
Decolonising Voice Research: The Inclusion of Indian Classical Music

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ABSTRACT: This article presents a narrative literature review on the decolonisation of voice research through the inclusion of Indian Classical Music (ICM). It utilises the Indigenous paradigm to incorporate the experiences of ICM practitioners, recognising their valuable perspectives and knowledge. The review delves into key aspects of ICM: range, vocal registration, and vocal ornamentation and agility. It explores the specific requirements and techniques employed in these areas, shedding light on the unique stylistic elements of ICM. Furthermore, the article examines the common vocal issues faced by ICM singers, considering the impact of these challenges on style and performance. By addressing these issues, the article aims to contribute to the preservation and enhancement of ICM as a distinct vocal tradition. The review emphasises the significance of incorporating ICM research not only for the benefit of the ICM community, but also for the broader voice research community. By integrating ICM into the realm of voice research, scholars may gain a deeper understanding of the diverse range of vocal practices and expand their knowledge base. This inclusivity fosters a more equitable and comprehensive voice research landscape. By embracing the Indigenous paradigm and examining the unique aspects of ICM, researchers can contribute to a more inclusive, diverse, and enriched understanding of vocal traditions and practices.

KEYWORDS: Indigenous research paradigm, diversity in voice research, vocal acoustics, vocal agility, vocal range

INTRODUCTION

Indian Classical Music (ICM) is an ancient oral tradition predominantly taught through the guru-shishya Parampara (GSP) (Banerji et al., 2017; Tiwari, 2011), which translates into “teacher-student tradition”. The training typically begins at

an early age, around six or seven, with the guru guiding the student through basic vocal exercises, advanced repertoire, and professional training. This relationship ideally continues throughout the student's career. Notation or the use of instruments such as a piano for teaching melodies or vocal exercises is minimal in this traditional methodology. The essence of this teaching approach lies primarily in imitation and oral transmission. It also aims to preserve and uphold the lineage or bani/gharana of the student's musical heritage (Radhakrishnan et al., 2011). Given its lineage-based transmission, science-based or evidence-based voice science is minimally applied to instruction in the classroom. The primary focus of ICM is the transmission of vocally authentic style and repertoire rather than functional vocal technique.

As it exists today, ICM encompasses two distinct forms: Hindustani, commonly known as North Indian Classical music, and Carnatic, which represents South Indian Classical music (Radhakrishnan et al., 2011). Both vocal genres share several common characteristics, including the utilisation of an “open-throated” speech quality and bold sound with the prominent use of agility gestures (Arunachalam et al., 2014). Additionally, both styles adhere to the GSP as the primary method of instruction. This paper will discuss the pedagogical approach of voice teaching in South Indian Classical Music (referred to in this paper as ICM). Since the two genres have nuanced stylistic differences, this analysis will focus solely on Carnatic music to ensure adequate depth of exploration.

Thus, this narrative literature review aims to explore the unique demands and challenges faced by singers in Indian Classical Music. Specifically, it will investigate the required vocal range, registers, and ornamentation. The review will also examine the documented issues faced by ICM singers and their implications on the style. It emphasises the need to integrate ICM research into the broader domain of voice research to benefit the ICM community and raise awareness of its distinct needs. The article highlights an underrepresentation of ICM in voice research and aims to highlight ICM as a distinct vocal genre with specific stylistic requirements and challenges. By doing so, this analysis advocates for a more inclusive approach to voice research by integrating genres, styles and cultures of diverse vocal traditions. Moreover, by incorporating ICM into voice research, scholars can gain a deeper understanding of the complexities and nuances within this genre, contributing to a more comprehensive and representative body of knowledge.

METHODOLOGY AND PARADIGM

ICM, a sparsely researched subject within voice pedagogy, has primarily been explored from a clinical perspective, focusing on range, voice issues, and treatment of voice disorders. The lineage-based nature of ICM pedagogy has resulted in a lack of studies on the practical application of voice science in the ICM classroom, as the style, repertoire, and pedagogy are traditionally transmitted from teacher to student.

However, due to the Western-centric nature of voice research, ICM practitioners often question the relevance of voice science to their genre. The ancient oral tradition of ICM prioritises conservatism and preservation to protect the integrity of the genre. Therefore, in this analysis, an Indigenous paradigm is adopted to centre Indian voices and experiences, which is crucial for integrating voice science research into the ICM classroom.

The Indigenous paradigm recognises that many mainstream research paradigms have a Western focus, relegating non-Western paradigms to objects of study rather than co-equals within Western-centric academic institutions (Held, 2019). Consequently, even when studying non-Western subjects, a forced Western perspective prevails, underscoring the need to decolonise knowledge in academia by moving beyond a

purely Western/Euro-centric approach (Held, 2019).

This issue is prevalent in academic research, from the selection of research topics to the publishing process (Avery et al., 2022). Scholars in specialised or non-mainstream areas often face disenfranchisement, as their programs are typically considered less prestigious or top-tier due to mainstream scholars' lack of familiarity with their scholarship and quality (Reid & Curry, 2019). The predominant norms in research and academia often determine what is considered worthy of research and publication, leading to a cycle of exclusion (Avery et al., 2022). For instance, an ICM practitioner may face barriers to entering a research program due to limited knowledge of Western music, sometimes in conjunction with a research program lacking resources for studies and mentorship in ICM. Consequently, this obstructs the progress of scholarly exploration in ICM. The resulting impact also hinders scholars from engaging in research related to ICM, perpetuating a cycle where the research realm inadequately serves ICM practitioners' needs.

Research is influenced by philosophies and values shaped by the prevailing dominant worldview. To bring about change, academia must acknowledge and validate different worldviews that possess equal scholarly value (Held, 2019). As an Indigenous researcher, my aim is to adequately represent the worldviews and experiences of the population being researched. Accordingly, the literature chosen in this narrative literature review included peer-reviewed sources but necessitated the inclusion of non-peer-reviewed sources in the form of blog posts and newspaper articles to highlight ICM practitioner experiences. The Indigenous paradigm allows for both peer-reviewed and non-peer-reviewed sources to be considered equally to highlight the significance of local, community-based experiences in knowledge creation (Jones et al., 2017).

RANGE AND VOCAL REGISTER

This discussion presents the vocal requirements for range and agility within the context of ICM. It is important to recognise that, in practical application, distinctions in voice types and the influence of banis (stylistic lineages transmitted from teacher to student) introduce subtle nuances that are not examined in this discussion.

Current Register Terminology Use

In ICM, a student's comfortable vocal range is determined by their teacher. The teacher selects a tonic or first note within the student's range that allows them to sing four whole steps below the tonic and five whole steps above the eighth note, effectively maintaining a speech-quality vocal registration for a full two octaves. Since ICM is a melodic style rather than a harmonic one, there are no voice parts, and all ragas (modes) and songs are sung within one's sruthi or scale (Arunachalam et al., 2014).

Typically, female ICM singers choose a tonic that lies between F3 and A3 with the most common tonic being G#3, while male ICM singers' tonics fall between B2 and D3 with C#3 being most frequently selected (Venkataraman, et al., 2022). Student experiences indicate that children usually begin with a higher sruthi, A#3, and are expected to lower as their voices become more practiced and their bodies mature. Children are not expected to traverse the full two octaves initially. As they become more comfortable with the swaras (solfege), they progress to exercises focusing on the lower (Mandra Sthayi Varisai) and upper (Tara Sthayi Varisai) octaves, eventually practising with the vowel /a/.

Within ICM teaching methodology, there is little reference to vocal registers. Instead, the emphasis is on achieving a desired vocal sound without explicit instructions on how to achieve it. The voice is encouraged to sound bold, well-projected, connected, and strong, regardless of the vocal range being sung (Venkataraman et al., 2022). It is preferred that no audible register shifts occur, and the voice is expected to approximate the speaking voice with proper lyrical diction. Consequently, the laryngeal position used in ICM is neutral. This could be considered similar to the laryngeal position utilised in Contemporary Commercial Music (CCM) (Chandler, 2014).

The only terminology related to vocal registration used in ICM is the distinction between “normal voice”, “real voice”, or “true voice” versus “false voice”. The term “false voice” may have been derived from the Western classical style and the use of the term falsetto (Narayan, 2014). It is used to describe voices that suddenly shift or crack in registration, resulting in a breathier, thinner, or lighter tone, typically occurring after crossing into the upper range (tara sthayi). The “false voice” is considered to have poor sound quality, considered inauthentic, and its use and practice are discouraged (Narayan, 2014; Viswanathan, 2013).

While traditional teaching methods in ICM have not focused on vocal registers, voice clinicians often encounter strain in the upper range (Venkataraman et al., 2022), which can lead to future vocal injuries if not addressed properly. Without knowledge of the registers being utilised, teachers find it challenging to guide students in phonation techniques that can alleviate strain. ICM teachers often use terms like “real” and “false” to describe desired vocal qualities but rarely explain or teach how to transition between different registers throughout the entire vocal range. Providing students with knowledge that register shifts are natural, normal, and require appropriate navigation can help raise awareness of the importance of developing functional and efficient vocal techniques.

Defining Range and Register Use in ICM

For a female ICM singer, the octave of F3 to A3 – F#4 to A4 (depending on the singer’s chosen tonic) is the main octave used during a song or improvisation with a little less time spent above G#4 or below G#3. The top notes accessed during a performance are between C#5 and E5, and the lowest are D3 and C3, depending on the tonic. If we map the entire range of a female voice whose chosen tonic is G#3, the lowest note in their range most commonly accessed would be D#3, occasionally C#3, and the highest note accessed would be a D#5 (Venkataraman et al, 2022) (Figure 1).

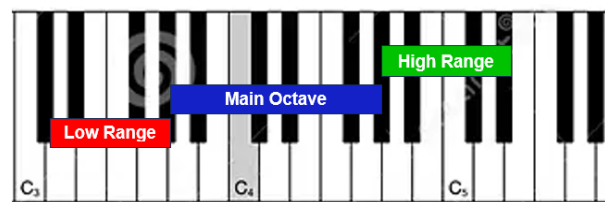


Figure 1. Average Female Voice Range Map – Image from dreamstime.com

According to Titze (1988), D4 is one of the major passaggios for male and female voices, with G3–D4 being the chest register characterised by a rich and bold sound quality. Given Titze’s description of a major passaggio event occurring around D4, it would indicate that about half the range is sung in chest phonation with a passaggio event from the 5th and above up until the A–B, where Chipman (2008) then indicates that there is another transition that follows.

For a male ICM singer, the average chosen tonic is C#3 (Venkataraman et al., 2022). Mapping the octaves in use, the main octave is C#3–C#4 (Figure 2) with the lowest notes reached being

between F#2 and G#2, and the highest being an average of G#4. Since the concept of voice parts does not exist in ICM (Venkataraman et al., 2022) and assuming that most men are baritones (Vennard, 1967), a male singer’s main passaggio event occurs before reaching their octave (around B3–C4) and their second passaggio event would occur as they reach the 4th above the octave (around D4–E4) stopping short of the G4–C5 range that Titze (1988) states where it would be hard to phonate in chest voice, especially for tenors. A male singer’s tonic can vary from a B2 on the low end to a D3 on the high end depending on their comfortable range. Experience teaching male students has demonstrated that the most challenging area for them in terms of technique is maintaining a strong register above a D4–F4 (*secondo passaggio*), depending on their tonic.

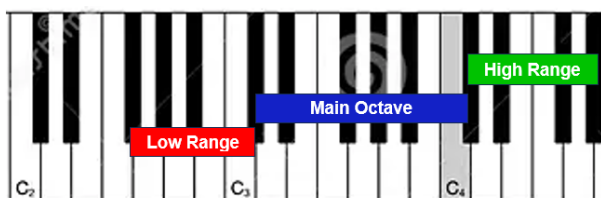


Figure 2. Average Male Voice Range Mapped – Image from dreamstime.com

Herbst et al. (2011) contribute to our understanding of the “grey areas” of vocal registration within the context of Indian Classical Music (ICM). It is assumed that ICM voices employ both membranous medialisation and lateral cricothyroid (LCA) adduction. Above the pitch D#4, the voice must transition to either an abducted chest phonation without LCA involvement or an adducted falsetto, relinquishing thyroarytenoid (TA) medialisation (Herbst et al., 2011). The prevailing “mixed” register commonly used by ICM singers, whether leaning towards an adducted falsetto, an abducted chest voice, or a combination of both, remains unknown. Considering the similarity in phonation techniques, if we assume that the registrations used by Contemporary Commercial Music (CCM) singers are similar to those used by ICM singers, chest and chest mix (abducted chest phonation) are more likely to be utilised than a head mix (Kochis-Jennings et al., 2012). Further investigation to determine the appropriate and effective vocal mix is crucial in establishing a pedagogical standard for vocal registration in ICM.

Concepts from vocal acoustics for ICM could provide a more robust voice teaching technique for ICM practitioners. According to Herbst (2021), only one of the major register

transitions applicable to ICM singers is a laryngeal event (D4–C4) while the other transition higher in the singer’s range (F5–D5) was more influenced by vocal tract resonances. While acoustics and vocal tract resonances are not typically taught, these findings suggest benefits for ICM practitioners. Given the importance of lyrical content and speech-like quality, applying acoustics, especially vowel migration across the range and the dependence of acoustic registration on sung vowels (Bozeman, 2015), might prove useful for navigating the upper range of an ICM singer. For instance, ICM singers’ ranges mapped against Bozeman’s (2015) acoustic registration charts (Figure 3) indicate that for most vowels other than /i/ and /u/, ICM singers employ mostly open and some closed timbre registration. Perceptually, the transition to whoop timbre on /i/ and /u/ would make a singer feel like they were employing head voice (Bozeman, 2015), which is considered undesirable in ICM. However, without completely understanding the acoustics of the vocal tract, singers could belt with poor technique and overlook more efficient, acoustic-based methods of maintaining speech quality in higher notes, such as pharyngeal voice, even on vowels that promote whoop timbre/head voice.

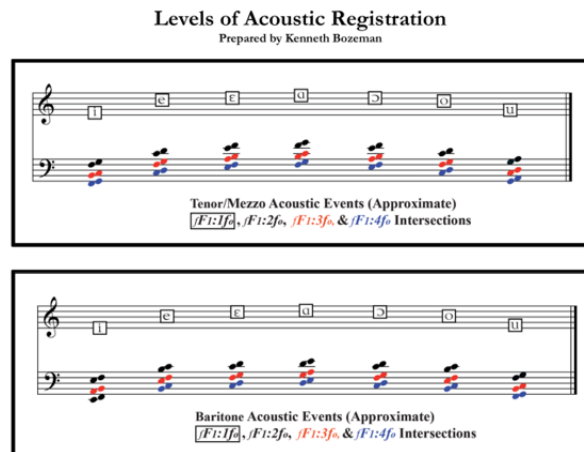


Figure 3. Vowel charts and acoustic events (Bozeman, 2015)

Furthermore, it has been noted that Carnatic singers also do not use Singer’s Formant Cluster (SFC) as described by Bozeman (2015), relying on different means, usually imitated or self-taught, to project their voices (Boominathan, 2004). Boominathan (2004) also states that since Indian singers do not need to project over an entire orchestra, there is no need for the use of SFC; however, the need for a bold sound is emphasised in Carnatic music and an effortless way of finding projection and maintaining connected sound

through a register shift is important to prevent injury and strain (Arunachalam et al., 2014; Venkataraman et al., 2022).

AGILITY AND ORNAMENTATION

While maintaining this potentially heavier vocal fold mass, the voice in Carnatic Music is also required to exhibit fast and precise agility in executing melodic phrases (Radhakrishnan et al., 2011). These agility gestures predominantly utilise the vowel /a/ with limited use of consonants such as /n/ and /r/ and other vowels like /i/ during free-form improvisation known as alapana. In song phrases, certain portions of lyrics are employed, similar to the concept of runs or riffs in Contemporary Commercial Music (CCM). In solfege-based rhythmic improvisation called Kalpana swarams, swaras (musical notes or solfa) are sung at high speeds. They can be sung with a heavier mass, characterised by dips between notes (Radhakrishnan et al., 2011) or with faster, lighter flashes of short note sequences. The latter embellishments are known as brighas, which, in an interesting cross-cultural study by Mani (2019), are compared to gorgie in Italian music.

Another significant ornamentation technique unique to ICM is the gamaka, which encompasses various types. Gamaka refers to the melodic ornamentation that occurs during note transitions within a raga (Rajan et al., 2019). The defining and possibly the most widely used gamaka known as kampita gamaka, involves heavy and wide oscillations while moving between notes that are separated by multiple semitones (Rajan et al., 2019). Most ragas incorporate some form of gamaka. The extent and frequency of gamaka usage varies across different ragas. Some ragas emphasise frequent and pronounced oscillations on almost every note, while others include a higher proportion of straight-tone notes with fewer gamaka transitions. The oscillation between two frequencies in a gamaka can be wide enough to transform the intended frequency of a note, such as the minor third or Ga. Instead of being sustained as a steady straight-tone with the dominant frequency, it is held momentarily as a passing note during a repeated glide between the second (Ri) and the fourth (Ma) (Rajan et al., 2019).

Even when heavy and wide oscillations are not utilised, grace notes and mordents are employed extensively throughout a melodic presentation (Bhuyan et al., 2016). These grace notes, known as anuswarams (hidden notes), are

accompanied by an embellishment technique called nokku, involving small pitch variations on a single note (Bhuyan et al., 2016).

The prevalence of agility gestures as an essential requirement of ICM offers additional insights into optimal laryngeal and acoustic registration. Assuming a typical agility gesture in ICM is characterised by a contraction of the thyroarytenoid (TA) muscles followed by a rapid contraction of the cricothyroid (CT) muscles (Radhakrishnan et al., 2011) and considering a belt as a phonation with adducted chest voice (Herbst et al., 2011), it follows that maintaining a full belt throughout agility phrases may not be feasible. Instead, ICM singers likely employ a mixed registration. Existing literature on CCM (Schutte & Miller, 1993; Rooney, 2016) and laryngeal mechanisms (Herbst et al., 2011) suggests that the voice employed by ICM singers may be equivalent to a blend of speech quality and head register, known as CCM chest mix (Rooney, n.d.). Rooney further posits that this mix aids in smoother register transitions while preserving connectedness. Such a mix aligns with Schutte's description of pop phonation (1993), characterised by lower subglottal pressure and more relaxed vocal folds compared to pop belts, while still belonging to the chest voice category (Schutte & Miller, 1993). To gain a better understanding of ICM registration, it is important to recognise the significant influence of vowels on acoustic registrations (Bozeman, 2019). Considering that ICM singers employ lyrics or solfege during agility phrases and likely prefer an open timbre, the manner in which singers manage different acoustic registrations at high vocal speeds becomes a crucial inquiry, particularly when vowels /i/ and /u/ transition to a whoop timbre one octave lower than other vowels (Bozeman, 2015).

In the realm of vocal agility, acoustic register transitions present a challenging area of navigation for ICM singers. Vibrato serves as an illustrative example of vocal agility, where changes in acoustic registration can impact the maintenance of vibrato rate. Nix and Patinka (2020) suggest that as vibrato passes through a shift in acoustic registration, such as the fundamental or the second harmonic passing through the first resonance of the vocal tract, it becomes difficult to maintain laryngeal muscular stability, thus affecting the ability to sustain a consistent vibrato rate. They attribute vibrato instabilities to inefficient vocal tract tuning.

Applying this understanding to vocal agility in ICM, where fast and agile phrases often span the singer's entire range, it becomes evident that

accomplishing such agility necessitates vocal tract adjustments that simultaneously preserve a connected, speech-like quality, without unintentionally slowing down or audibly displaying a shift in registration. The demand for maintaining both agility and a seamless vocal quality poses a considerable challenge in ICM vocal performances.

The vocal agility required of ICM practitioners extends beyond executing learned phrases. During improvisation, which forms a significant part of ICM training and performance, the singer is expected to improvise at different speeds incorporating ornamentations creatively and authentically to the style. Consequently, singers need to be able to think of notes and create phrases and entire improvisational pieces, executing them with agility immediately and accurately. It is a complex process that may not only happen at the vocal fold level but must incorporate neurological principles as well such as motor-learning theory (Jeffreys, 2006), highlighting new avenues of research that may not be beneficial just for ICM but for several genres that employ melismatic gestures as key features of their style.

VOCAL ISSUES FACED BY CARNATIC SINGERS

The athleticism required of Carnatic singers along with the limited technical instruction applied in a class may contribute to the most common vocal ICM practitioner vocal complaint: reaching and maintaining high notes and vocal fatigue after singing (Venkataraman et al., 2022). Venkataraman et al. (2022) highlight that attempting to produce high notes while maintaining a strong, open-throated voice and without the appropriate application of physiological knowledge is one of the causes of the issue. A solo singer is expected to perform for between 90 to 180 minutes each concert, making fatigue an extremely pressing issue for ICM career longevity. This is highlighted by a study by Devdas et al. (2018) that states that 35.2% of Carnatic singers face career or point prevalence of voice disorders.

A clinical study by Arunachalam et al. (2014) indicates that Carnatic singers who present to clinics for voice-based issues seem to suffer from strain or vocal hyperfunction. The study concludes that the fact that all participants in the study presented with hyperfunction could be indicative of demands of the vocal style and the

potential overuse/misuse of the vocal apparatus. The study also adds that lifestyle choices such as the amount of practice, concert schedules, food habits and overall stress cannot be removed as causes that could further affect the outcome of the study.

Interestingly, several studies (Arunachalam et al., 2014; Boominathan et al., 2021; Devdas et al., 2018) also state that once a vocal disturbance is perceived, Carnatic singers are slower to present themselves to a clinic for diagnosis and treatment than Western singers. The preference is to try home remedies, rest, or, in some cases, practice more in order to build vocal endurance and stamina, further indicating the urgency for ICM teacher education and awareness through research and implementation of vocal techniques relevant to the genre.

Impact on Range

ICM singers' range difficulties (Venkataraman et al., 2022) may be related to the prevalence of hyperfunction in ICM singers. According to Arunachalam et al. (2014), singers who present with hyperfunction show reduced range access in both their upper and lower octaves. ICM singers' working ranges show that they require the ability to traverse two complete octaves comfortably with the flexibility to reach any pitch they desire in order to improvise comfortably. Arunachalam et al. (2014) point out that every Carnatic singer in the clinical voice analysis presented with hyperfunction or muscle tension dysphonia is an alarming fact pointing to more systemic issues in the genre's understanding of vocal use.

Impact on Agility

It is recognised that vocal agility necessitates unencumbered vocal production (Treinkman, 2021). Using vibrato once again as an example, it is understood that achieving a delicate balance within the intrinsic laryngeal muscles is critical for optimal vibrato production (Sundberg, 1994). In cases of hyperadduction or hyperfunction, an elevation in subglottal pressure is required to initiate phonation, often resulting in compensatory mechanisms such as abdominal pulsations attempting to create vibrato or leading to an uncontrolled bleat, both of which are detrimental to vocal agility. Within ICM, which encompasses a diverse repertoire of ornamentations, it becomes evident that an unbalanced state of the intrinsic laryngeal muscles impedes the singer's ability to

execute vocal agility effectively. Moreover, persisting in a hyperfunctional state can initiate a cycle of fatigue, wherein singers exert excessive effort to overcome hyperfunction, ultimately leading to phonotrauma and increased fatigue (Hillman et al., 2020), further exacerbating the challenge of maintaining vocal agility. The detrimental impact of fatigue on the voice has a direct negative influence on vocal speed and agility.

INCORPORATING ICM INTO CURRENT VOICE SCIENCE RESEARCH

The current state of research in ICM reveals several key points that warrant attention and further investigation. While existing studies in ICM focus primarily on clinical aspects and identify the need to address strain and hyperfunction, there is a distinct lack of research on how to effectively address these issues within ICM classrooms. Moreover, most studies conducted on pedagogy and evidence-based techniques are heavily centred around Western genres, including several analysed in this paper (Bozeman, 2015; Herbst et al., 2011; Kochis-Jennings, et al., 2012; Schutte & Miller, 1993; Sundberg, 1994), demonstrating a noticeable gap in research specific to ICM. This necessitates the cross-synthesis of findings from Western-centric studies to bridge the gap and apply relevant scientific knowledge to ICM practices, enabling communication and understanding across genres.

However, the absence of pedagogical research conducted by the ICM community itself further exacerbates the divide between the scientific community and ICM practitioners. The predisposition toward conservatism within the ICM community (Krishna, 2020) often leads to skepticism regarding the applicability of Western-centric scientific findings to their own practices, further alienating them from the scientific community. In alignment with the Indigenous paradigm, it is crucial for the ICM community that the voice research community actively involve singers and participants with diverse singing backgrounds in research endeavours. This inclusive approach not only benefits ICM but also encourages a broader perspective in the wider singing community. ICM has much to offer, including ear training and improvisation, which can enrich the pedagogical practices of other genres.

Furthermore, shedding light on the topic of vocal agility, which seems to be limited within the

broader voice research community, can be achieved by examining the diverse vocal ornamentations found in Indian Classical Music (ICM). The study of ICM's melismatic singing style can provide valuable insights for the development of effective techniques in teaching vocal agility and ornamentation across various genres.

By exploring the ornamentations present in ICM, researchers can uncover valuable knowledge that can be applied to other genres that share similar vocal features. For instance, RnB music exhibits vocal characteristics such as vocal range, register, and melismatic gestures that mirror those found in Carnatic music (Ramakrishna, 2016). Analysing ornamentation and vocal agility in ICM can thus inform the teaching and singing practices of other contemporary genres that incorporate similar stylistic elements. Examining the unique approach to vocal ornamentation in ICM can help researchers expand their understanding of vocal agility and its application in a wider musical context. This cross-genre exploration can contribute to a more comprehensive understanding of vocal performance techniques, benefiting vocalists and educators across musical traditions.

In conclusion, it is essential to prioritise inclusivity in voice research, ensuring the active involvement of singers from diverse backgrounds. This approach not only benefits ICM but also fosters a more comprehensive and inclusive understanding of vocal pedagogy and performance practices across various genres.

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LISTENING LINKS

0:00 – 2:30 highlights the kampita gamaka, faster flashes of notes or akarams and brighas and the lower extension of range -

<https://www.youtube.com/watch?v=NSJKKrchjOA&t=686s>

5:13 – 6:20 highlights the sound qualities of the high range alongside the akarams that traverse a singers entire range - <https://youtu.be/WkjJO-7mSa4?si=wcYx4IGdbtJ1p65c>

6:11- 6:35 highlights the high range of female voices as well as high-speed solfa (swara) pattern in the composition that traverses most of singers' voices -

<https://youtu.be/PXBsT0yBKVo?si=tqgWu17htCHEuPDv>

0:51 – 1:30 showcases a female singer's low range https://youtu.be/Z0-6KRIXvii?si=b6Fo_itZ-IiZIRP7&t=51

BIOGRAPHY

Samyukta Ranganathan is an acclaimed Indian Classical Music (ICM) singer in New York City. She has a Master of Arts in Voice Pedagogy at the Voice Study Centre, University of Wales Trinity St David. Her research comprises ICM registers, vocal ornamentation, and integrating compassion into ICM classrooms to bridge the gap between voice science and the oral tradition. She presented her research on ICM acoustics at the Pan-European Voice Conference in Estonia (August, 2022) and gave a peer-reviewed presentation on transformative methodologies at VASTA's 2023 conference in Mexico. Additionally, she holds a Voice Teacher Training certification from New York Vocal Coaching.