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Emotion in Indian Classical Music:
A Cross Cultural Study

Abstract

This paper addresses the question, “Will western listeners be able to successfully identify the subtleties in Indian Classical Music?” Western listeners listened and rated the emotion present in excerpts of Indian Classical Music at different times of the day. Analysis was then done to see how the ratings to the same excerpts differed with time. It was found that, listeners gave higher ratings to the morning raga in the morning session as compared to the evening session. This relationship was found to be true with the evening raga as well. Therefore, the findings seem to suggest that the raga-time relation does manifest in listeners unfamiliar to the musical style. Thus, we can say that sensitivity to emotion transcends acoustic cues, psychophysical cues and cultural boundaries.

Introduction

According to Indian Music Theory, classical music has two main components – Raga and the Tala. Tala is defined as the rhythmic pattern present in a performance. It can be equated to the ‘meter’ in Western music. Raga is the melodic component of the music. Parallels to the melodic modes in Western music can be drawn to the Ragas. The theory also goes on to say that, Indian ragas have a time of the day when they evoke greater emotional responses. Also every raga has an emotion (rasa) attached to it. It is also said that a particular raga will activate a certain chakra in the human body. Given the raga-time relation, the activation of the particular chakra should be higher when the raga is heard/performed at its associated time. That would in turn reflect in greater emotional ratings indicated by listeners. If successfully verified in Western Listeners, this would mean that the emotional responses of an unfamiliar listener is more than just the psychophysical cues and acoustic cues present in the performance of the raga. Given the above parameters, I hypothesize that; “Listeners use more than psychophysical cues and acoustic while judging the emotions evoked in them from an unfamiliar piece of music.”

Background/Previous Work:

While work has been done previously in exploring the emotions present in Indian Ragas, little work has been done in exploring the time of the day associated with each raga. Bhatkande (1934) was one of the first people to explain the musical structures present in ragas and thereby explain how the ragas are given a time of the day. In his study, Bhatkande stated that the most important notes of the raga (vadi and samvadi) provided key links to the raga-time relation rather than the tonic (Sa) or the Dominant (Pa). He showed that ragas with the vadi in the upper register (between pitches 8-11), known as uttaranga pradhan ragas, were performed between 12am-12pm while ragas with the vadi in the lower register (0-7), called poorvanga pradhan ragas, were performed between 12pm-12am. This was later confirmed in the studies conducted by Jairazbhoy (1995). In addition, Bhatkande observed that ragas could be assigned more specific times based on other pitch classes present in them. For instance, ragas with pitch classes {2, 4, 9} (Re♭, Ga, Dha♭) are sung between the times 7-10am/pm, classes {1, 4, 11} between 4-7am/pm and so on. Raga Bhairav, for example has the note progression Sa Re♭ Ga Ma Pa Dha♭ Ni Sa. This conforms to Bhatkande’s model of a raga to be performed between 7-10am/pm. Secondly, being an uttaranga pradhan raga with Dha♭ as its vadi, it is sung between 12am-12pm. Tying these two concepts together, we arrive at Raga Bhairav being a Morning Raga (Jasani, 2000).

Yardi, and Chew (2004) explored the use of Harmonic Networks to try and explain the emotions present in the ragas and the possibility of associating a time to the raga depending on the Harmonic Network and the emotion elicited by the raga. In their work, they observed that the networks formed a pattern that could explain that conformed to Indian music theory the findings of Bhatkande and Jairazbhoy.

The findings of Bhatkande, Jairazbhoy, Yardi and Chew do seem to suggest that the structure of Indian Classical music could potentially be explained using a tonal hierarchy. This indeed was attempted by Bharucha, Catellano and Krumhansl (1984). They explained

the structure of Indian music using a model similar to the circle of fifths present in Western Music. They proposed that given this strong relation, Western Musicians could hear the subtle changes in Indian music but they would always try to relate it to the Western structure and that would skew the results. Their experiments successfully supported this hypothesis. This was later also examined in a musical expectation research. Western Listeners were stumped in made errors in judgments when presented with a raga (Raga Bhairav) pattern similar to the C-major scale but with a couple of minor changes (Curtis and Bharucha, 2009). These studies showed that the Western listeners look for clues in non-familiar music that can draw parallel to music they are familiar with. Although Deutsch (1984) did raise concerns with the tonal hierarchy model regarding its cognitive use and the testability of the cues employed by listeners in making key judgments of music, the tonal hierarchy model provides more positive features than negative.

Emotion present in Indian music has been explored extensively. Ali and Peynircioğlu (2010) have shown variation of intensity of emotions when listening to familiar and unfamiliar music. They have shown that the music seems to generate a higher intensity of emotion when the subject is questioned along the lines of the emotions conveyed by the music as opposed to the emotions elicited by listening to it. Balkwill, Thompson and Matsunaga (2004) showed that irrespective of the listeners' familiarity with the music, he/she could correctly to the emotional content of the piece. This was verified by testing Japanese listeners on Hindustani music and noting that their responses were in coherence with the emotions intended by the performer. Balkwill and Thompson (1999) performed a similar cross-cultural study with western listeners, who were also able to tease out the intended emotion of a Hindustani musical piece. Alluri and Toiviainen (2012) showed that music across cultures has similar structural aspects, which could possibly explain the results of the above studies. They, however, showed in their studies that although that might be the case, the unique cultural cues override the common traits, and this results in the skewed results we seem to observe. Chordia and Rae (2007), in their experiments with musical emotions found that people's responses to happier music seemed to be of greater absolute value than music that conveys sadness. Hegde, Aucouturier, Ramanujam and Bigand (2012) examined the emotional changes experienced by a listener over the course of a single musical performance. They inferred from their studies that faster music with more strong beats need not necessarily be perceived as more energetic and having a greater arousal.

Pilot Study

As an initial assessment of the experiment design, a pilot study was conducted. 2 graduate students of New York University, mean age 29.5 years, with no formal musical training and minimal knowledge of Indian Classical music were asked to listen to the excerpts and rate the emotional content present in them. Of the 4 excerpts, they agreed upon the emotion in 3 of them and their degree of emotion either agreed (in 2 cases) or varied by a factor of 1 (in 2 other cases). The results can be summarized as follows.

Participant ID	Raga Bhairav	Raga Dhani	Raga Hamsadhwani	Raga Darbari
1	Peaceful (6)	Sadness (5)	Happiness (6)	Anger (6)
2	Peaceful (7)	Sadness (5)	Happiness (6)	Excitement (5)

Table 1: Shows the responses of the participants to the various ragas. Numbers in brackets indicate the degree of emotion elicited. (Scale of 1-7)

The above results showed that the excerpts chosen did convey emotions fairly strongly and there was a good correlation among participants when it came to the type of emotion elicited. Thus, a full-scale experiment was designed and conducted using these excerpts.

Method

Given the hypothesis, I am looking to verify by asking the participants to listen to the stimuli and rate the degree of emotion elicited in them. If the Indian Theory's claim is observed in non-educated listeners, this will strongly support the aforementioned hypothesis.

Participants: 18 undergraduate/graduate students from New York University with varying musical training and little/no familiarity with Indian Classical Music.

Stimuli: 4 excerpts of Indian Classical Ragas were used as the stimuli. Each was approximately 2 minutes long (mean duration 2 minutes, 8 seconds). Excerpts used were sitar and sarod performances of renowned artists. Both being string instruments with slightly different timbres, which did not have a major impact on the listeners. The Ragas used were

1. Raga Bhairav (Morning Raga)
2. Raga Dhani (Afternoon Raga)
3. Raga Hamsadwani (Evening Raga)
4. Raga Darbari (Night Raga)

Equipment and Software: The stimuli were be played on a MacBook pro laptop and heard by the listeners through a pair of Sennheiser headphones (model HD650).

Procedure: The 18 participants divided into two groups (9 each). One group took the experiment in the morning (7am-10pm) and the other group in the evening (4pm-7pm). According to the Indian theory, emotional responses to the raga at its intended time should be higher. If so, the responses to the morning raga should be greater among the people who took the experiment in the morning than those who took it in the evening and the same for the evening raga. Listeners were tested individually. First they were asked a few general questions regarding their age, gender, musical training and familiarity with Indian Classical Music. After this, they were played the excerpts one at a time in a random order for each participant. They were asked to listen to it and indicate which emotion among the options present was most dominantly elicited. They were also asked to indicate on a scale of 1-7, how strongly the emotion indicated was elicited, with 1 being emotion not elicited and 7 being emotion very strongly elicited. 2 random ragas (1 afternoon and 1 night raga) were added to the experiment to add variability to the stimuli presented. After listening and responding to all the stimuli, the participants were asked for some general feedback.

Results

Tables 2 and 3 show the responses of the participants of the morning and evening sessions to the question of the emotion most strongly elicited in them. These are combined and represented in the form of pie charts in figures 1-4.

PARTICIPANT NO	RAGA BHAIRAV	RAGA DHANI	RAGA HAMSADHWANI	RAGA DARBARI
1	PEACEFUL	SADNESS	HAPPINESS	EXCITEMENT
2	ANGER	PEACEFUL	SADNESS	EXCITEMENT
3	SADNESS	SADNESS	PEACEFUL	ANGER
4	PEACEFUL	DULLNESS	HAPPINESS	ANGER
5	SADNESS	SADNESS	HAPPINESS	ANGER
6	EXCITEMENT	SADNESS	HAPPINESS	SADNESS
7	PEACEFUL	SADNESS	EXCITEMENT	EXCITEMENT
8	PEACEFUL	PEACEFUL	HAPPINESS	ANGER
9	PEACEFUL	EXCITEMENT	HAPPINESS	SADNESS

Table 2: Morning Session

PARTICIPANT NO	RAGA BHAIRAV	RAGA DHANI	RAGA HAMSADHWANI	RAGA DARBARI
1	DULLNESS	SADNESS	PEACEFUL	SADNESS
2	PEACEFUL	PEACEFUL	PEACEFUL	EXCITEMENT
3	PEACEFUL	SADNESS	HAPPINESS	EXCITEMENT
4	DULLNESS	DULLNESS	HAPPINESS	HAPPINESS
5	ANGER	SADNESS	EXCITEMENT	SADNESS
6	PEACEFUL	DULLNESS	HAPPINESS	EXCITEMENT
7	SADNESS	SADNESS	HAPPINESS	ANGER
8	DULLNESS	PEACEFUL	HAPPINESS	EXCITEMENT
9	SADNESS	EXCITEMENT	PEACEFUL	ANGER

Table 3: Evening Session

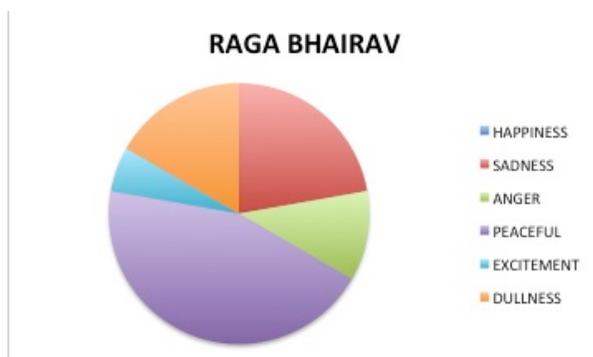


Figure 1: Peaceful (44.4%), Sadness (22.2%), Dullness (16.67%), Anger (11.1%), Excitement (5.56%)

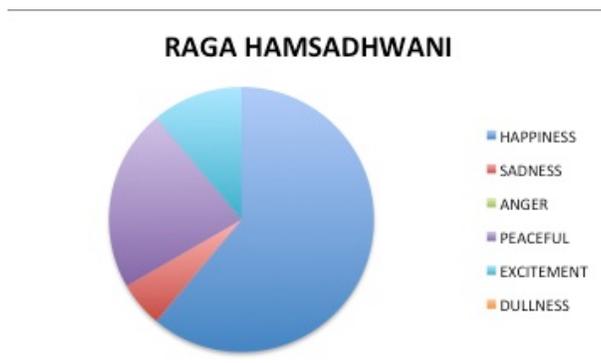


Figure 2: Happiness (61.1%), Peaceful (22.2%), Excitement (11.1%), Sadness (5.56%)

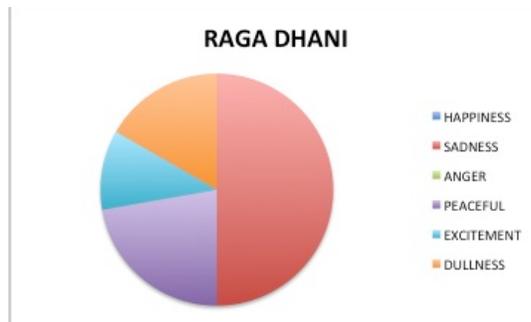


Figure 3: Sadness (50%), Peaceful (22.2%), Dullness (16.67%), Excitement (11.1%)

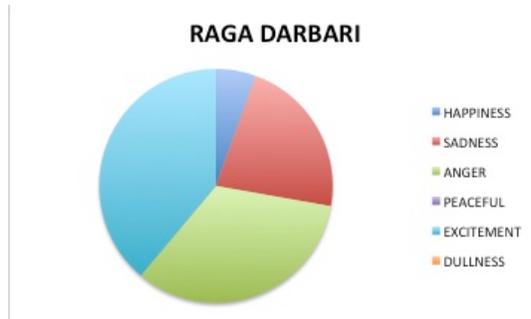


Figure 4: Excitement (38.39%), Anger (33.3%), Sadness (22.2%), Happiness (5.56%)

The above results show some variation in the type of emotion elicited in the participants in both sessions. This was expected to an extent as there was no intended emotion and it wasn't a controlled parameter. The degree of emotion was being tested, the results of which are shown in tables 4 and 5. These show the absolute values of the degree of emotion elicited. The type of emotion is not a factor.

PARTICIPANT ID	RAGA BHAIRAV	RAGA DHANI	RAGA HAMSADHWANI	RAGA DARBARI
1	7	2	6	5
2	5	5	2	6
3	5	5	6	4
4	2	3	4	5
5	4	4	6	6
6	5	4	7	3
7	6	6	5	4
8	5	3	7	3
9	5	5	5	6
MEAN	4.888888889	4.111111111	5.333333333	4.666666667
STANDARD DEVIATION	1.364225462	1.269295518	1.58113883	1.224744871
MEDIAN	5	4	6	5

Table 4: Morning Session

PARTICIPANT ID	RAGA BHAIRAV	RAGA DHANI	RAGA HAMSADHWANI	RAGA DARBARI
1	4	6	6	5
2	6	6	4	6
3	5	6	6	5
4	4	3	5	5
5	3	4	4	3
6	4	5	7	4
7	5	6	7	5
8	1	2	4	4
9	4	4	6	4
MEAN	4	4.666666667	5.444444444	4.555555556
STANDARD DEVIATION	1.414213562	1.5	1.236033081	0.881917104
MEDIAN	4	5	6	5

Table 5: Evening Session

In order to observe the emotion rating between morning and evening, a line plot has been drawn, as shown below. The marks represent the values as indicated by the participants, which varies across the y-axis while the x-axis is for the 9 participants of both the sessions.

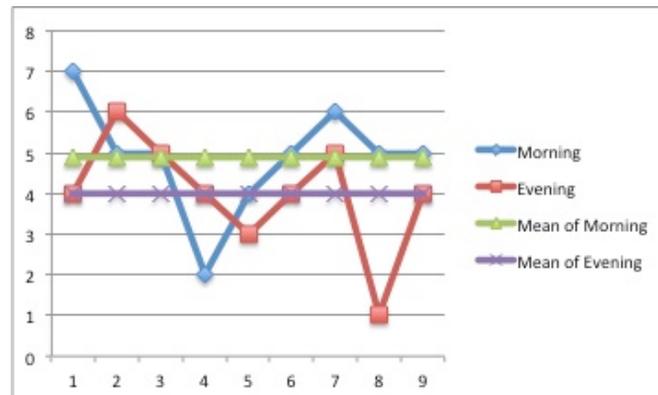


Figure 5: Raga Bhairav

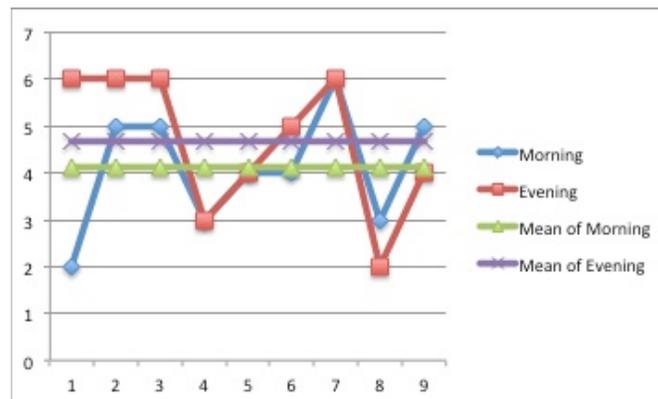


Figure 6: Raga Dhani

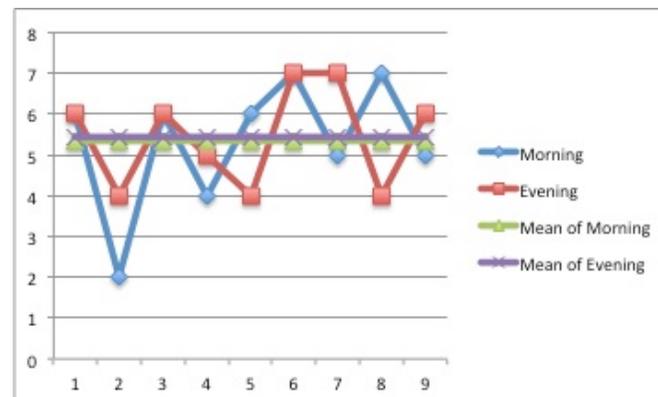


Figure 7: Raga Hamsadhwani

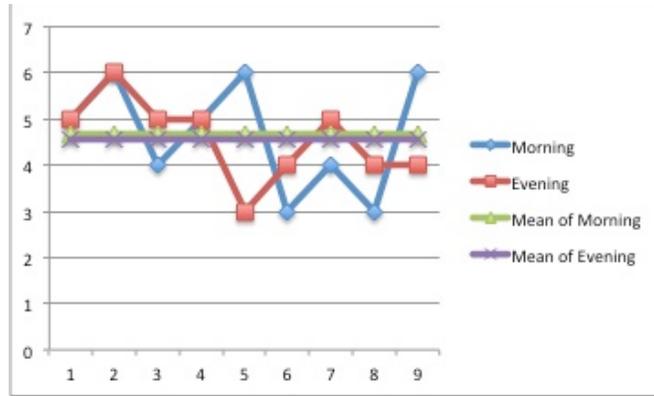


Figure 8: Raga Darbari

Discussion

The results seem to support my hypothesis of perception of Indian Classical Music by western listeners. If we observe the mean curve for the morning raga, Bhairav (fig. 5), we clearly see that the mean rating given by listeners of the morning session is significantly larger (4.9) than the mean emotion rating of listeners in the evening session (4.0). This conforms to the hypothesis of listeners listening to a raga at its intended time will give a higher rating for the raga than other listeners. This shows that Raga Bhairav elicited greater emotion response in listeners in the morning.

Moving to the other significant data set, the evening raga Hamsadhvani. Here the results are not very prominent. The mean ratings of both sessions are very close with the evening session rating having a slightly higher rating (difference of 0.1). This insignificant difference might seem to suggest that the hypothesis failed. However, on closer observation of the mean rating of all the ragas and all the sessions, we see that Raga Hamsadhvani has out scored all the other ragas by over 8% in the morning and over 16% in the evening session. Therefore, it would be a safe to assume that the Hamsadhvani excerpt was much more expressive than the other pieces, leading to this slightly skewed result. We can also observe the type of emotion-elicited graph to add to this conclusion. 11 out of 18 participants, that is, 61.1% of the participants selected happiness as the dominant emotion. None of the other ragas has crossed 50%. This shows the piece was very expressive and the emotion came out very strongly.

Analysis on the other 2 ragas tells us that the mean ratings across both sessions were similar. This seems to suggest that morning/evening time did not have much effect on afternoon and night ragas, which also indirectly supports my hypothesis.

The post experiment feedback suggested that 100% of the participants determined rhythmic and melodic complexity as the primary contributing factor for emotional response while ~20% also felt pitch was a contributing factor. This shows that people were looking for the same cues and yet the responses were in different across sessions for the morning raga. This strengthens the hypothesis of more than psychophysical cues present in perception of unfamiliar music.

In conclusion, I have conducted an empirical survey to examine the raga-time relation and its affect on western listeners. The results seem to indicate that there is a trend toward greater emotional response during the intended time of the raga. Future work can involve greater statistical analysis in the form of more subjects and more controlled musical excerpts keeping in mind the impact of the compositional structure and performer's expression. More musical stimuli will also be required to make the study more robust.

References

- Balkwill, L.-L., & Thompson, W. F. (1999). A Cross-cultural investigation of emotion in music: Psychophysical and cultural cues. *Music Perception*, 17(1), 43–64.
- Balkwill, L.-L., Thompson, W. F., & Matsunaga, R. (2004). Recognition of emotion in Japanese, Western, and Hindustani music by Japanese listeners. *Japanese Psychological Research*, 46(4), 337–349.
- Ali, S. O., & Peynircioğlu, Z. F. (2010). Intensity of Emotions Conveyed and Elicited by Familiar and Unfamiliar Music. *Music Perception*, 27(3), 177–182.
- Curtis, M. E., & Bharucha, J. J. (2009). Memory and musical expectation for tones in cultural context. *Music Perception*, 26(4), 365–375.
- Izard, C. E. (2009). Emotion Theory and Research: Highlights, Unanswered Questions, and Emerging Issues. *Annual Review of Psychology*, 60(1), 1–25.
- Hegde, S., Aucouturier, J. -J., Ramanujam, B., & Bigand, E. (2012). Variations in emotional experience during phases of elaboration of North Indian Raga performance. 12th International Conference on Music Perception and Cognition.
- Yardi, S., Chew, & E. (2004). Giving Ragas the Time of Day: Linking structure, emotion and performance time in North Indian Classical Music using the Harmonic Network. 8th International Conference on Music Perception & Cognition.
- Bhaucha, J. J., Castellano, M. A., Krumhansl, C. L. (1984). Tonal Hierarchies in the Music of North India. *Journal of Experimental Psychology: General*, Vol. 113, No. 3, 394-412.
- Deutsch, D. (1984). Two Issues Concerning Tonal Hierarchies: Comment on Catellano, Bharucha, and Krumhansl. *Journal of Experimental Psychology: General*, Vol. 113, No. 3, 413-416.
- Jasani. Tarun, “Ragas of the Morning”
<http://www.amc.org.uk/education/article>
- Jairazbhoy, N. A. (1995). The Rags of North Indian Music: Their Structure and Evolution. Bombay: Popular Prakashan Pvt. Ltd. Pages 16-46.
- Chordia, P. & Rae, A. (2007). Understanding Emotion in Raag: An Empirical Study of Listener Responses. 4th International Symposium, CMMR 2007, Copenhagen, Denmark, August 27-31, 2007.
- Koduri, G. K., Indurkha, B. (2010), A behavioral study of emotions in South Indian classical and its implications in music recommendation systems. ACM workshop on Social, adaptive and personalized multimedia interaction and access Pages 55-60.
- Rao, B. T., Chinnam, S., Kanth, P. L., Gargi, M. (2012). Automatic Melakarta Raaga Identification System: Carnatic Music. *IJARAI*, Vol. 1, No. 4, 43-48.
- Parncutt, R. & Marin, M. (2006). Emotions and associations evoked by unfamiliar music. *Proceedings of the International Association of Empirical Aesthetics*.
- Alluri, V., & Toiviainen, P. (2012). Effect of Enculturation on the Semantic and Acoustic Correlation of Polyphonic Timbre. *Music Perception: An Interdisciplinary Journal*, Vol. 29, No. 3, Pages 297-310.
- Bhatkande, V. (1934), *Hindusthani Sangeet Paddhati*. Sangeet Karyalaya
- Clayton, M. (2000). *Time In Indian Music*. New York: Oxford University Press.
- Juslin, P. N., Liljestrom, S., Vastfjall, D., Barradas, G., & Silva, A. (2008). An Experience Sampling Study of Emotional Reactions to Music: Listener, Music, and Situation. *American Psychological Association*, Vol. 5, No. 5, 608-683.

- Juslin, P., & Västfjäll, D. J. H. (2008). Emotional responses to music: The need to consider underlying mechanisms. *Behavioral and Brain Sciences*, 31, 559–621.
- Juslin, P. N., & Sloboda, J. A. (2013). Music and emotion. In D. Deutsch (Ed.), *The Psychology of Music* (3rd ed., pp. 583–645).