>
<td>.10</td>
</tr>
<tr>
<td>Sadness - Tempo</td>
<td>-.26**</td>
<td>-.30**</td>
<td>-.12</td>
</tr>
<tr>
<td>Sadness - Pitch</td>
<td>-.22**</td>
<td>-.08</td>
<td>.04</td>
</tr>
<tr>
<td>Sadness - RC</td>
<td>.09</td>
<td>.003</td>
<td>.02</td>
</tr>
<tr>
<td>Sadness - MC</td>
<td>-.32**</td>
<td>-.04</td>
<td>-.05</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)
## Appendix A

### TEMPO / PACE

<table>
<thead>
<tr>
<th>slow</th>
<th>fast</th>
</tr>
</thead>
</table>

### PITCH

<table>
<thead>
<tr>
<th>same notes</th>
<th>different notes</th>
</tr>
</thead>
</table>

### RHYTHMIC COMPLEXITY

<table>
<thead>
<tr>
<th>simple</th>
<th>complex</th>
</tr>
</thead>
</table>

### MELODIC COMPLEXITY

<table>
<thead>
<tr>
<th>simple / repetitive</th>
<th>complex</th>
</tr>
</thead>
</table>

### JOY

<table>
<thead>
<tr>
<th>not present</th>
<th>high levels</th>
</tr>
</thead>
</table>

### ANGER

<table>
<thead>
<tr>
<th>not present</th>
<th>high levels</th>
</tr>
</thead>
</table>

### SADNESS

<table>
<thead>
<tr>
<th>not present</th>
<th>high levels</th>
</tr>
</thead>
</table>
Appendix B

DO NOT START THE CD UNTIL YOU FULLY UNDERSTAND ALL INSTRUCTIONS!!!!!!!!!!!!!!!!!!!!!!!

--You will listen to nine one-minute excerpts of music on headphones. Please listen carefully and rate each excerpt. Use the rating sheet for each track to rate the musical characteristics of the excerpt AFTER THE TRACK HAS FINISHED. If you are listening to track one, please mark the sheet that corresponds to track one. Do not stop or restart any tracks as that will change the timing of the pauses between the excerpts. Rate each excerpt as quickly AND as accurately as possible as the pause is limited. Further instructions on what to do when finished are at the back of your packet.

--Please turn your packet over now and fill out the questions on the first sheet regarding age, gender, and musical background.

--Now, please turn to the second sheet of your packet, which says "track 1" at the top. This is your first rating sheet that is similar to the other nine. After listening to each excerpt, please rate it for four musical characteristics - tempo, pitch, rhythmic complexity, and melodic complexity.

--Tempo is the pace or beat of the song. If the song moves quickly, you will mark a box closer to the right whereas a slower song would be marked closer to the left. Any questions regarding Tempo?

--For rating pitch, you will decide if the notes of the song are very similar or very different, using "Mary Had a Little Lamb" as a model for similar notes. If the notes are more similar throughout the excerpt, you will mark boxes closer to the left whereas more different notes will be marked closer to the right. Any questions regarding Pitch?

--For RC, you will rate to the left, closer to simple, if there is a clear steady beat that is easy to follow. You will rate closer to the right if the beat is more complex, meaning hard to follow or tap along with. Any questions regarding RC?

--MC is rated simple, to the left, when the melody repeats a lot, like "Twinkle, Twinkle Little Star". It is complex, to the right, when there is no unifying melody that is played over and over. Any questions regarding MC?

--After rating the four musical characteristics, you will then rate the excerpts for three emotions - joy, anger, and sadness. If you felt that the emotion was stronger in the music,
you will rate more towards the right. If you felt that there was very little of it expressed
in the excerpt, mark closer to the left boxes. If you have any further questions at this
time, please ask before beginning your CD. If there are no questions, you may proceed
when ready.