Variations in emotional experience during phases of elaboration of North Indian Raga performance

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ABSTRACT

Background

In Indian classical Music (ICM), the melodic basis of compositions and improvisations is based on specific melodic modes, called 'Ragas' or 'Raags'. Contrary to the modes of Western music, the ragas are specified not only by a scale, but also specific lines of ascent and descent, transilience, emphasized notes and register, and intonation and ornaments (Jairazbhoy, 1995). In the North Indian classical tradition (NICM) in particular, the ragas are classified into different groups, called 'Thaat' or parent scales, based on the nature and number of tones, as well as similarities in melodic patterns (Bhatkande, 1934; Castellano, Bharucha, & Krumhansl, 1984).

The etymological meaning of the work 'Raga' is derived from a Sanskrit word '*Ranjayati iti raga'*, meaning 'that which colors the mind'. Ragas are closely associated with specific emotional themes, termed as 'rasas' (emotional essence). Expression of the raga-rasa aspect is considered the primary goal in ICM, and this expression is intended to vary dynamically during a piece's performance.

More precisely, the performance of a raga evolves the time in various stages introducing variations in melody, tempo and instrumentation and rhythm. In the NICM in particular, the first phase is known as the 'alap', an extremely slow or metrically-free improvisation of the raga. The second phase is known as the 'vilambit' ("slow tempo"). In the 'vilambit' phase, a compositional pattern (gat or bandish) and a rhythmic cycle (taal) are introduced, still in a slow tempo. In the third and final phase, a second compositional pattern is introduced, set in a rhythmic cycle at a faster tempo (Dhrut). Additionally, in instrumental performance, the 'alap' phase is followed by another phase known as 'jor- jhala' prior to the presentation of a composition in the vilambit phase. In this phase, the performer introduces a steady pulse without any rhythmic accompaniment.

Emotional experiences in NICM have been studied at the global level of the raga, often using excerpts of the slow, ametric alap phases (Balkwill & Thompson, 1999; Chordia & Rae, 2007). By focusing on alap, however, such studies have emphasized the raga's harmonic features and neglected its performance and rhythmic features. In particular, no studies so far have investigated the variations in the emotional experience if any during the different phases of raga elaboration. This is the aim of the present study.

Method

Participants: Fifty musically-untrained Indian, normal healthy volunteers (M:F 36:14) with average age of 26±6 years comprised the sample.

Material: 10 ragas each representing one of the ten 'thaat' of NICM was chosen: Bhoop (Bho.), Bihag (Bih.), Jog, Chandrakauns (Cha.), Desi (Des.), Malkauns (Mal.), Bhairav (Bha.), Gurjari Todi (GT.), Lalat (Lal.), Marwa (Mar.). All musical excerpts were selected from commercially available recordings of a highly accomplished professional musician, performed in bamboo flute (bansuri). Three one minute excerpts were chosen from each of the ten ragas, amounting to 30 excerpts. Of the three excerpts chosen from each raga, one excerpt was from the first phase of raga elaboration (i.e., the alap phase of each raga) (P1), one excerpt was from the second phase of raga elaboration (i.e., the jod/jahla, with pulse and tempo section of each raga) (P2) and one excerpt was from the third phase of the raga elaboration (i.e., the 'madhyala -dhrut' phase with medium paced rhythm of each raga) (P3). During the following we only report on differences observed comparing P1 and P2 of the ragas.

Procedure: The experiment was carried out in individual session. Each participant was seated comfortably in a sound treated room. Musical excerpts were presented using windows media player via Bose 3 2.1 speakers. The volume was kept constant for all participants. Two different randomized blocks of the musical excerpt were prepared, making sure no two excerpts of the same raga were played consecutively. For each extract, participants were asked to choose the predominant emotion perceived from a set of eight emotional categories known to be associated with NICM: sadness, romance, peace, strength/courage, anger, devotion, happiness/joy, longing (Bhatkande, 1934).

Analysis

We conducted a PCA analysis of the complete dataset of 30 extracts (10 ragas, each in 3 phases). We encoded each extract as an 8-dimensional vector, in which each coordinate represents the frequency of occurrence (among all rating participants) of each of the 8 emotional labels as the predominant emotion for the extract. After normalizing the dataset for zero mean and unity variance, the variance of the data was well explained by the first 2 principal dimensions (84% variance). The PCA space could be naturally interpreted as a rotated valence/arousal space, opposing Anger, Strength versus Peace and Devotion along dimension 1 ("arousal", 51% variance) and Sadness, Longing versus Romance, Happy along dimension 2 ("valence", 33% variance) - see Figure 1.

In parallel, we analyzed the rhythmic properties of each extract using MIRToolbox's algorithms (Lartillot & Toiviainen, 2007) for tempo (the speed of the periodicity of the piece), pulse clarity (the relative signal energy found on each beat), event density (the quantity of instrumental onsets per second) and attack time (the duration of the attack portion of each note).

Results

We observe considerable emotional variations between P1 and P2 of each raag. Valence and arousal variations within a raga typically exceed variations between different ragas. For instance, the change of valence within Mal1 and Mal2 is larger than the difference between Mar1 and Jog1. On the whole, emotional changes are larger along the dimension of arousal than valence (bottom to top movement in Figure 1).

The transition from P1 to P2 was associated with a significant increase in pulse clarity (M=0.18 < M=0.23, F(1)=9.75, p=0.0059) and event density (M=1.1 < M=1.8, F(1)=6.39, p=0.02). P2 pieces were therefore played systematically with a strongly marked beat, and denser phrases with more notes than in P1. However, there was no significant trend for tempo (p=0.62) and attack time (p=0.75).

The change in pulse clarity (small or large increase) and the change in tempo (decrease or increase) from P1 to P2 appeared to be correlated with the valence of the piece in P1: it was more likely for negative ragas to see their tempo decrease (e.g. GT, Cha, Bha) and positive ragas to see it increase (e.g. Bho, Desi, Jog) (correlation $R^2=0.36$, F=4.6, p=0.064). Positive ragas saw larger increases of pulse clarity than negative ragas (correlation $R^2=0.44$, F=6.4, p=0.034). These likely reflect interpretation choices from the performers, who are more likely to e.g. speed up positive pieces than negative ones. Interestingly, the change of tempo did not correlate with the perceived change of arousal from P1 to P2 ($R^2=0.13$, F=1.23, p=0.29). Pieces with very large change of arousal from Phase 1 to phase 2 were yet performed with similar (Bho) or even slower (Cha) tempi. Similarly, stronger pulse clarity did not correlate with stronger arousals ($R^2=0.2$, F=2.12, p=0.18).

However, the changes in arousal from phase 1 to phase 2 were well explained by both the changes in event density (correlation: $R^2=0.54$, F=9.72, p=0.014) and attack time (correlation: $R^2=0.55$, F=9.84, p=0.01). Pieces played with more notes (higher density), and a starker articulation (shorter attack time) are perceived as more aroused. Interestingly, contrary to tempo and pulse clarity, neither the change in event density ($R^2=0.2$) not the change in attack time ($R^2=0.2$) appeared correlated with the original valence of the piece, indicating that the performer's choice to manipulate one or the other did not depend on the piece being negative or positive. For instance, Jog, a positive raga, is played with a slower attack time in phase 2 than phase 1 (and undergo an only moderate increase of arousal), while negative ragas like Mal. and Cha. are played with shorter attacks (and undergo large changes of arousal).

In summary, in the context of Indian music, faster music with strong beats does not appear to be perceived as more energetic and aroused, but rather are conventional attributes of positive ragas regardless of their arousal. What makes pieces aroused is the fast rate of notes (higher event density) and their pinched articulation (shorter attack time), and performers appear free to chose this effect on either negative or positive ragas.
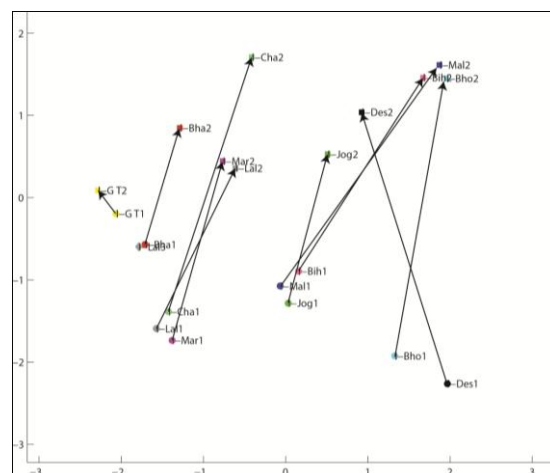

Figure 1: Projection on the 2 principal dimensions of the dim-8 space of frequency ratings (horizontal: valence, vertical: arousal). Ragas postfixed by 1 are performed in P1, 2 are in P2.

Conclusions

Emotional variations within certain ragas were often larger than between ragas. Indian performers have the possibility to strongly vary the expressivity associated with a specific raga by their performances, but with some specific constraints depending upon the ragas.

Keywords

Musical emotions, Ragas, North Indian Classical Music.

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