INTONAPHOBIA: A CULTURALLY CONDITIONED DEFICIENCY IN MICROTONAL PERCEPTION AMONG MALAY *GAMBUS* MUSICIANS IN *MAQĀM* TRADITIONS

(Intonaphobia: Kekurangan Persepsi Mikrotonal yang Dibentuk Secara Budaya dalam Kalangan Pemuzik Gambus Melayu yang Tidak Terbiasa dengan Tradisi Maqām)

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Abstract

This article introduces the term *Intonaphobia* to describe a culturally conditioned perceptual deficiency observed among musicians unfamiliar with *maqām*-based musical traditions, particularly those trained exclusively within Western twelve-tone equal temperament systems. The study addresses a persistent challenge faced by these musicians: the difficulty of accurately identifying, internalising, and reproducing microtonal intervals, especially the quarter-tones that are fundamental to the identity of many *maqāmāt*. Drawing on the author's ethnographic and pedagogical experience in teaching oud (*gambus*) performance, as well as empirical findings from performance analyses and interviews with informants; including archival audio material by the late Haji Fadzil Ahmad; this research highlights recurring instances of modal confusion, such as the conflation of Kurd with Bayati, and *Ajam* with *Rast*. The article argues that Intonaphobia is not a form of clinical tone-deafness but rather a perceptual limitation shaped

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by culturally ingrained tonal expectations and aural memory conditioned by tempered tuning systems. By defining and contextualising this phenomenon, the study offers new perspectives for cross-cultural music education, proposes a diagnostic framework for recognising tonal perception biases, and outlines remedial strategies for musicians engaging with non-Western modal traditions.

Keywords: Intonaphobia, microtonality, *maqām* pedagogy, quarter-tone perception, cross-cultural aurality, music cognition

Abstrak

*Artikel ini memperkenalkan istilah asal Intonaphobia bagi merujuk satu bentuk kekurangan persepsi yang terbentuk secara budaya, yang diperhatikan dalam kalangan pemuzik yang tidak terbiasa dengan tradisi muzik berasaskan maqām; terutamanya mereka yang dilatih sepenuhnya dalam sistem talaan tetap dua belas nada (*twelve-tone equal temperament*) Barat. Kajian ini menangani cabaran berterusan yang dihadapi oleh pemuzik ini: kesukaran untuk mengenal pasti, menginternalisasi dan menghasilkan semula selang mikrotonal dengan tepat, khususnya nada suku (*quarter-tone*) yang menjadi asas kepada identiti banyak maqāmāt. Berdasarkan pengalaman etnografi dan pedagogi penulis dalam pengajaran persembahan oud (gambus), serta penemuan empirikal daripada analisis persembahan dan temu bual bersama para informan; termasuk bahan audio arkib oleh Allahyarham Haji Fadzil Ahmad; kajian ini menyoroti kejadian berulang kekeliruan modal, seperti kekeliruan antara maqām Kurd dengan Bayati, serta Ajam dengan Rast. Artikel ini menghujahkan bahawa Intonaphobia bukanlah bentuk tuli nada klinikal, sebaliknya merupakan satu bentuk keterbatasan persepsi yang dibentuk oleh jangkaan tonal yang tertanam secara budaya dan memori pendengaran yang dibentuk oleh sistem talaan tetap. Dengan mentakrif dan mengkontekstualkan fenomena ini, kajian ini menawarkan perspektif baharu dalam pendidikan muzik rentas budaya, mencadangkan satu kerangka diagnostik untuk mengenal pasti bias persepsi nada, serta menggariskan strategi pemulihan bagi pemuzik yang terlibat dalam tradisi muzik mod bukan-Barat.*

Kata kunci: Intonaphobia, mikrotonaliti, pedagogi maqām, persepsi nada suku, auraliti rentas budaya, kognisi muzik

INTRODUCTION

In modal music traditions, such as the Arabic *maqām* system, the identity of a mode is shaped not merely by scalar construction but by a complex interplay of tonal behaviour, melodic contour (*sayr*), and pitch inflection (Touma, 1996; Raja Zulkarnain Raja Mohd Yusof, 2025). Among the most distinctive characteristics of the *maqām* system, particularly in Arabic and Middle Eastern traditions, is the use of microtones, especially quarter-tones (intervals approximating halfway between two semitones). These microtonal intervals are not ornamental or peripheral; they are central to expressing the emotional, spiritual, and cultural character of each *maqām*.

However, among musicians trained exclusively within the Western twelve-tone equal temperament (12-TET) system, a recurring challenge arises: the inability to accurately identify, internalise, or reproduce these non-tempered tones. This perceptual and cognitive limitation often results in modal confusion, for example, rendering *Maqām Bayati* as *Kurd* or mistaking *Rast* for *Ajam*. In such cases, the quarter-tone distinction is either blurred or altogether omitted, resulting in a tonal flattening that compromises the mode's unique expressive identity.

This issue is not limited to cross-cultural encounters but frequently emerges in pedagogical settings where *maqām* traditions are introduced to learners unfamiliar with oral, aural-based transmission. Many students approach *maqām* with tonal expectations conditioned by Western harmony and standardised pitch, making it difficult for them to adapt to the flexible intonational systems found in Arabic, Turkish, Persian, or Malay modal practices. To address this recurring problem, this paper introduces a new term: Intonaphobia.

Coined by the author, *Intonaphobia* refers to a culturally conditioned perceptual deficiency and cognitive bias in which musicians struggle to perceive or reproduce microtonal intervals, especially quarter-tones, due to long-term conditioning within equal-tempered tuning systems. This phenomenon is not synonymous with amusia (clinical tone-deafness) but rather reflects a form of cultural intonational dissonance, wherein one's aural memory and listening habits resist adaptation to unfamiliar pitch systems.

A major issue addressed in this study is the persistent difficulty faced by musicians trained under Western twelve-tone equal temperament systems in accurately perceiving and reproducing microtonal intervals essential to *maqām* performance. This cultural and cognitive limitation often leads to modal confusion, tonal flattening, and the misrepresentation of traditional modal expressions within localised musical practices such as the Malay *gambus* tradition.

Intonaphobia typically manifests in one or more of the following ways:

1. Misidentification of *maqāmāt* with superficially similar intervallic structures (e.g., confusing Bayati [*D–E half-flat–F–G*] with Kurd [*D–E♭–F–G*]);
2. Substitution of the neutral third in *Rast* with a major third, resulting in an *Ajam*-like sound;
3. Inability to retain or reproduce microtonal pitch nuances after listening to them;
4. Flattening or "correcting" intonation to conform with Western pitch centres when reading or transcribing *maqām* melodies.

This article frames *Intonaphobia* not as a personal failing but as a learned auditory bias, one embedded in the epistemological frameworks of Western music education and reinforced through standardised tuning technologies, digital software, and notation systems that omit or simplify microtonality.

Therefore, the objective of this study is to introduce and define the concept of *Intonaphobia* as a culturally conditioned perceptual phenomenon, to analyse its manifestations through empirical data collected from *gambus* practitioners in Johor, and to propose pedagogical and diagnostic strategies for addressing these perceptual challenges in non-Western modal music education.

The author's theoretical framing and empirical evidence draw on a practice-based DCA exegesis (Raja Zulkarnain Raja Mohd Yusof, 2024), which includes audio analysis, ethnographic interviews, and performance documentation involving four informants from Johor, Malaysia. Among these is a recording by the late Haji Fadzil Ahmad, a celebrated *gambus* practitioner whose interpretation of *maqām*-based repertoire provides a critical reference point for understanding how quarter-tones are embodied, localised, and stylistically rendered in Malay musical contexts.

A prime example is found in the *taqsīm* introduction to "*Ramadhan Bulan Mulia*", performed by Haji Fadzil Ahmad. Although he stated that the improvisation was based on *maqām Bayati* (Fadzil Ahmad, 2005), a closer examination of the first nine bars of the performance, transcribed below (see Figure 1), reveals a notable adaptation. In these opening measures, only the *♭2* pitch appears, rather than the expected *½♭2* pitch characteristic of classical *Bayati* (where *½♭2* refers to a note approximately 50 cents lower than a Western minor second, roughly halfway between two piano keys).

This finding suggests a localised interpretation of *maqām* principles, where melodic decisions reflect regional stylistic preferences rather than strict adherence

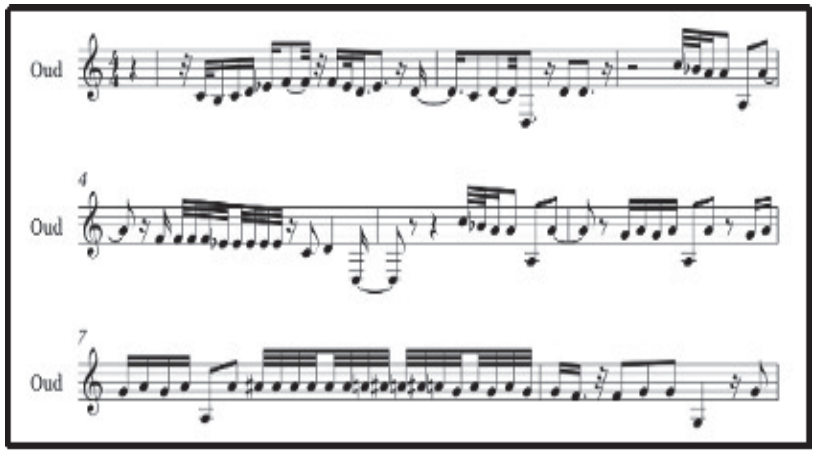

Figure 1 Notated excerpt from Haji Fadzil Ahmad's *taqsīm* introduction to "*Ramadhan Bulan Mulia*".

Source: Fadzil Ahmad. (2005). *Ramadhan Bulan Mulia* [Audio recording]. Personal collection of Raja Zulkarnain Raja Mohd Yusof.

to canonical *maqām* theory. Haji Fadzil's *taqsīm* thus embodies a fluid and context-sensitive rendering of *maqām* Bayati, blending traditional Arab modal aesthetics with a distinctly Malay expressive character.

Informant reflections further illustrate this dynamic process of learning and adaptation. One informant remarked: "I thought he was playing Bayati, but when I tried to follow it, something felt different; it's not the textbook version, but it still sounds right, like it belongs here." Such insights underscore the phenomenon of "detuning the ear," where learners must gradually reorient their aural perception to internalise microtonal inflections that differ from both Western equal temperament and orthodox Arab *maqām* realisations.

Across multiple learning cycles, informants expressed a mix of fascination and frustration. Many described the process as one of "unlearning" in order to appreciate and reproduce the subtle gradations of microtonal intervals. Some informants eventually developed improved microtonal accuracy, particularly after immersing themselves in *maqām* recordings, learning to sing *taqsīm* before attempting it on their instruments and reducing their reliance on visual cues such as fingerboard markers. Instead, some began adopting internal visualisation techniques, including the concept of the "imaginary line" introduced in the author's second *Gambus* book (Raja Zulkarnain Raja Mohd Yusof, 2017), which aids in navigating modal shifts and octave positioning without disrupting the fluid intonation required for *maqām* performance.

These perspectives — archival interpretation, learner reflection, and practice-led experimentation—together illuminate the processes by which quarter-tonal sensibilities are not only transmitted but also localised and re-embodied within the Malay *gambus* tradition.

By introducing and theorising *Intonaphobia*, this study aims to contribute to contemporary discourse in ethnomusicology, cognitive musicology, and intercultural pedagogy. It requires a deeper understanding of how tonal perception is culturally constructed, highlighting the necessity for ear training, pedagogical tools, and diagnostic frameworks that respond to the perceptual realities of musicians engaging with non-Western modal systems.

Background to the Problem

In an increasingly globalised musical landscape where intercultural exchange is common, musicians are often required to engage with modal traditions beyond their tonal training. Yet this engagement reveals a persistent perceptual gap, particularly among performers whose musical education has been shaped exclusively by Western twelve-tone equal temperament systems.

The phenomenon now termed *Intonaphobia* does not arise in isolation. It reflects a longstanding disconnect between musical cultures grounded in tempered tuning systems and those that rely on nuanced, orally transmitted modal frameworks. At the core of this issue is a systemic mismatch between the perceptual habits embedded in Western classical education and the microtonal demands of *maqām*-based traditions. For musicians conditioned within the twelve-tone grid, microtonal intervals — especially quarter-tones — can seem alien, ambiguous, or even dissonant. This is not merely a technical obstacle but a consequence of deeply habituated listening schemas.

Historically, the Western canon has emphasised harmonic progression and vertical chordal structures, often at the expense of modal fluidity and intonational subtlety. Most ear-training curricula focus on major and minor scales, with pitch discrimination exercises centred on semitonal relationships and fixed pitch centres. Such pedagogies reinforce auditory schemas that resist deviation from equal temperament, making the acquisition of microtonal sensitivity challenging for those stepping outside the Western system. In contrast, the *maqām* system relies heavily on pitch inflections, expressive intonation, and an embodied familiarity with modal behaviour, components that are not easily conveyed through Western notation or theoretical abstraction.

This perceptual divide becomes especially pronounced when students encounter *maqāmāt* with superficially similar scalar outlines but distinct microtonal characters. For instance, *Maqām Bayati*, notated as *D–E* half-flat–*F–G*, is often confused

with *Maqām* Kurd (*D–E♭–F–G*) due to difficulty distinguishing the half-flat from the flattened second. Similarly, *Maqām Rast*, which employs a neutral third (*E half-flat*) over C, is frequently rendered with a major third (E natural), thereby unintentionally evoking the *Ajam* scale, the Arabic equivalent of the Western major scale. These are not isolated performance errors; they represent systematic modal misidentification rooted in perceptual conditioning.

What exacerbates this issue is the lack of immersive *maqām* exposure in formal music education, particularly outside the Arab, Turkish, or Persian worlds. In many conservatories or hybrid music programs, *maqām* instruction is often limited to theoretical overviews, lacking embodied, oral, or aural transmission. Students may be able to name the pitches of a *maqām* yet struggle to perform them convincingly due to aural memory conditioned by Western pitch structures.

In the author's teaching practice, such tendencies have been repeatedly observed. While students could imitate finger placements when guided, they often reverted to tempered approximations of the intended tones. Even after repeated exposure to *maqām* audio examples, many learners defaulted to the closest familiar pitch. This suggests that the barrier is not simply mechanical or mnemonic, but cognitive and perceptual, rooted in internalised tonal frameworks that govern how pitch is heard, understood, and reproduced.

Despite growing research into cross-cultural music cognition and global music pedagogy, no specific term has been coined to describe this kind of systemic perceptual limitation, one shaped by cultural tuning expectations and manifested in modal misidentification. This study introduces the term *Intonaphobia* to fill that conceptual gap: first, as a way to name and characterise a culturally conditioned auditory bias, and second, as a diagnostic lens for educators and researchers working to address cross-cultural perceptual challenges in music training.

The following section presents empirical evidence drawn from the author's Doctor of Creative Arts (DCA) exegesis, including case studies, pitch analysis, and informant reflections that reveal recurring patterns of intonaphobic behaviour in *gambus*-based *maqām* performance.

LITERATURE REVIEW

Cultural Conditioning and Aural Memory

The relationship between cultural conditioning and auditory perception has been extensively explored in music cognition literature. Krumhansl (1990) and Sloboda (2005) argue that tonal expectation frameworks are shaped through long-term exposure to specific tuning systems, primarily the Western twelve-tone equal temperament

(12-TET) system. More recent studies affirm this perspective: Tervaniemi and Brattico (2020) review the profound influence of cultural environments on pitch perception, indicating that musical enculturation affects not only musical preferences but also the cognitive categorisation of intervals. Feld's (1984) anthropological exploration of "sound structure as social structure" further emphasises that musical hearing is a socially constructed phenomenon rather than a biologically fixed one. Similarly, Shannon (2019) emphasises the challenges musicians face when adapting their ears to new cultural contexts, underscoring the entrenched nature of aural schemas formed by early musical experiences.

Microtonality, *Maqām*, and Performance Practice

The role of microtonality in non-Western modal traditions, particularly the Arabic *maqām* system, has been foundationally discussed by Touma (1996) and expanded by Racy (2003). However, recent contributions deepen this understanding within contemporary pedagogical and performance contexts. Marcus (2020) proposes a cognitive approach to modal music, emphasising that *maqām* learning involves acquiring new perceptual habits that are not easily mapped onto Western-trained auditory systems. In terms of practical challenges, Bejjani (2022) addresses the difficulties of integrating *maqām*-based aural skills into Western-oriented educational structures, while Elsherif (2021) highlights the microtonal challenges modern Arab musicians face when navigating between tradition and contemporary musical expectations. Racy (2022) adds a performance-based perspective, demonstrating how quarter-tone aesthetics are internalised differently across cultural settings, even among seasoned oud players.

Cross-Cultural Listening and Schema Conflict

Schema theory, as discussed by Bartlett (1932) and applied to music by Stevens (2004), suggests that individuals interpret musical stimuli through pre-existing cognitive frameworks. This idea aligns with recent empirical findings by Polak (2021), who demonstrates how even micro-timing and subtle-pitch inflections are interpreted across different cultural backgrounds. In a broader review, Trehub (2003) and Huron (2006) point out that listeners tend to "normalise" unfamiliar musical inputs according to their internalised expectations. This is especially relevant for

musicians engaging with modal systems that rely on microtonal subtleties, where defaulting to semitone-based approximations leads to perceptual distortion.

Research Gap

While prior studies have explored microtonal perception, cultural conditioning, and challenges in cross-cultural music education, a significant gap persists in the literature: no existing research has formally defined or theorised a culturally conditioned perceptual bias, such as *Intonaphobia*, particularly among musicians transitioning into *maqām*-based traditions from Western musical backgrounds. Moreover, although existing scholarship has acknowledged the pedagogical difficulties inherent in *maqām* instruction, systematic empirical studies focusing on Malay *gambus* practitioners' engagement with microtonal intervals, especially within a localised, non-Arabic cultural setting, remain virtually absent. This omission leaves a critical blind spot in understanding how *maqām* principles are internalised, misinterpreted, or adapted in regional traditions such as the *gambus* music of Johor. This study addresses that lacuna by formally introducing the term *Intonaphobia*, grounding it in both established theoretical frameworks and empirical data collected through fieldwork with *gambus* musicians in Johor, Malaysia. By doing so, it not only defines a new diagnostic concept but also contributes original insight into the aural and pedagogical realities of modal music transmission beyond the Arab world.

METHODOLOGY

Understanding *Intonaphobia*, a culturally conditioned perceptual deficiency in recognising or reproducing microtonal intervals, requires a multidisciplinary lens that integrates music cognition, ethnomusicology, and cross-cultural pedagogy. This section outlines the theoretical foundations that inform the coining, framing, and interpretation of this auditory phenomenon.

Cultural Conditioning and Tonal Expectation

Tonal expectation plays a central role in shaping how musicians interpret and respond to pitch relationships. As demonstrated by Krumhansl (1990) and further elaborated in studies on culturally specific listening habits (Stevens, 2004), individuals internalise the tonal systems in which they are immersed. Musicians trained exclusively in the Western 12-tone equal temperament (12-TET) system tend to develop an aural

framework that privileges semitone-based intervals and diatonic harmony. When confronted with microtonal intervals such as quarter-tones (approximately 50 cents), they often experience auditory ambiguity or cognitive resistance, as these intervals fall outside their conditioned tonal schema.

Modal Systems and Microtonality in the *Maqām* Tradition

The Arabic *maqām* system is a sophisticated modal framework that relies on nuanced microtonal inflections to convey the emotional and cultural identity of each mode (Touma, 1996). *Maqāmāt*, such as *Bayati*, *Rast*, and *Saba*, employ intervals that lie between the semitones of the Western scale: neutral seconds, half-flats, and three-quarter tones. These inflections are not merely theoretical; they are embodied through oral transmission and sustained listening (Racy, 2003). Students unfamiliar with these tonal subtleties often struggle to differentiate between modes with superficially similar scalar shapes but distinct intonational behaviours, for example, *Bayati* versus *Kurd* or *Rast* versus *Ajam*.

Aural Perception and Enculturation

Aural perception is shaped more by cultural enculturation than biological determinism. Feld (1984), in his "Anthropology of Sound," emphasised that musical hearing is socially and culturally constructed. Similarly, Oliveros (2005) proposed the concept of deep listening, highlighting that perception is a learned and intentional act involving attentiveness, memory, and internalised sonic models. From this perspective, difficulty in perceiving microtones is not an innate deficiency but a reflection of how pitch categories are culturally reinforced. The perceptual range of the ear narrows to accommodate the dominant musical logic of a given cultural system.

Coining Musical Syndromes: From Amusia to Intonaphobia

Music cognition research has long employed diagnostic terms, such as amusia, to describe clinical impairments in pitch recognition (Peretz, 2003). However, *Intonaphobia* diverges from this model. It is not a neurological condition but a culturally acquired auditory bias shaped by prolonged exposure to tempered tuning systems. Naming this phenomenon serves both analytical and pedagogical purposes. Similar to the broader experience of auditory dissonance felt by Western-trained musicians when confronted with unfamiliar tuning systems (Feld,

1984; Krumhansl, 1990), *Intonaphobia* captures the discomfort, resistance, or perceptual disorientation that arises when engaging with modal systems that rely heavily on microtonal nuance.

By framing *Intonaphobia* within these interconnected theories of tonal expectation, perceptual schema, and cultural conditioning, this study extends current models of musical cognition into the realm of intercultural pedagogy, highlighting a gap in how microtonal limitations are theorised, named, and addressed in cross-cultural learning environments. These theoretical insights set the stage for the following sections, which examine how such limitations are encountered and negotiated by real-world practitioners of Malay *gambus* music.

ANALYSIS AND DISCUSSIONS

The research adopted a practice-led and ethnographic methodology, focusing on how informants encountered, internalised, and attempted to reproduce modal pitch materials. Participants were introduced to a curated repertoire of *maqāmāt*, including *Ajam*, *Nahawand*, *Rast*, *Kurd*, *Bayati*, *Hijaz*, *Saba*, and *Sikah*, through a combination of oral transmission (demonstration, repetition, and singing) and visual tools (transcriptions, pitch diagrams, and fingerboard overlays).

This research was conducted under the Doctor of Creative Arts (DCA) program at the National Academy of Arts, Culture & Heritage (ASWARA) between 2022 and 2023. Fieldwork involved four Malay *gambus* players from Johor, Malaysia; Ahmad Hussein al-Habshee (Muar), Shafiq Awang (Johor Bahru), Wan Muhamad Izzatul Hafiz (Johor Bahru), and Zaidan Attan (Batu Pahat); as well as a performance recording by the late Haji Fadzil Ahmad (Muar), a seminal figure in Johor's *gambus* tradition. Participants ranged in age from early 30s to late 70s and represented a spectrum of musical backgrounds, including traditional *Hadrami*-style *gambus*, Western classical guitar, and formal institutional training in Malay music performance.

Sessions took place at private homes in Muar and Kuala Lumpur, with data collection conducted through informal interviews, audio-video documentation, and field-based observations. Rather than incorporating structured visual tools such as fingerboard overlays or pitch diagrams during instruction, the analysis focused on interpretive reflections and performance behaviours observed throughout the learning process. Notably, the author's concept of the "imaginary line" (Raja Zulkarnain Raja Mohd Yusof, 2017) served as a mental framework to describe how participants navigated modal shifts and octave positioning, highlighting the role of internalised visual strategies in aiding microtonal differentiation from tempered intonation.

Case Study 1: Modal Confusion between Bayati and Kurd

In multiple recorded sessions, *Maqām Bayati* (*D–E half-flat–F–G*) was consistently misrendered as *Kurd* (*D–E♭–F–G*), particularly during improvisation (*taqsīm*) and ornamental passages. Despite repeated exposure to the distinct half-flat interval via live demonstration and curated recordings, informants defaulted to *E♭*, reflecting a perceptual compression of microtonal nuance into a familiar semitone (Figure 2).

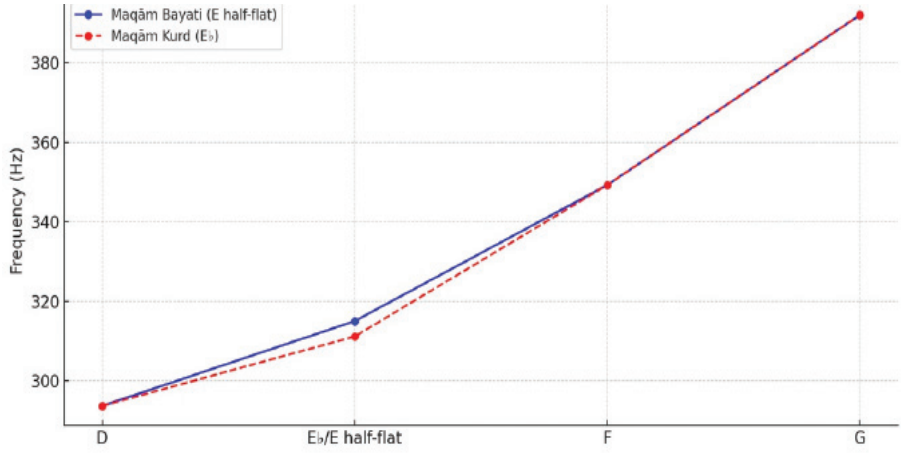

Figure 2 Pitch contour comparison between *Maqām* Bayati (E half-flat ~315 Hz) and *Maqām* Kurd (E□ ~311 Hz). The subtle difference in the second scale degree, though minor in pitch, results in a distinct modal identity and emotional effect.
Source: Raja Zulkarnain Raja Mohd Yusof (2025).

> "During the taqsīm, I couldn't really feel the E half-flat. I kept slipping into E♭. *It* just sounded closer to what I know from minor scales."
> — Informant A, *Gambus* musician with a Western ear-training background

> "I had listened to Bayati many times, but when I played it, I instinctively went to E♭. *It took several takes before I could internalise the quarter-tone.*"
> — Informant C, *Gambus* improviser from Muar

This pattern was especially pronounced among informants with institutional music training where *maqām* was not part of the formal curriculum. Responses such as "*It just sounds like E♭ to me*" or "*I couldn't tell it was different*" pointed not only to technical unfamiliarity but to deeper tonal conditioning shaped by tempered ear-training schemas.

Analysis

The consistent misidentification of *Bayati* as *Kurd* supports the conceptualisation of *Intonaphobia* as a perceptual deficiency rather than a lack of technical ability. It illustrates how culturally conditioned auditory schemas can override new pitch categories, resulting in a cognitive flattening of microtonal distinctions. This phenomenon also highlights the limitations of passive listening exposure alone; despite repeated demonstrations, without active auditory recalibration strategies, the perceptual templates remained resistant to microtonal adaptation.

Case Study 2: Rast Misinterpreted as Ajam

Maqām Rast (*C–D–E half-flat–F–G*) posed another perceptual hurdle, with informants often playing the third scale degree (E) as a natural major third. The modal character of *Rast*, which hinges on the neutral third, was repeatedly neutralised, rendering the passage indistinguishable from *Ajam*, the *maqām* equivalent of the Western major scale.

To better visualise this phenomenon, a pitch contour comparison was conducted between *Maqām Rast* and *Maqām Ajam* in Figure 3.

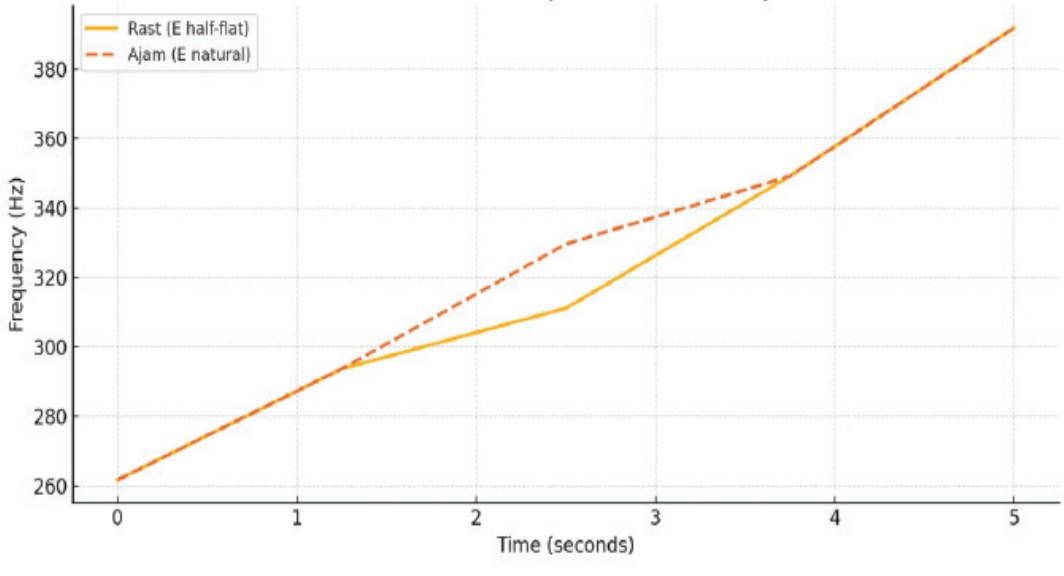

Figure 3 Pitch contour comparison between *Maqām Rast* and *Maqām Ajam*.
Source: Raja Zulkarnain Raja Mohd Yusof (2025).

As seen in the pitch contour graph, the third scale degree (*E*) in *Maqām Rast* falls at approximately 311 Hz, closer to a neutral third, whereas in *Ajam*, it aligns with a standard major third at ~330 Hz. This slight variation is critical to distinguishing the two *maqāmāt* aurally, yet students unfamiliar with quarter-tones often default to the more familiar E natural, unintentionally neutralising *Rast's* distinctive flavour.

This confusion between *Rast* and *Ajam* often stems from deeply ingrained tonal expectations shaped by Western musical training. As one informant explained:

> "I thought I was playing *Rast* correctly, but it sounded 'too happy.' I later realised I had defaulted to the major third because that's what my ear is used to. The quarter-tone in Rast doesn't 'sit' in my aural memory the same way."
> — Informant B, *gambus* player from Batu Pahat, Johor

Another participant, with a background in classical guitar, echoed this tonal slippage:

> "When I play from instinct, my fingers go to E natural. Only after a few listens to the original recording did I notice that the mood was different, more grounded, not as bright."
> — Informant D, *gambus* improviser trained in Western electric guitar

These reflections reinforce the pitch contour data and provide insight into how *Intonaphobia* manifests in real-world contexts, not as a failure of skill, but as a culturally conditioned perceptual bias.

Even after sustained exposure and correction, some informants continued to default to the major third, suggesting that internalised pitch templates from equal temperament remained dominant. Microtonal reproduction began to improve only after rigorous aural conditioning, which involved vocal exercises, call-and-response dictation, and extensive listening.

Analysis

This case further demonstrates how tonal expectation biases, conditioned by Western tuning exposure, can subtly but consistently override intended modal character. Despite being introduced to the theoretical structure of *Rast*, informants' aural memory prioritised the more familiar sound of the major third. The challenge was not in finger positioning alone but in perceptually hearing the neutral third as a distinct pitch entity.

The findings underscore the necessity for remedial aural training exercises, such as vocalisation of *maqām* intervals, slow melodic dictation, and immersive listening, rather than relying solely on instrumental fingering corrections. Developing new internal pitch schemas appears essential for overcoming *Intonaphobia* in modal music contexts.

Informant Reflections and Learning Trajectories

Across multiple learning cycles, informants shared both fascination and frustration as they navigated the challenges of microtonal music. Many described the learning process as one of "unlearning" previous tonal systems, with a specific focus on the difficulty of perceiving and reproducing microtonal intervals.

Several informants reported that immersion in *maqām* recordings and vocalising *taqsim* (instrumental improvisation) before attempting it on their instruments helped refine their microtonal accuracy. This approach, alongside reduced reliance on visual cues (e.g., fingerboard markers), led to gradual improvement. However, some informants continued to face challenges in mastering the subtleties of microtonal intonation, especially when performing live.

Diagnostic Indicators of Intonaphobia

From these case studies, a number of recurring behavioural indicators emerged that substantiate the theorisation of *Intonaphobia* as a culturally conditioned perceptual limitation:

1. Persistent confusion between *maqāmāt* with superficially similar scalar structures.
2. Inconsistent microtonal rendering across repeated attempts or phrases.
3. Verbal rationalisation of incorrect intervals using Western tonal language.
4. Overreliance on visual/fretboard orientation rather than aural recall.
5. Resistance to accepting quarter-tones or half-flats as valid pitch categories.

These indicators suggest that *Intonaphobia* operates not only at the cognitive level (aural schema, tonal expectation) but also at the somatic level (muscle memory, gestural instinct), ultimately shaping how informants perceive, anticipate, and perform in modal frameworks.

Theoretical Discussion and Implications

The phenomenon of *Intonaphobia* can be understood through several theoretical frameworks, ranging from cognitive musicology to intercultural music perception. This section contextualises *Intonaphobia* within these frameworks, drawing on existing literature to shed light on how culturally conditioned auditory biases influence musicians' interactions with unfamiliar musical systems, particularly those employing microtonality.

Cognitive Musicology and Aural Memory

Cognitive musicology recognises the critical role of aural memory in music perception, particularly tonal memory, the ability to recall and recognise pitches, intervals, and melodic contours (Sloboda, 2005). Musicians trained in Western equal temperament develop deeply ingrained tonal expectations shaped by the standardised semitone intervals of the twelve-tone system. When juxtaposed with non-Western tunings, this can produce a sense of perceptual dissonance.

Intonaphobia aligns with the concept of tonal expectation in cognitive musicology, whereby the brain anticipates semitone intervals and resists integrating unfamiliar microtones. This expectation acts as a perceptual filter, limiting the perception and reproduction of non-tempered intervals. As Huron (2006) explains, listeners tend to hear what they expect; when exposed to unfamiliar tonal systems, the brain often fills in the gaps with familiar intonations, rendering the nuances of microtonality imperceptible.

In the case of *Intonaphobia*, the tonal bias created by Western-tempered training prevents students from accurately perceiving or internalising the subtle quarter-tones characteristic of *maqāmāt*. As observed in the empirical data, students often default to semitone-based perceptions, misinterpreting the E *half-flat* of *Bayati* as the more familiar E natural or the natural third of *Rast* as a major third. This is not a case of tone-deafness but rather a deeply embedded cognitive and perceptual limitation shaped by cultural conditioning.

Schema Theory and Cross-Cultural Listening

Schema theory offers a valuable lens for understanding how musicians interpret musical information based on prior exposure and learning. Schemas are cognitive frameworks that help individuals organise and process information drawn from accumulated experiences (Bartlett, 1932). In music, schemas shape how musicians perceive scales, modes, and intervals.

For Western-trained musicians, the schema of the equal-tempered scale dominates their auditory framework, strongly influencing pitch perception and instrument tuning. While highly effective within Western music, this schema becomes inadequate when confronted with microtonal systems such as the Arabic *maqām* tradition.

Intonaphobia represents a conflict between the existing schema of Western temperament and the new schema required to process *maqāmāt*. When students first encounter microtonal systems, they often attempt to map unfamiliar intervals onto familiar Western tonal frameworks, resulting in errors in identification and reproduction. These cognitive schemas, shaped by cultural and musical exposure, thus create a barrier to cross-cultural musical engagement.

Studies in cross-cultural music cognition (Trehub, 2003) support this, showing that musicians trained in Western traditions may struggle to restructure their tonal schemas to accommodate non-tempered intervals, leading to performance inaccuracies. *Intonaphobia*, therefore, can be interpreted as the cognitive manifestation of unresolved schema conflict.

Pedagogical Implications

Recognising *Intonaphobia* as a distinct phenomenon carries significant implications for music pedagogy, particularly in the teaching of non-Western music traditions. Existing pedagogical approaches often overlook the perceptual challenges faced by Western-trained students when encountering microtonal modes. As such, there is a need for targeted remedial strategies and ear-training methods that address the difficulties of tuning and interval recognition in modal systems, such as *maqāmāt*.

Active listening exercises, such as transcription or singing of *maqāmāt* prior to instrumental practice, can help reinforce the perception of quarter-tones. Vocalisation techniques, where students sing microtonal intervals before attempting them on their instruments, may also help develop the aural flexibility needed for accurate reproduction.

Visual aids could further support this process. For instance, customised fingerboard or pitch diagrams for instruments like the oud (*gambus*) may help students visually map microtonal intervals. Given that many Western-trained musicians rely on semitone-based visual references, culturally relevant visual tools can bridge the gap between theory and practice, supporting the development of new perceptual schemas.

Implications for Future Research

The conceptualisation of *Intonaphobia* opens several avenues for future research. Empirical studies are needed to investigate the prevalence of this phenomenon

among musicians from various musical backgrounds. Longitudinal research could evaluate the effectiveness of different pedagogical interventions in helping students overcome *Intonaphobia*.

In addition, neurocognitive research could investigate how the brain processes microtonal versus tempered intervals. What role does neuroplasticity play in adapting to unfamiliar tuning systems? Cognitive neuroscience may shed light on the biological mechanisms behind the difficulty Western-trained musicians face when encountering new tonal paradigms.

Finally, the broader implications of *Intonaphobia* underscore the need for an expanded vocabulary in music education and *ethnomusicology* to describe perceptual challenges rooted in cultural conditioning. The term *Intonaphobia* provides a foundation for the development of diagnostic tools and interventions that can be applied across diverse educational and research contexts.

Reflection

Intonaphobia highlights an important intersection of cognitive musicology, ethnomusicology, and pedagogy. By identifying this perceptual limitation, the paper provides a conceptual framework for understanding how cultural conditioning shapes musical perception and performance. Addressing *Intonaphobia* in educational settings may not only enhance cross-cultural musical fluency but also deepen our understanding of the intricate relationship between culture, cognition, and sound.

Discussion

The phenomenon of *Intonaphobia*, introduced in this study, can be interpreted as a cognitive and perceptual manifestation resulting from cultural conditioning toward Western-tempered tuning systems. The empirical findings collected from the informants reveal a systematic tendency to assimilate microtonal *maqām* intervals into familiar semitone structures, leading to modal confusion, such as between *Bayati* and *Kurd*, and *Rast* and *Ajam*.

According to theories of aural memory and tonal expectation (Huron, 2006; Krumhansl, 1990; Sloboda, 2005), long-term exposure to a fixed-pitch system, such as twelve-tone equal temperament (12-TET) forms deeply structured listening schemas. These schemas cause listeners to anticipate and mentally "fill in" tonal gaps based on their familiar system, blurring or rejecting microtonal intervals that do not conform to existing expectations. In this context, the informants' inability to accurately identify or reproduce the half-flat second in *Bayati* or the neutral third in *Rast* is a direct consequence of learned auditory biases.

Moreover, schema theory, as proposed by Bartlett (1932) and further developed in cross-cultural musical studies by Stevens (2004) and Tervaniemi and Brattico (2020), supports these observations. Informants automatically mapped microtonal intervals into familiar Western tonal frameworks, not through conscious decision-making, but as an unconscious perceptual strategy. This reflects the mind's need to impose coherence in unfamiliar auditory environments.

Data drawn from transcriptions, pitch contour analyses, and interviews further reveal that even after repeated exposure to authentic *maqām* recordings and microtonal vocal training, informants tended to revert to Western-tempered approximations, especially during spontaneous improvisation. This suggests that overcoming *Intonaphobia* requires not only cognitive understanding but also the deep restructuring of long-term aural memory through neuroplastic processes (as suggested by Peretz, 2003).

In addition, comparisons with Racy's (2022) findings on modal improvisation and expressive intonation in Arab music indicate that even experienced *maqām* practitioners develop microtonal flexibility through intensive oral immersion and traditional learning methods. This type of training is generally absent in Western conservatory-style education in Malaysia, which heavily emphasises tempered systems.

Locally, the documentation of Haji Fadzil Ahmad's *taqsīm* in Malay *gambus* performance demonstrates how Arab *maqām* principles have been localised, resulting in a hybrid form of microtonality. This reinforces the idea that intonational perception is not static but dynamic and context-sensitive, shaped by cultural interaction and adaptation.

Intonaphobia, as evidenced in this study, represents a form of cultural *auditory dissonance* — a cognitive tension between entrenched tonal expectations and unfamiliar microtonal realities that resist assimilation into dominant auditory schemas. This dissonance underscores the urgent need for remedial pedagogical strategies in music education. These should include immersive *maqām* listening modules, targeted *vocalisation exercises* for internalising microtonal intervals, and the use of *visualisation techniques*, such as the "imaginary line" concept (Raja Zulkarnain Raja Mohd Yusof, 2017), to aid in navigating modal intonation without reliance on tempered pitch references.

CONCLUSION

This article has introduced *Intonaphobia* as a novel conceptual lens for understanding a perceptual limitation frequently encountered by musicians trained in Western equal temperament systems when engaging with non-Western modal frameworks, particularly those that employ microtonality, such as the *maqām* system. By defining

and diagnosing this culturally conditioned phenomenon, the study underscores the profound influence of tonal training and aural conditioning on musical perception and performance.

Rather than representing a form of *amusia* or clinical tone-deafness, *Intonaphobia* is best understood as a learned perceptual bias, one that resists the accurate hearing and reproduction of intervals outside the Western twelve-tone equal temperament. This resistance, reinforced through prolonged exposure to Western tonal structures, often results in modal confusion and the flattening of microtonal nuances within *maqāmāt*. It is a cognitive and cultural phenomenon, not a matter of individual technical deficiency.

Drawing on ethnographic insights and empirical data from the author's teaching experiences, this study has illuminated specific examples of modal misidentification, such as the conflation of *Bayati* with *Kurd* or *Rast* with *Ajam*, that typify the manifestation of *Intonaphobia* among students unfamiliar with quarter-tone systems. These recurring patterns reveal a clear need for targeted pedagogical responses that prioritise perceptual recalibration and microtonal literacy.

The theoretical implications of *Intonaphobia* are far-reaching. Rooted in cognitive musicology, schema theory, and cross-cultural music perception, the concept challenges the notion of universal hearing by illustrating how cultural listening habits deeply shape musical cognition. Musical perception, as argued here, is not only a product of acoustics or physical hearing mechanisms but also enculturation and training. This reinforces the value of culturally situated frameworks when examining how musicians hear, interpret, and reproduce music.

From a pedagogical perspective, recognising *Intonaphobia* reshapes how educators approach non-Western music instruction. Students' difficulties with microtonality must be understood not as a lack of skill or musical aptitude but as a result of entrenched tonal expectations. As such, music educators can adopt remedial strategies that blend ear-training, vocalisation, and active listening exercises. These techniques not only train the ear but also rebuild perceptual schemas, opening students up to new tonal systems. Tools such as quarter-tone solfège, *maqām* transcription tasks, and culturally relevant visual aids can support this recalibration.

Looking forward, further research is essential to deepen our understanding of *Intonaphobia* and its broader implications. Neurocognitive studies could investigate how the brain processes microtonal intervals and explore the role neuroplasticity plays in adapting to unfamiliar tonal systems. Longitudinal pedagogical studies would also be valuable in evaluating the efficacy of different intervention strategies over time, especially in diverse educational and cultural contexts.

Ultimately, *Intonaphobia* is not only a concept relevant to musicians working within the *maqām* tradition; it offers a critical insight into the broader mechanisms by which cultural conditioning shapes auditory perception. Addressing this perceptual barrier is key to fostering richer cross-cultural musical exchanges, expanding the scope of music education, and encouraging more inclusive ways of listening and learning. In naming and exploring this phenomenon, we take a step toward bridging musical worlds and cultivating deeper, more empathetic modes of musical understanding.

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DATA AVAILABILITY STATEMENT

The author confirms that the data supporting the findings of this study are available within the article.

DECLARATIONS

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REFERENCES

Bartlett, F. C. (1932). *Remembering*: *A study in experimental and social psychology*. Cambridge University Press.

Elsherif, M. A. (2021). Microtonality in contemporary Arab music: Between heritage and innovation. *Middle Eastern Studies, 57*(4), 569–586.

Fadzil Ahmad. (2005). *Ramadhan bulan mulia* [Audio recording]. Personal collection of Raja Zulkarnain.

Feld, S. (1984). Sound structure as social structure. *Ethnomusicology*, *28*(3), 383–409. https://doi.org/10.2307/851460

Huron, D. (2006). *Sweet anticipation: Music and the psychology of expectation*. MIT Press.

Krumhansl, C. L. (1990). *Cognitive foundations of musical pitch*. Oxford University Press.

Marcus, S. (2020). The Maqam phenomenon: A cognitive approach to modal music in the Middle East. Ethnomusicology, *64*(1), 1–28.

Oliveros, P. (2005). *Deep listening: A composer's sound practice*. iUniverse.

Peretz, I. (2003). Listening to the brain: A biological perspective on musical emotions. *Trends in Cognitive Sciences*, *7*(6), 359–361. https://doi.org/10.1016/S1364-6613(03)00161-6

Polak, R. (2021). *Microtiming and form in African percussion music*. Frontiers in Psychology, 12, 675210.

Racy, A. J. (2003). *Making music in the Arab world*: *The culture and artistry of Tarab*. Cambridge University Press.

Racy, A. J. (2022). Modal improvisation and expressive intonation in Arab music: New insights from traditional practice. *Journal of the Society for Ethnomusicology*, *66*(3), 359–380.

Raja Zulkarnain Raja Mohd Yusof. (2017). *Gambus*: *Spesifikasi dan cara bermain*. Dewan Bahasa dan Pustaka.

Raja Zulkarnain Raja Mohd Yusof. (2024). *Taqsīm and maqāmāt: Enhancing taqsīm improvisation performance through a structured formula based on Arab music practice and theory, and the use of alternative maqāmāt in popular gambus songs in Johor.* [Doctoral exegesis, National Academy of Arts, Culture & Heritage [ASWARA], Malaysia].

Shannon, R. (2019). *Retuning the ears: Intercultural music education and tuning systems*. International Journal of Music Education, *37*(4), 587–602.

Sloboda, J. A. (2005). *Exploring the musical mind*: *Cognition, emotion, ability, function*. Oxford University Press.

Stevens, C. (2004). Cross-cultural studies of musical pitch and time. *Acoustical Science and Technology*, *25*(6), 433–438. https://doi.org/10.1250/ast.25.433

Tervaniemi, M., & Brattico, E. (2020). *Cultural influences on musical pitch perception*: *A review*. Frontiers in Psychology, *11*, 558541.

Touma, H. H. (1996). *The music of the Arabs* (L. Schwartz, Trans.). Amadeus Press.

Trehub, S. E. (2003). The developmental origins of musicality. *Nature Neuroscience*, *6*(7), 669–673.