

What emotions do *raags* evoke? An Internet-based survey of listener responses.

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Raag is the basis of Indian music providing a melodic framework for structured improvisation. Raags are thought to consistently elicit certain emotions, with different raags creating different moods.

We seek to establish whether there is indeed a consistent correspondence between raags and emotions for a diverse group of listeners. Although the connection between raag and emotion has been central to Indian music theory for centuries, there have been almost no empirical evaluations to date. The current work builds on a smaller previous survey by the authors.

We undertook a web-based survey (<http://paragchordia.com/survey/raagemotion2>) in which participants were asked to listen to ten raag excerpts and rate the extent to which each of twelve emotions ('happy', 'sad', 'angry/aggressive', 'awakening/arousing', 'calming/soothing', 'devotional', 'emotional/passionate', 'loving/romantic', 'peaceful', 'powerful/strong', 'restless', 'tender/soft') were evoked by the excerpt. To ensure generalization, several excerpts were used for each raag, and one was chosen randomly for each subject.

A total of 553 subjects participated, making a total 21,377 judgments, where each judgment was the assignment of a score to a particular emotion for a particular raag excerpt. 40.0% of subjects reported having 'no' familiarity with North Indian classical music (NICM), 30.7% 'a little', 15.4% were 'somewhat' familiar, and 9.95% were very familiar.

An ANOVA analysis showed that raag was a significant factor in emotion responses ($p < .001$). Using confidence intervals adjusted for multiple comparisons ($p < .05$), we found that, for many of the emotions, a clear distinction could be made between many raags. Across many emotions, a clustering pattern was evident, with a group of positively valenced raags, Khamaj, Desh and Bageshri, a medium one consisting of Bhimpalasi and Yaman, and a negatively valenced

group with Gujari Todi, Marwa, Shree and Darbari. Certain emotions were found to apply more or less equally to all raags. Almost all raags were considered not 'angry/aggressive' while at the same time most raags were rated highly 'emotional/touching'.

Additionally we found that familiarity with NICM was a significant main effect for many emotions. The general pattern was that 'very' experienced listeners tended to rate the excerpts as more intensely emotional (e.g. more sad or more peaceful) as compared with listeners with little or no prior exposure.

We also found that the highest scoring emotions for a given raag conformed well to traditional descriptions, whether or not the listener was at all familiar with Indian music. For example, Khamaj and Desh were 'happy', 'peaceful' and 'calming', whereas raags such as Darbari, Shree and Marwa were 'powerful', 'sad', 'strong', and 'restless'.

Detailed data and graphs can be found at <http://paragchordia.com/research/>.

We have undertaken a large-scale survey of emotion in raag music and have shown that there are significant differences between the emotions that raags elicit. Broadly it seems that raags cluster according to valence. Informally, there seems to be a clear correspondence, at least for this set of raags, between scale degrees used and valence. Raags that use 'minor' notes such as the m2 and m6 scale degrees are considered negatively valenced, while raags that use 'major' notes tend to be positively valenced, giving further evidence for this cross-culturally observed phenomenon.