Exploring Extended Techniques and Experimental Sounds on Santoor

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Written work submitted for the fulfillment of the MA Degree

December 2024

Abstract

This study investigates the application of extended techniques on the Iranian santoor, a traditional instrument central to Persian classical music, with the aim of expanding its sonic possibilities and role in contemporary and experimental music. Bridging conventional and innovative practices, the research explores how the santoor can evolve through the integration of extended techniques. Drawing from the theoretical insights of Nathan Riki Thomson, Sergio Castrillón, and other pioneering musicians and scholars in experimental music, such as John Cage, as well as practice-based research frameworks, this study situates the santoor within a broader context of experimental music. By incorporating influences from Iranian musical traditions and global experimental practices, this research underscores the transformative potential of extended techniques for reimagining the santoor in new and innovative ways.

Methodologically, this practice-based research combines qualitative data collection with experiential inquiry. Fieldwork conducted in Iran involved collaboration with santoor students at varying skill levels, observing their responses to techniques such as plucking, bowing, muting, and soundboard striking. Additionally, collaborative improvisational sessions with other musicians allowed for real-time exploration and documentation of how the santoor interacts with other instruments and electronic elements.

The findings reveal that while extended techniques on the santoor challenge established norms and create new auditory experiences, they also encounter resistance from traditional audiences. However, for audiences open to experimental music, these techniques provide a fresh perspective on the santoor's expressive capabilities. The study concludes that the integration of extended techniques enhances the santoor's relevance in global experimental practices, contributing to a more dynamic, intercultural repertoire. This work not only enriches the repertoire of the santoor but also invites future musicians to explore innovative ways of engaging with traditional instruments.

Keywords

Santoor, Extended Techniques, Experimental Music, Persian Classical Music, Improvisation, Contemporary Music Practices, Sound Exploration, Instrumental Innovation, Interculturalism, Musical Expression.

Acknowledgements

I would like to express my deepest gratitude to my advisor, Ramin Akhavijou, for his invaluable guidance, encouragement, and insight throughout this research journey. His expertise and patience have been instrumental in shaping this thesis.

My heartfelt thanks go to my santoor teacher and mentor, Ali Bahramifard, whose profound knowledge of the Iranian Santoor and dedication to both tradition and innovation have greatly influenced my work. I am also deeply grateful to Sergio Castrillón, whose classes and collaborations introduced me to new dimensions of experimental music, improvisation, and intercultural exchange, helping me expand my creative boundaries.

Special thanks to Joachim Heintz, whose workshop was the first to inspire me to think beyond conventional practices and venture into electronic music and extended techniques. His influence has been foundational in my journey toward experimentation. I would also like to acknowledge Nathan Riki Thomson, Head of the Global Music Department at Sibelius Academy, for his support and for creating an inspiring academic environment that nurtured my growth.

To my friends and fellow musicians who shared their insights, participated in experimental sessions, and continually encouraged me, I extend my deepest appreciation. Your collaborative spirit and enthusiasm brought life to this research.

Finally, I owe my deepest gratitude to my family, whose unwavering support, patience, and belief in my work made this journey possible. Thank you for your encouragement, love, and for always reminding me of the importance of following my passion. This work is as much a reflection of your support as it is of my dedication.

Contents

1. Introduction

This research presents an exploration of extended techniques on the Iranian santoor, a traditional instrument deeply rooted in Persian classical music. In contemporary music, extended techniques refer to unconventional methods of playing an instrument that expand its sonic possibilities. Although extensively explored on other musical instruments, the application of these techniques to the santoor represents an emerging and innovative field of inquiry. My research seeks to address the classification of these new playing methods: Are they truly extended techniques, or should they be considered equally valid forms of expression alongside more conventional techniques? This question lies at the intersection of tradition and innovation, reflecting the broader tension between preserving the santoor's classical identity and embracing modern experimental practices.

Extended techniques on the Iranian santoor open up a world of sonic possibilities, allowing the instrument to transcend its traditional context and expand its expressive possibilities. John Cage's assertion that we should 'let sounds be themselves rather than vehicles for man-made theories or expressions' (Cage, 1961, p. 10) is central to this exploration, as it encourages an approach where each sound's intrinsic quality is valued outside of traditional musical norms. This concept resonates with the philosophy underlying extended techniques on the santoor, where sounds produced by unconventional methods—such as bowing or percussive tapping—are appreciated for their unique textures and timbres, rather than being confined by the instrument's classical framework. This research navigates the intersection of artistic practice-based inquiry and theoretical analysis, combining hands-on experimentation with critical examination. By incorporating techniques from other instruments—such as bowing from the violin and tapping from percussive instruments—I sought to adapt these methods to the santoor, uncovering the unique sounds they can generate.

My personal journey with the santoor has been transformative, particularly as I began to explore these extended techniques. Traditionally, the santoor is associated with specific melodic frameworks and a rigid performance style. However, integrating new approaches has allowed me to improvise more freely and interact seamlessly with other musicians. This journey has illuminated the potential of the santoor to evolve within contemporary contexts, fostering a deeper understanding of its capabilities as an instrument.

In this thesis, I aim to discuss how extended techniques not only expand the expressive possibilities of the santoor but also enhance my improvisational skills. By experimenting with these methods, I have discovered a richer sonic palette that allows for more dynamic interactions with other musicians. This exploration not only challenges my understanding of the instrument but also invites audiences to engage with the santoor in novel ways.

The significance of this study lies in its potential to contribute to the discourse surrounding the evolving role of traditional instruments in contemporary music. As Vincent Lostanlen et al. note, the exploration of extended playing techniques marks 'the next milestone in musical instrument recognition,' emphasizing how these approaches significantly transform traditional auditory perceptions of instruments (Lostanlen et al., 2018). Extended techniques, by introducing unconventional sounds—such as the sustained resonance from bowing or percussive qualities from tapping—allow listeners to experience the santoor in new auditory dimensions. This shift challenges audiences to engage with the instrument’s sound outside of familiar frameworks, fostering a deeper appreciation for its expressive range. In this study, I explore techniques like plucking, bowing, and electronic manipulation, each opening unique avenues for creativity and expression. These methods allow the santoor to interact fluidly with various musical genres and traditions, positioning it as a versatile voice within contemporary and experimental music landscapes.

Additionally, I intend to examine the implications of these techniques on the listener's experience. The traditional audience accustomed to a specific melodic framework may initially react with surprise or curiosity when exposed to experimental interpretations of the santoor. Understanding their responses will be crucial in assessing the impact of these techniques on the perception of Iranian music. By bridging the gap between tradition and innovation, this research aims to foster a richer understanding of the santoor's role in contemporary music.

Throughout this thesis, I will also reflect on my experiences collaborating with other musicians and how these techniques have facilitated more intuitive improvisation. By exploring the ways in which I can merge the traditional with the experimental, I hope to illuminate the unique opportunities that arise when we embrace new soundscapes.

The rationale for this study is rooted in philosophical and musical discussions. Building on Cage’s ideas, I will investigate how innovative techniques reshape the santoor’s role within contemporary music. David Huron, in his research on the psychology of musical expectation,

argues that our reactions to music are deeply influenced by our prior experiences. This insight becomes particularly relevant when new and unconventional techniques are introduced in music, as they challenge traditional musical patterns and reshape existing expectations (Huron, 2006).

In this introductory section, I have laid the foundation for the ensuing discussion on extended techniques and their application to the Iranian santoor. The subsequent chapters will delve deeper into the specific techniques, my methodology, and the implications for performance and audience engagement. Ultimately, this study aims to contribute to a growing discourse on the evolution of musical instruments, demonstrating the enduring power of creativity and exploration in the world of music.

1.1 Context of the study

The impetus for this research is deeply rooted in my extensive engagement with traditional Persian music and the santoor, a central instrument in this rich musical heritage. With over 20 years of experience performing within the framework of Persian Dastgahs, I have cultivated a profound understanding of the intricacies of this music form. My journey as a musician began in Iran, where the santoor serves not only as a melodic instrument but also as a vehicle for cultural expression and identity. The complex interplay of notes and modes characteristic of Persian music has profoundly shaped my artistic sensibilities and aspirations. This background provides the essential context for exploring the application of extended techniques to the santoor, an area that remains underexplored in scholarly discourse.

In addition to my practical experience, my academic studies in Iran and Finland have significantly shaped my perspective on music. Pursuing higher education in music performance at the University of Tehran immersed me in the rich traditions of Persian music, emphasizing the preservation of classical styles and the intricate nuances of the Dastgah system. This grounding in tradition gave me a strong foundation in the technical and theoretical aspects of Persian music, fostering a deep respect for its formal structures. Later, my studies at the Sibelius Academy in Finland exposed me to a more experimental and cross-genre approach, where creative boundaries are frequently pushed and musical innovation is celebrated. This contrasting environment encouraged me to view traditional instruments, like the santoor, as adaptable to modern experimental practices. The duality of these experiences—grounded tradition from Tehran and creative exploration from Finland—has driven me to investigate the

intersection of tradition and innovation. Through this academic journey, I've been inspired to explore how the santoor can evolve with the integration of unconventional playing methods, ultimately challenging and expanding the established norms of its performance.

The cultural significance of the santoor within Persian music cannot be overstated. As a traditional instrument, it embodies a rich historical narrative that reflects the artistic heritage of Iran. However, as the global music landscape continues to evolve, there exists a pressing need to reassess the role of the santoor within contemporary music contexts. By examining how extended techniques can augment the santoor's sonic capabilities, this research seeks to contribute to a broader understanding of the instrument's potential. This investigation aligns with the growing interest in reinterpreting traditional instruments through modern lenses, which has become a hallmark of contemporary musical discourse.

My ongoing artistic exploration has continually raised questions about the boundaries of traditional music. Through my performances, I have observed a shift in audience expectations and perceptions, particularly among listeners who are accustomed to the structured frameworks of classical Persian music. This has prompted me to consider how incorporating experimental techniques can not only enhance my improvisational skills but also facilitate collaboration with musicians from diverse backgrounds. The interplay of different musical traditions and styles fosters a dynamic creative environment that encourages innovation and exploration.

In the contemporary music landscape, the integration of techniques from diverse musical styles with traditional forms has become increasingly prominent, presenting both opportunities and challenges. This research will analyze how extended techniques, drawn from various musical traditions, can be applied to the santoor. By situating the santoor within the context of global music practices, this study aims to highlight the instrument's adaptability and relevance in modern compositions. This contextual framework will serve as a foundation for understanding the implications of my research on the evolution of traditional Persian music.

Lastly, my personal motivation for undertaking this study stems from a desire to bridge the gap between traditional and contemporary music practices. The santoor has a rich history within Persian classical music, with roots that trace back centuries. Esteemed musicians like Faramarz Payvar, Parviz Meshkatian, and Ardavan Kamkar have elevated the santoor's role, showcasing its unique tonal qualities and expressive depth. Ardavan Kamkar, in particular, is celebrated for pushing the boundaries of santoor performance; he has introduced new techniques and

expanded its role beyond traditional Persian music. His compositions blend classical Persian elements with modern influences, creating intricate and expressive pieces that underscore the versatility of the santoor. As I explore the possibilities offered by extended techniques, I am keenly aware of the impact these innovations may have on audiences, especially those accustomed to the conventional soundscapes of Persian music. Through this investigation, I hope to contribute to a more nuanced understanding of the santoor's evolving role in contemporary music, paving the way for future musicians to experiment and innovate within their own practices. By embracing both tradition and experimentation, this research aims to enrich the repertoire of the santoor and foster a deeper engagement with its sound among diverse audiences.

1.2 Research Aim and Questions

The overarching aim of my research is to investigate the application of extended techniques on the Santoor and their impact on improvisation and expression within the context of both traditional Persian music and contemporary experimental music. This exploration arises not only from my personal journey as a musician but also from a broader artistic inquiry that spans over two decades of performing traditional Persian music and academic studies in Iran and Finland.

A crucial aspect of this research involved conducting fieldwork in Iran, where I aimed to test extended techniques with Santoor students across three skill levels: beginner, intermediate, and advanced. My objective was to observe their reactions and creativity in improvisation after they had been introduced to these new techniques. I wanted to understand how these students adapted to and integrated the extended techniques following their learning of traditional Persian music and the radif.[1]

Furthermore, I had some sessions with Ali Bahrami-Fard to delve deeper into various aspects of these techniques, allowing us to gain richer insights into their application and significance. Additionally, He noted that several students are actively gathering information and conducting their own research in this area, highlighting a growing interest in the intersection of traditional techniques and contemporary practices.

[1] The radif is a structured repertoire of melodies and motifs that form the foundation of Persian classical music, serving both as a pedagogical framework and a reference for improvisation and composition.

To frame my inquiry, I pose the following research questions:

1. How can extended techniques influence the improvisational skills and expressive possibilities of Santoor players?
2. What are the students' perceptions of these techniques after transitioning from traditional Persian music to more experimental forms?
3. In what ways do these techniques reshape the students' understanding of their musical framework and creativity?

By addressing these questions, I hope to contribute to the discourse surrounding the integration of contemporary techniques in traditional music and explore the potential for intercultural dialogue through music.

1.3 Research Design and Method

The design of my research is grounded in a pluralistic approach, embracing a diversity of methodologies to effectively explore extended techniques for the santoor. Drawing from Knox's (2004) argument, as cited in Castañeda Lozano (2024), that "methods are not selected necessarily by theory, but instead they have 'elective affinity' between both" (Knox, 2004, p. 124), I aim to integrate various methods that resonate with the ontological framework of my study. Knox (2004, p. 125) further emphasizes the dynamic relationship between theory and methodology, which aligns with the exploratory nature of this research. This research employs a qualitative approach, allowing for an in-depth exploration of the perceptions and experiences of santoor students regarding extended techniques and improvisation. Focusing on qualitative data captures the nuanced perspectives of participants, providing deeper insights into their evolving musical practices.

The study involved ten santoor students in Iran, organized into three skill levels: beginner, intermediate, and advanced, and conducted in 2023 as part of my fieldwork. Participants were chosen based on their experience with traditional Persian music and their openness to experimenting with extended techniques. The research sessions introduced students to various techniques like plucking, bowing, and muting, and observations were made regarding their reactions, adaptability, and creativity when incorporating these techniques into their improvisations.

Data collection was conducted through a combination of interviews, observations, and field research. Semi-structured interviews were conducted to gain insights into participants' experiences and reactions to the implementation of extended techniques in their improvisational practice. Additionally, I observed participants during practice sessions to assess their engagement with the techniques and noted their creative responses.

Data analysis involved examining interviews and observational notes to identify recurring themes and patterns related to the impact of extended techniques on improvisation and creative engagement. This analysis provided a comprehensive understanding of how these techniques influenced students' creative processes, particularly in their ability to explore and integrate unconventional sounds into traditional frameworks.

The fieldwork not only focused on improvisation but also emphasized the concept of comprovisation[2], where composition and improvisation intersect, allowing students to balance structure and spontaneity. Through this approach, participants began to view improvisation as a tool for both experimentation and expression, demonstrating increased confidence and creativity in their musical interactions. The results revealed that while some students initially found these techniques unfamiliar, they gradually embraced them as a means to expand their understanding of the santoor's potential.

From the participants' perspectives, this process fostered a sense of curiosity and adaptability, as they learned to navigate between traditional Dastgah[3] structures and experimental approaches. Many expressed that these techniques helped them break free from conventional expectations, enabling a more personalized and exploratory relationship with their instrument.

While the study offers valuable insights, it is important to acknowledge its limitations. The relatively small sample size may limit the generalizability of the findings, and potential biases could arise from my positionality as a researcher. Nonetheless, the findings will contribute to the growing body of knowledge on extended techniques in Persian music and their implications for intercultural collaboration.

[2] Comprovisation refers to the blending of composition and improvisation, combining pre-structured elements with spontaneous, real-time creativity.
[3] Dastgah is a modal system in Persian classical music, comprising specific modes and their associated melodic frameworks.

An integral part of this research involves my own artistic experimentation with extended techniques on the santoor. As an artist-researcher, I actively engaged in testing and refining these techniques through personal practice, composition, and performance. This approach aligns with the methodology of artistic research, where the artist's creative process serves as both a source and method of inquiry. By incorporating techniques such as bowing, plucking, muting, and using electronics, I explored how these methods impact my own playing, expression, and connection to the instrument. These experiments not only provided firsthand insight into the practicalities and challenges of integrating extended techniques but also allowed me to critically analyze their potential to expand the santoor's sonic and expressive capabilities. This dual role as a performer and researcher has been instrumental in shaping the direction of the study and its outcomes.

The rationale behind this research stems from a desire to bridge the gap between tradition and innovation in Persian music, particularly by exploring how the santoor can adapt to contemporary and experimental contexts. Working with students at varying skill levels allowed me to investigate the pedagogical implications of extended techniques and assess their adaptability across different stages of musical development. The results highlighted both the challenges and opportunities of introducing these techniques. While some students initially resisted these methods, their eventual willingness to experiment demonstrated the potential for creative growth and redefined their understanding of the santoor.

In addition to its impact on students, this research also revealed important insights about audience reactions. Through post-performance discussions and observations, I found that many audience members, initially unfamiliar with the unconventional sounds produced by extended techniques, expressed curiosity and intrigue once the context of these methods was explained. While some listeners struggled to reconcile these techniques with their expectations of traditional Persian music, others appreciated the fusion of tradition and experimentation, viewing it as a natural evolution of the instrument's role. These reactions underscored the importance of creating dialogue with audiences to foster understanding and appreciation for innovative practices.

Ultimately, this research provided me with a framework for how extended techniques can be effectively incorporated into education and performance, paving the way for new approaches to teaching and playing the santoor in both traditional and experimental contexts.

Despite the growing interest in contemporary and experimental music, there remains a significant degree of cultural resistance among Iranian audiences, particularly when it comes to music that deviates from traditional forms. When I perform experimental music using extended techniques or modern styles that do not explicitly feature traditional Persian elements, I sometimes observe that audiences respond in varied ways. This response can be seen across different age groups, with some listeners, despite being open to new experiences, finding it challenging to connect with unfamiliar sounds or to identify clear traditional references.

Based on my experiences after experimental concerts, I often engaged in informal discussions with audience members to better understand their perceptions and reactions. These conversations revealed a recurring pattern: audiences initially struggled to connect with unconventional sounds, citing unfamiliarity and a lack of clear traditional references. However, as they reflected on their listening experiences, many expressed a growing curiosity about the creative potential of these new techniques, especially when I explained how I incorporate them into Persian musical traditions.

In general, I observed that audiences were more receptive when experimental elements were integrated with recognizable frameworks, such as the Dastgah system. Younger attendees, while initially hesitant, were often more intrigued by the innovative possibilities extended techniques offer, particularly when I framed them as an evolution of Persian musical expression rather than a departure from tradition. These insights underscore the importance of fostering dialogue and providing contextual bridges between tradition and experimentation.

Through these post-performance interactions, I realized that audience engagement is key to breaking down preconceptions. By contextualizing experimental music within Persian traditions, I could inspire a more open-minded appreciation for innovative forms of expression. Ultimately, these findings reinforce the need for continued efforts in education and outreach to gradually shift cultural perceptions and pave the way for broader acceptance of contemporary and experimental music in Iran.

2. Literature review

2.1 Introduction

The central themes of this literature review focus on improvisation, the expansion of musical instruments through extended techniques, and the role of the musician's relationship with their instrument. The aim of this section is to contextualize the use of extended techniques on the Iranian santoor within the broader frameworks of musical experimentation and improvisation. Given the relatively underexplored nature of these techniques in Persian music, the research seeks to highlight key studies that investigate improvisation and instrumental modifications in both Western and global music traditions. To gather relevant sources, I searched scholarly databases, journal articles, and books focusing on improvisation, experimental music, and extended techniques, specifically looking for studies that explore non-Western instruments. Themes from works by Cobussen (2017), Cage (1961), and others will help frame the discussion of how new techniques on the santoor might interact with traditional concepts of sound, silence, and performance.

2.2 Improvisation and Tradition

Improvisation, as defined by Cobussen (2017, p. 37), “provides space for originality, for newness, and for unexpectedness, thus connecting to creativity, inventiveness, and openness.” This concept directly applies to my exploration of extended techniques on the santoor, where improvisation serves as a key tool for discovering new sonic possibilities and challenging traditional boundaries. Similarly, Chen (2024) highlights how extended techniques in violin performance encourage musicians to explore unfamiliar territory, reflecting a shared approach of blending tradition with experimentation across different instruments.

Mikhail Bakhtin emphasizes that “something created is always created out of something” (Bakhtin, 1986, p. 120), reflecting the idea that innovation often stems from engaging with and transforming historical and cultural traditions. Improvisation acts as a tool for bridging this gap, enabling musicians to build upon and challenge the constraints of tradition.

2.3 Expanding the Instrument

One of the core discussions in experimental music is the expansion and modification of instruments to generate new sounds. Eddie Prévost and Evens (2005) argue that a musician should not aim to “command” their instrument but rather “explore” and “engage” with its

materiality (Prévost in Hopkins, 2009, p. 122). This resonates deeply with my practice of using extended techniques on the santoor, such as plucking the strings, bowing, or using unconventional objects to produce sounds. By modifying the instrument's sound production methods, I am able to explore new auditory experiences that push the boundaries of tradition.

"Altering the instrument provokes the unforeseen" (Evens, 2005, p. 153), which is central to the development of new techniques. Whether it's detuning the instrument or experimenting with electronic effects, these practices align with the concept of "defamiliarizing" the instrument, as suggested by Frith. Frith (1998) argues that defamiliarization in music allows for fresh perspectives and opens new creative pathways, challenging both the performer and the listener to engage with the instrument in unconventional ways.

John Cage's philosophical exploration of sound and silence is integral to understanding the impact of extended techniques on the santoor. Cage famously stated, "Let sounds be themselves rather than vehicles for man-made theories or expressions" (Cage, 1961, p. 10), urging musicians to explore sound in its pure form, without the constraints of conventional musical expectations. This approach aligns with my aim of using extended techniques to expand the sonic possibilities of the santoor, moving away from its traditional, continuous tonal framework. Techniques such as muting or tapping the soundboard introduce moments of near-silence or subdued sound, which contrasts with the instrument's naturally resonant quality, making silence an intentional and perceptible element within a performance.

Similarly, Dauenhauer (1980) examines the ontological significance of silence in music, proposing that new forms of expression challenge conventional boundaries between sound and silence. The incorporation of silence through extended techniques on the santoor allows for deliberate pauses, rhythmic gaps, and textural contrasts that highlight silence as a dynamic part of the music. By creating these intervals, extended techniques redefine the santoor's role, not only in Persian classical music, where silence traditionally has limited presence, but also in global experimental practices where silence and sound interact fluidly. In this way, the study reveals how extended techniques transform both the perception of silence and the expressive capacity of the santoor.

2.4 Perception and Expectation

The work of David Huron (2006) on the psychology of musical expectation highlights the deep influence of prior experiences on how listeners perceive new sounds. Huron suggests that

unconventional techniques challenge traditional musical patterns and reshape listeners' expectations (Huron, 2006). This directly relates to the introduction of extended techniques on the santoor, which may produce sounds that listeners accustomed to classical Persian music might find unexpected or disruptive. By embracing these techniques, musicians can expand the audience's auditory frameworks and create more engaging and emotionally provocative experiences.

Additionally, Dretske (1969) explores how our perception is shaped by representational frameworks, which influence how we interpret and categorize sensory inputs. This concept is particularly relevant to the use of extended techniques, as they challenge established auditory conventions and encourage new interpretations of the santoor's sound.

Nathan Riki Thomson's *Resonance* (2021) explores the relationship between body and sound in improvisation, particularly emphasizing how extended techniques and intercultural collaboration can impact musical expression. His analysis of sound interactions provides an essential framework for my research, as it parallels the way I explore extended techniques on the santoor. This source serves as a key reference for understanding how these techniques redefine the role of traditional instruments in experimental music.

Sergio Castrillón's *New Timbre* (2019) research delves into the search for new sounds and extended techniques, which are central to my thesis. His work highlights how experimental musicians redefine the sonic possibilities of their instruments, a theme directly aligned with my research on the santoor. These concepts help frame the analysis of how extended techniques expand the sonic repertoire of the santoor.

2.5 The Intersection of Tradition and Experimentation

Incorporating extended techniques into the santoor repertoire involves negotiating the delicate balance between tradition and modernity. Nyman (1999) highlights how experimental music, particularly through the innovations of composers like John Cage, disrupts traditional structures and paves the way for novel forms of expression. This mirrors the challenges faced when introducing contemporary methods, such as extended techniques, into the context of Persian music, which is deeply rooted in structured and formalized traditions.

By employing a variety of extended techniques and integrating electronic effects, the santoor can transcend its historical role and engage with modern experimental music. These techniques add layers of complexity to the instrument, enabling it to interact dynamically with diverse

musical traditions and genres—aligning with Nyman's observations on the evolution of experimental music.

Stewart (2015) emphasizes the importance of integrating modern pedagogical methods in cello performance to encourage creative exploration and flexibility. This perspective aligns with my work, as I introduce students to these experimental techniques and encourage them to apply them within the Persian classical framework.

The literature review highlights key themes of improvisation, extended techniques, and the integration of traditional and experimental music practices. While previous studies have explored these themes in Western music, there remains a significant gap in the study of how these concepts apply to non-Western instruments like the Iranian santoor. This research seeks to fill that gap by demonstrating how extended techniques can expand the expressive possibilities of the santoor, bridging traditional Persian music with contemporary experimental practices. Through this exploration, the research contributes to a broader understanding of how cultural and musical boundaries can be pushed through innovation and creativity.

2.6 Extended Techniques for Santoor

The concept of extended techniques—unconventional methods of playing an instrument to create unique sounds—is traditionally associated with Western classical instruments such as strings, woodwinds, and brass. However, contemporary musicians worldwide are exploring ways to expand the sonic possibilities of their instruments, breaking away from standard performance practices. The Iranian santoor, with its deeply rooted traditions in Persian classical music, is particularly suited for such exploration. Applying extended techniques to the santoor not only broadens its expressive range but also introduces audiences to innovative soundscapes that redefine expectations for this ancient instrument.

These techniques, whether borrowed from other instruments, developed through experimentation, or inspired by electronic manipulation—serve to bridge the gap between tradition and modernity. Many of the techniques listed below have been adapted from methods used for other instruments, while some are original developments from my own artistic experimentation during this research. Together, they allow the santoor to interact with a variety of musical genres, enabling musicians to combine Persian classical music with contemporary, experimental styles. This section provides an overview of some key extended techniques for the santoor, including their execution and their impact on the instrument's sonic character.

In general, my perspective is shaped by sound studies approaches, which highlight the ways musicians across cultures and instruments push the boundaries of their practice through extended techniques. While these explorations are not unique to the santoor, they underscore the instrument's potential to engage in a broader global dialogue of experimental sound-making and reimagine its role in modern music. For me, this research has been a way to align my artistic voice with this evolving landscape, contributing both to the santoor's repertoire and to a deeper understanding of its possibilities.

Key Extended Techniques for Santoor

- **Plucking the Strings (Pizzicato)**
  Rather than striking the strings with mezrabs[4], the performer plucks the strings directly with their fingers. This technique produces a soft, muted, harp-like sound, adding delicate texture to compositions. By controlling the plucking angle and string location, the performer can vary the tone, creating contrast within a piece.
- **Muting with the Hand or Fingers**
  Using the side of the hand or fingers to muffle strings while striking them reduces resonance, resulting in a percussive, staccato sound. This technique allows for rhythmic complexity and adds emphasis, similar to the effect of a piano's mute pedal.
- **Striking the Soundboard (Percussive Techniques)**
  Tapping or striking the santoor's soundboard, or even the instrument's backside, produces a variety of percussive sounds. This allows the santoor to assume both melodic and rhythmic roles, a quality that is especially effective in fusion genres.
- **Glissando (Sliding)**
  By sliding the finger or mezrab along the strings, the performer creates a continuous, sweeping sound. Glissando adds fluidity and expressiveness, connecting musical phrases and evoking a sense of movement. When performed smoothly, it can evoke a wind-like quality, enhancing the instrument's natural resonance.
- **Bowing the Strings**
  Drawing a violin bow across the strings produces a sustained, continuous sound, distinct from the santoor's traditional plucked or struck tones. Bowing introduces an atmospheric quality, allowing for long, expressive notes and ambient effects, expanding the santoor's sonic palette.

[4] *Mezrab* refers to the lightweight mallets used to strike the strings of the santoor, traditionally made of wood.

- **Harmonics (Flageolet Tones)**
  By lightly touching a string at specific points, usually at fractional lengths, the player produces bell-like overtones. Harmonics add a shimmering, ethereal quality to the music, often used to highlight certain passages or create a delicate soundscape.
- **Tapping the Strings Directly**
  Using fingers to tap directly on the strings creates a short, percussive sound, contrasting with the santoor's more resonant notes. This muted effect adds rhythmic interest, useful for punctuating musical ideas or enhancing dynamic shifts.
- **Using Alternative Mezrabs**
  Employing mezrabs made from rubber, plastic, or felt changes the sound quality. Each material brings a distinct texture to the music, from soft warmth to metallic sharpness, providing the performer with a range of tonal options.
- **Microtonal Bending**
  Altering a note's pitch by pressing on the string after striking it allows for microtonal variations, a technique integral to Persian music. This adds emotional depth and expressiveness, especially within the traditional Persian modes, or Dastgahs.
- **Preparation Techniques**
  Placing objects (e.g., paper, metal) on the strings transforms the santoor's sound, producing effects that range from muted buzzes to bell-like chimes. This approach, akin to prepared piano techniques, creates unusual timbres, adding a distinctive modern twist to the instrument.
- **Use of Electronics**
  Connecting the santoor to microphones, pickups, or effects processors opens up further sonic possibilities, from subtle reverbs to dramatic distortions. This adaptation is particularly relevant in fusion and contemporary music, enhancing the santoor's versatility within varied musical contexts.

These extended techniques demonstrate the versatility and adaptability of the Iranian santoor, pushing it beyond its conventional role in Persian classical music. By incorporating these techniques, musicians can engage in deeper experimentation, blending tradition with contemporary sounds. This expansion of the santoor's repertoire aligns with the broader goals of experimental music, inviting audiences to experience the instrument in novel ways. These

approaches contribute not only to the evolution of the santoor but also to a more dynamic understanding of Persian music within global and experimental frameworks.

3. Theoretical framework

This section outlines the key theoretical frameworks used to interpret the findings of this research on extended techniques for the Iranian santoor. The primary theoretical concepts draw from improvisation, intercultural music notation, and the expansion of sound through digital and acoustic hybridization. These frameworks provide a deeper understanding of how extended techniques redefine the traditional musical role of the santoor and introduce new possibilities for intercultural collaboration and sound experimentation.

3.1 Improvisation and Sound Expansion

Improvisation plays a central role in this research as a tool to explore new sonic possibilities and challenge traditional structures. Cobussen's argument that improvisation interacts with existing structures—accepting, rejecting, or transforming them—directly aligns with the practice of extending santoor techniques. These extended techniques engage with the Persian classical music system of Dastgâh, while pushing its limits to generate novel sounds and textures. This research applies this theoretical framework to understand how new performance practices alter the relationship between tradition and innovation on the santoor.

3.2 Intercultural Music Notation and Collaboration

Intercultural collaboration is another crucial aspect of this research, particularly in terms of how musicians from different cultural backgrounds can collaborate through music. According to Nicolás Castañeda Lozano’s research on intercultural music notation, intercultural collaboration requires a flexible, pluralistic approach to musical notation (Castañeda Lozano, 2024). In this research, we explore how the notation of extended techniques on the santoor serves as a bridge for intercultural collaboration, allowing musicians from different backgrounds to engage with the music while respecting the cultural contexts involved. Castañeda's proposal for intercultural music notation focuses on the idea of creating frameworks that reflect the diversity of cultural practices, allowing musicians to maintain their artistic identities while collaborating in new, hybrid forms (Castañeda Lozano, 2024). This notion is particularly relevant for the extended techniques explored in this thesis, as they introduce novel forms of notation that deviate from traditional Iranian santoor practices, encouraging a more flexible approach that facilitates intercultural exchanges.

3.3 Digital Augmentation and Extended Techniques

Another key theoretical framework stems from the concept of digital augmentation in musical instruments, as explored by Victor Zappi and colleagues in their research on augmented virtual instruments. They discuss how the augmentation of traditional instruments through digital means can lead to the exploration of new soundscapes and performance techniques, an idea applied in this research to the acoustic realm. For instance, the use of electronic effects such as reverb, delay, and distortion enables the santoor to produce textures that diverge from its conventional timbre, creating entirely new auditory experiences.

The introduction of techniques such as percussive strikes, the use of bows, and other methods further challenges the conventional boundaries of the instrument, aligning with Zappi's insights. These methods allow the santoor to move beyond its traditional constraints, embracing experimental practices that can coexist with its classical heritage. By pairing physical alterations with digital enhancements, the instrument is reimagined not as a static cultural artifact but as a dynamic tool capable of evolving in response to contemporary artistic demands (Zappi, 2018).

This integration of digital and physical experimentation underscores the broader argument that extended techniques offer a pathway to bridge traditional and experimental music practices. For the santoor, these innovations make it possible to engage with global experimental music trends while preserving its cultural identity. For example, incorporating digital effects in improvisational settings highlights how these frameworks enable musicians to explore previously unattainable soundscapes, adding depth and versatility to their performances.

The theoretical and conceptual frameworks employed in this research—improvisation, intercultural music notation, and digital augmentation—provide essential tools for interpreting the impact of extended techniques on the Iranian santoor. By drawing on the works of Cobussen (2017), Castañeda Lozano (2024), and Zappi (2018), this research not only redefines the santoor's role in contemporary music but also opens up new avenues for intercultural collaboration and sonic exploration. These frameworks illustrate how traditional instruments can be simultaneously preserved and transformed, offering musicians a means to negotiate the tension between cultural heritage and innovation. This duality will be instrumental in analyzing the results of this study and their broader implications for both Persian classical music and global experimental music practices.

4. Research design

This chapter outlines the steps taken to conduct the research on the extended techniques for the Iranian santoor, focusing on the role of experimental music in shaping both the methodology and the analysis. The primary aim of this research is to investigate how these extended techniques challenge traditional boundaries and expand the sonic possibilities of the santoor, particularly within the context of experimental and contemporary music practices. The study also explores how improvisation and experimental techniques, inspired by figures such as John Cage, Michael Nyman, and contemporary artists like Nathan Riki Thomson and Sergio Castrillón, contribute to a broader understanding of intercultural musical collaboration.

This chapter describes the methodologies employed, the process of generating musical material, and the analysis of the collected data. In addition, the researcher's position within the study, ethical considerations, and the role of artistic research in developing new knowledge are discussed.

4.1 Methodology

The overarching aim of this research is to explore and document extended techniques for the Iranian santoor, particularly in the context of experimental music. To address this, a practice-based research methodology was adopted, emphasizing artistic creation as both a process and a form of knowledge production. This approach aligns with the exploratory nature of experimental music, which challenges traditional boundaries and embraces unpredictability, unconventional sound production, and innovative techniques.

Practice-Based Research

This research is grounded in the principles of practice-based inquiry, framing the creative process as a key method for generating knowledge. Drawing on John Cage’s idea that "any sound can be considered musical" (Cage, 1961), the methodology emphasizes sonic experimentation and the exploration of new timbres. Various techniques, such as bowing and plucking, were applied to the santoor to investigate its capacity for sound production beyond its traditional Persian classical role.

Improvisation as a Central Methodology

Improvisation played a pivotal role as a creative process and research tool. Marcel Cobussen (2017) describes improvisation as creating “space for originality, for newness, and for

unexpectedness" (p. 37). This aligns with the experimental framework of this study, where improvisation was used to test the boundaries of traditional techniques and explore new sonic possibilities.

Collaborative improvisations with musicians from diverse cultural backgrounds allowed for real-time experimentation, revealing how extended techniques interact with traditional Persian frameworks like the Dastgah system. These sessions provided valuable insights into the adaptability of these techniques in live and intercultural settings.

Digital Augmentation and Sound Manipulation

The research also draws on theories of digital augmentation to explore how electronic processing enhances the sonic palette of the santoor. Victor Zappi et al. (2018) argue that digital tools extend the capabilities of traditional instruments by introducing virtual elements. In this study, electronic effects were used in live performances and recordings to create textures and effects that push the instrument's acoustic boundaries.

Intercultural Collaboration and Notation

A key methodological component was the exploration of intercultural collaboration. Drawing on Nicolás Castañeda Lozano's work on flexible notation systems, this research employed pluralistic documentation methods to communicate extended techniques effectively across musical traditions. These methods facilitated collaboration while respecting the dual influences of traditional Persian music and innovative experimentation.

Why This Methodology?

This methodology supports the creative freedom needed to fully investigate how extended techniques like plucking, muting, bowing, and electronics expand the santoor's expressive potential. By integrating traditional Persian frameworks with experimental practices, the research provides a comprehensive approach to exploring the instrument's evolving role.

Additionally, this methodology incorporates multimedia elements such as recordings and performances, treating them as both data and artistic outputs. This dual approach embraces artistic research as a means of generating knowledge, enriching the interplay between theory and practice.

4.2 Data Generation

Data was generated through practice-based experimentation, fieldwork with santoor students, and collaborative performances. Fieldwork conducted in Iran in 2023 involved observing how beginner, intermediate, and advanced students responded to extended techniques. Feedback and improvisational practices were documented through semi-structured interviews, video recordings, and reflective notes.

Research Methods:

1. **Practice-based experimentation**: I employed a variety of extended techniques on the santoor, such as plucking, bowing, muting, and striking the soundboard, many of which were developed through my exposure to experimental music practices during my experiences and studies at both the University of Tehran and the Sibelius Academy in Finland. During my field trip to Iran in 2023, I also engaged in discussions with Ali Bahrami-Fard, a professional Iranian santoor player, composer, about these techniques. These discussions were instrumental in shaping the research, particularly raising the question of whether these methods should be considered true techniques or merely sound effects. These conversations fueled my motivation to investigate the topic further.

2. **Fieldwork with Santoor Students**: During my fieldwork in Iran in 2023, I tested these extended techniques with santoor students at beginner, intermediate, and advanced levels. This process allowed me to gather feedback on how students, who were primarily trained in traditional Persian music, responded to these unconventional techniques. The primary goal was to observe their creativity and reactions, particularly in experimental improvisational contexts using extended techniques.

3. **Collaborative Improvisations**: Over several years, I have engaged in collaborative performances with other musicians, blending extended techniques with Iranian classical music. These sessions included improvisations that combined the extended techniques of the santoor with instruments such as the double bass, flute, percussion, cello, and electronic elements. These improvisations were guided by the principles of free improvisation and real-time interaction, drawing from my understanding of experimental music frameworks.

Stewart (2015) highlights how improvisation can act as a bridge between traditional and contemporary practices in modern cello pedagogy. Similarly, my collaborative improvisations

blend santoor techniques with the free improvisation style of contemporary music, creating a space where tradition and innovation coexist.

I have composed original pieces for the santoor that incorporate extended techniques, exploring new ways to communicate and interpret these methods. For instance, in an earlier composition for two santoors and fixed media, I experimented with a combination of Western classical notation and personalized signs. This approach parallels Chen's (2024) research on violin performance, where she combines traditional and graphic notation to provide performers with greater flexibility in interpreting experimental techniques.

Building on this experience, I composed a piece for double bass and fixed media for a competition, using graphic scores with lines and colors to convey performance directions more freely, emphasizing interpretive freedom. Additionally, I performed a composition for prepared santoor by Joachim Heintz, where some new approaches were employed to transform the instrument's sound, showcasing its potential for contemporary and experimental music contexts.

Selection of Participants:

For this research, I selected santoor students at varying levels of proficiency in traditional Persian music. This allowed me to investigate how musicians at different stages of their training responded to the introduction of extended techniques. Initially, many students were unfamiliar with techniques such as plucking the strings with fingers or using a bow, and they questioned the purpose of these practices, which are not common in Persian classical music. However, after demonstrating how these techniques could be integrated into a traditional Dastgah, many students showed greater openness. Despite this, some remained hesitant to fully embrace these techniques, especially in more formal settings such as concerts featuring experimental music, where unconventional sounds and improvisation are more common.

Contribution to Research Questions:

The data generated from these methods directly contributes to answering the research questions by providing both empirical and artistic evidence of how extended techniques influence the santoor’s role in contemporary music. By gathering student feedback and documenting their improvisations, I was able to assess how well these techniques can be taught and integrated into traditional music education. Furthermore, the compositions and recordings I created demonstrate the potential for the santoor to bridge traditional Persian music with modern, experimental practices.

Interestingly, while some students appreciated the creative possibilities offered by extended techniques, particularly after seeing how I incorporated them into a Persian classical framework, others remained more cautious. Many questioned the value of experimental music and why it is necessary to explore unconventional sounds on the santoor. While I continue to engage with these questions, it remains evident that resistance persists among both musicians and audiences toward these approaches.

4.3 Data Analysis

The analysis of my research data primarily focuses on my personal experience and reflections as I explored extended techniques for the santoor within the context of experimental and contemporary music. The primary source of data comes from my own artistic processes.

- **Personal Reflection and Iteration:** Throughout the research, I maintained a reflective journal where I documented my thoughts, challenges, and breakthroughs as I experimented with extended techniques. This allowed me to track my creative progress and evaluate the impact these techniques had on my compositions and performances.

- **Artistic Practice and Composition:** I analyzed the compositions I created for the santoor using extended techniques by reviewing the recordings and scores. This analysis helped me understand how these techniques expand the sonic possibilities of the instrument and how they can be integrated into both traditional Persian music and experimental frameworks.

- **Improvisational Development:** A significant portion of the data came from my own improvisational sessions, where I used extended techniques to explore new textures and soundscapes. By analyzing these improvisations, I gained insight into how these techniques influence my ability to interact with other musicians and to push the boundaries of the santoor's sound.

4.4 Researcher Position

As both a professional santoor player and a researcher, my role in this study is deeply intertwined with my personal artistic journey, which has been heavily influenced by my exposure to experimental music, free improvisation, and extended techniques. My interest in this field began during my studies at the University of Tehran, where I was introduced to electronic and experimental music, and later deepened through my studies and collaborations

at the Sibelius Academy in Finland. This research reflects my desire to push the boundaries of the santoor, combining traditional Persian music with experimental techniques, digital manipulation, and improvisation.

My Position in Relation to the Study

In line with the approaches of practiced-based research, I am not only the researcher but also the primary practitioner in this study. This research is a natural extension of my own creative exploration, and the extended techniques I examine in this thesis are techniques I have personally experimented with and implemented in both solo performances and collaborations. My collaboration with musicians like Sergio Castrillón has been particularly influential. Sergio's global interdisciplinary improvisation ensemble, provided a platform for me to deepen my understanding of free improvisation and experimental techniques, while also expanding the sonic possibilities of the santoor. This ensemble allowed me to break free from genre constraints, engaging with musicians from various backgrounds and using elements from diverse musical traditions.

In these sessions, there was no emphasis on a particular style or genre, but rather a focus on technical exploration, sonic identity, and real-time music creation. Sergio’s class emphasized comprovisation—the blending of composition and improvisation, combining pre-structured elements with spontaneous, real-time creativity—as an essential tool for musical expression. These experiences reinforced my belief in the transformative potential of extended techniques for the santoor, and they became a major driving force behind my research.

My Relationship with Research Participants

Through my experiences in Sergio’s ensemble and various collaborations, I encountered musicians from different genres who were also exploring their instruments in unconventional ways. These collaborations, including improvisational performances with many instruments such as double bass, flute, percussion, and electronic music, allowed me to see how the santoor can interact with diverse musical systems and how it can serve as a tool for intercultural musical dialogue.

4.5 Ethics

This research adhered to ethical principles to ensure the protection of participants' privacy and data. All participants, including santoor students, were informed about the study’s purpose and

methods, and their participation was voluntary, with the option to withdraw at any time. Data collected, such as feedback and recordings, were anonymized and securely stored. Throughout the study, power dynamics were carefully considered, fostering an environment that valued experimentation and creativity over rigid adherence to traditional methods.

As both an artist and researcher, I maintained a collaborative and respectful approach, ensuring participants had the freedom to engage with the techniques at their own pace. Collaborations with professional musicians were guided by mutual respect, allowing each participant to contribute their artistic vision. My dual role as an artist-researcher has enabled me to approach this study in a deeply personal and creative way, reflecting my ongoing journey to redefine the role of the santoor in contemporary music.

5. Results

In this section, I present the key findings from my research, which draws upon my own practice-based experimentation, fieldwork with santoor students, and collaborative improvisations. The analysis of the data revealed several key themes related to the challenges and opportunities of applying extended techniques to the santoor, particularly within the framework of experimental and contemporary music. The results are organized by the following main themes:

5.1 Exploration of Extended Techniques on Santoor

Through my personal experimentation and creative process, I discovered that extended techniques such as plucking, muting, bowing, and using unconventional materials for mezrabs significantly expand the sonic possibilities of the santoor. These techniques offer a range of new textures and sounds that go beyond the instrument's traditional role in Persian classical music. My compositions, which integrate these extended techniques, highlight the santoor's potential to bridge the gap between Persian classical and experimental music.

The application of these techniques in performance settings brought a new dimension to the santoor’s sound, one that challenges the conventional expectations of both performers and listeners. However, navigating the balance between preserving the instrument's traditional identity and pushing its boundaries into new sonic territories required thoughtful experimentation. This artistic process underscored the transformative potential of these techniques for reimagining the santoor’s place in contemporary music.

5.2 Integration of Extended Techniques in Traditional Frameworks

Introducing extended techniques to santoor students revealed both challenges and opportunities for integrating these methods into Persian music education. Initial reactions ranged from skepticism to curiosity, reflecting the unfamiliarity of these techniques within traditional contexts. However, as students practiced and observed how these methods could enrich their improvisations, many began to appreciate their expressive potential.

When contextualized within the Persian Dastgah framework, these techniques were not perceived as departures from tradition but as tools that complemented and expanded it. Students found creative ways to incorporate techniques such as plucking, bowing, and muting into their improvisations, demonstrating the adaptability of these methods to traditional

melodies. This blending of old and new fostered a deeper engagement with their music and challenged preconceived notions about the santoor's limitations.

The insights gained from this process highlight the educational value of extended techniques. They encourage students to think beyond conventional boundaries while remaining rooted in tradition. The study also underscores the importance of providing contextual bridges between tradition and innovation, as musicians and audiences alike were more receptive when experimental elements were framed as evolutions of Persian musical expression.

5.3 Cultural Resistance to Experimental Music

One of the most important findings from this research is the cultural resistance that persists within Persian classical music toward experimental techniques and styles. This resistance, rooted in traditional views of what constitutes "proper" music, is not limited to the santoor but reflects broader challenges within Iranian music culture.

During my fieldwork, I observed that while some students were eager to explore new methods, others struggled to see the value in unconventional sounds or non-traditional playing techniques. This aligns with my own experiences as a performer blending Persian classical music with experimental approaches. Resistance was most evident among audiences, especially older generations, though younger attendees showed a greater willingness to engage with innovative ideas when these were framed within familiar contexts like the Dastgah system.

5.4 Artistic Creation and Collaboration

Collaborative improvisations with other musicians highlighted the santoor's versatility and its potential for intercultural collaboration. By integrating the santoor with instruments like the cello, double bass, flute, and electronic elements, I created new sonic landscapes that bridged Persian classical music with global experimental practices. These collaborations showcased the adaptability of the santoor, enabling it to interact with diverse musical traditions and genres.

The performances and recordings of my compositions, which incorporate extended techniques, further demonstrated the santoor’s evolving role in both solo and ensemble settings. These artistic creations serve not only as evidence of the research findings but also as contributions to the broader discourse on traditional instruments in contemporary music.

5.5 Summary of Findings

In summary, this research affirms that extended techniques offer exciting new possibilities for the santoor, but their integration into Persian classical music remains challenging due to cultural resistance. Through practice-based research, fieldwork, and collaborative projects, I have demonstrated that the santoor can transcend its traditional boundaries and play a significant role in modern experimental music.

These findings highlight the potential for extended techniques to transform the santoor's sonic identity and contribute to its pedagogical and performance practices. They emphasize the importance of education and outreach in fostering broader acceptance of these innovations within Persian music culture. By bridging tradition and experimentation, this research lays the groundwork for future exploration of extended techniques in both local and global contexts.

6. Conclusions

This research has demonstrated the transformative potential of extended techniques for the Iranian santoor, bridging its classical heritage with contemporary experimental practices. Through practice-based research, fieldwork, and collaborative improvisations, the study explored how these unconventional methods expand the santoor's sonic repertoire, redefining its role in modern music while addressing the challenges of integrating innovation within traditional frameworks.

One of the key findings is the resistance encountered from musicians and audiences toward unconventional sounds. As David Huron's (2006) theory of musical expectation suggests, unfamiliar sonic elements can evoke discomfort or confusion, particularly in cultural contexts where specific musical frameworks are deeply ingrained. This underscores the importance of presenting innovative techniques within culturally familiar contexts to foster acceptance. Despite initial resistance, integrating extended techniques such as plucking, bowing, and muting within the Dastgah framework elicited curiosity and appreciation, particularly from students who initially approached these methods with skepticism.

The pedagogical implications of these findings are significant. Observing students' adaptability and creativity revealed that even minor shifts in performance practices can inspire broader artistic growth. This aligns with Mikhail Bakhtin's assertion that "something created is always created out of something" (1986, p. 120), highlighting how innovation often emerges through the transformation of tradition. By incorporating these techniques into educational practices, future generations of musicians can develop a more holistic approach that balances traditional methods with creativity and experimentation.

Improvisation emerged as a central methodological and creative tool in this research. Drawing on Marcel Cobussen's (2017) exploration of improvisation as a space for originality and unpredictability, the study showed how extended techniques enable musicians to challenge conventional boundaries and explore new sonic landscapes. Collaborative improvisation sessions with musicians from diverse traditions further highlighted the santoor's intercultural potential, positioning it as a dynamic tool for global experimental music.

Theoretical frameworks, such as intercultural music notation (Castañeda Lozano, 2024) and digital augmentation (Zappi, 2018), also played a pivotal role in expanding the santoor's

capabilities. These approaches underscore the instrument's adaptability, offering pathways for further exploration of how traditional instruments can engage with modern experimental practices.

While resistance from musicians and audiences remains a challenge, this research affirms the santoor's capacity to evolve and adapt. Framing extended techniques as an evolution rather than a departure from tradition can foster greater acceptance, enriching the dialogue between tradition and innovation.

The contributions of this research extend beyond the santoor. By documenting and analyzing techniques such as plucking, bowing, and muting, it offers a framework for other musicians and educators interested in exploring experimental approaches with traditional instruments. Moreover, the findings emphasize the importance of intercultural collaboration and innovation in music, demonstrating how traditional instruments can transcend their historical roles to thrive in global experimental contexts.

Looking ahead, this study opens several avenues for future research. Investigating compositional methods to enhance intercultural musical exchanges could provide valuable insights into bridging diverse musical traditions through innovative notational systems. Additionally, exploring the integration of digital augmentation with the santoor's acoustic capabilities offers exciting possibilities for further innovation. By building on these insights, future studies can deepen our understanding of how traditional instruments like the santoor can thrive in modern music.

In conclusion, this research highlights the transformative potential of extended techniques for the Iranian santoor, emphasizing its adaptability and relevance in contemporary music. By embracing experimentation, improvisation, and intercultural collaboration, musicians can redefine traditional instruments for the modern era, contributing to a richer and more diverse musical landscape.

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Appendices

This section includes two compositions: *Memori* by Joachim Heintz and *M for Mother*, a piece composed by myself.

I would like to extend my heartfelt thanks to my esteemed colleague and friend, Rakhsha Ghazizadeh, for his invaluable support during the recording process. These works were recorded at his studio, Marcato, located in Tehran, Iran.

- **Memori, Composed by Joachim Heintz**

https://joachimheintz.net/memori.html

Joachim Heintz

memori

for santur

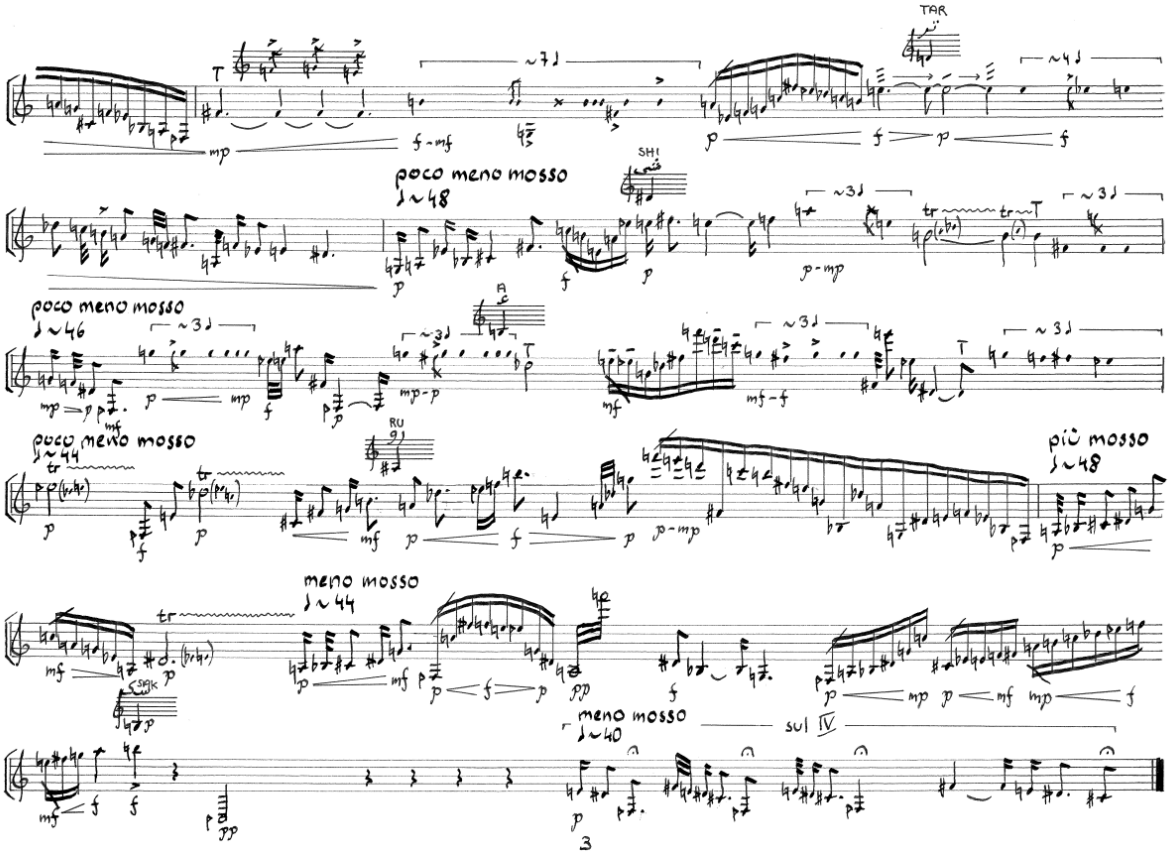
(2021)

written for Mehrnoosh Zolfaghari

supported by Goethe Institute as Virtual Partner Residency

MEMORI

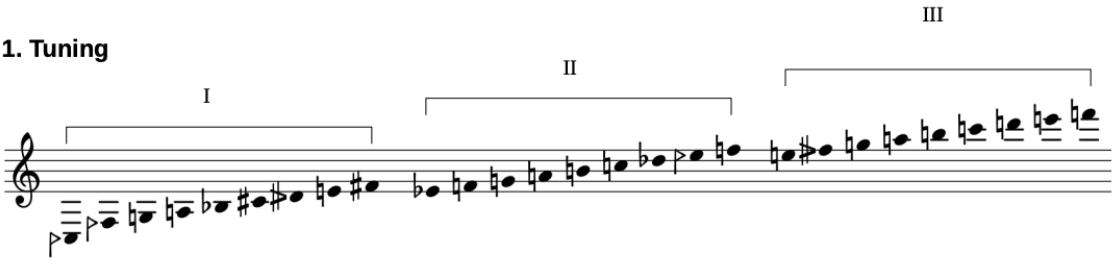

♪~69
preciso
libero
senza misura
~12♪
(preciso)
meno mosso
♪~63
(libero)
~15♪
poco accelerando
meno mosso
♪~58
~10♪
più mosso
♪~63
~17♪
poco accelerando
più mosso
♪~69
1
~12♪
molto meno mosso
♪~52
~19♪
molto più mosso
♪~60
~8♪
~9♪
molto meno mosso
♪~50
~8♪
poco più mosso
♪~52
~14♪
poco meno mosso
♪~50
~9♪
2



Joachim Heintz ***memori***

Score explanations

1. Tuning



2. Preparation

Section IV must be prepared with some old strings. The strings are to be fixed loosely so that a sizzling noise is being produced. Instead of old santur string, a thin wire can be used (like the one used for flowers).

3. Words and signs

preciso Very precise in rhythm.

libero Free in time, like a figuration, fast but some notes can be slower or faster (find the appropriate gesture).

senza misura Without measuring time, the space between notes approximately suggests the timing.
(The overall duration of a section is approximately given in ♩ notes, in the tempo which is valid in this moment.)

first note very fast followed by second note, which has an accent

same but accent is on the first note

small (slight) accent on the second note

- **M for Mother, Composed by Mehrnoosh Zolfaghari**

M for Mother

For two Santoors and Fixed Media

Mehrnoosh Zolfaghari

2021

Program Note:

Inspired by the movie "M for Mother"

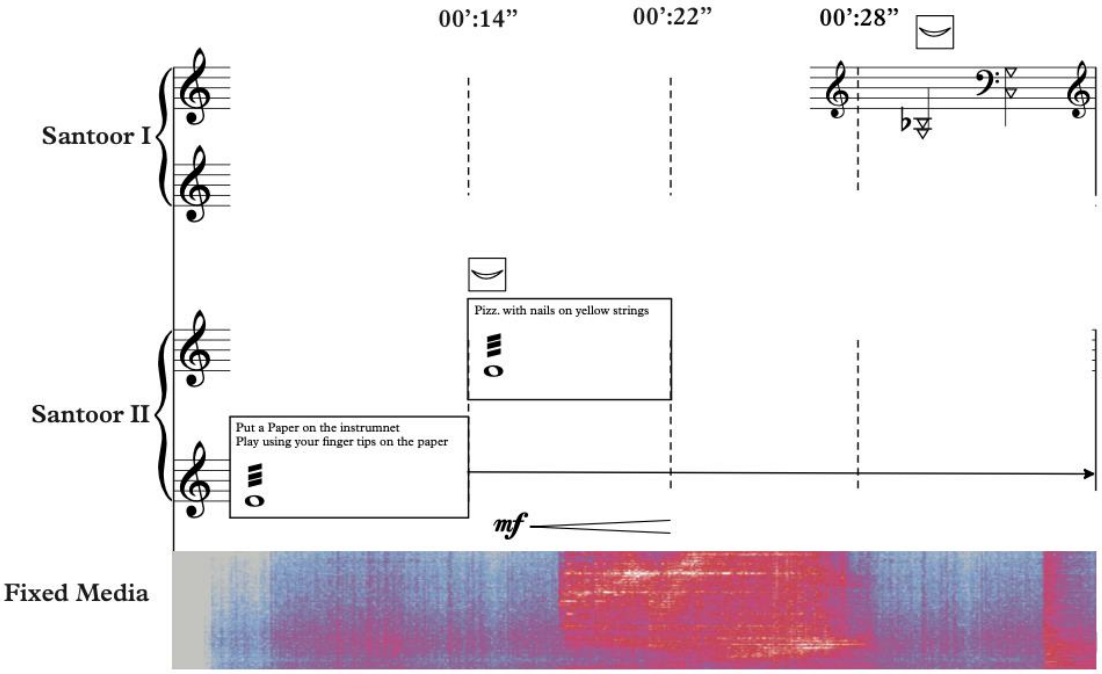
Director & Writer: Rasoul Mollagholipour

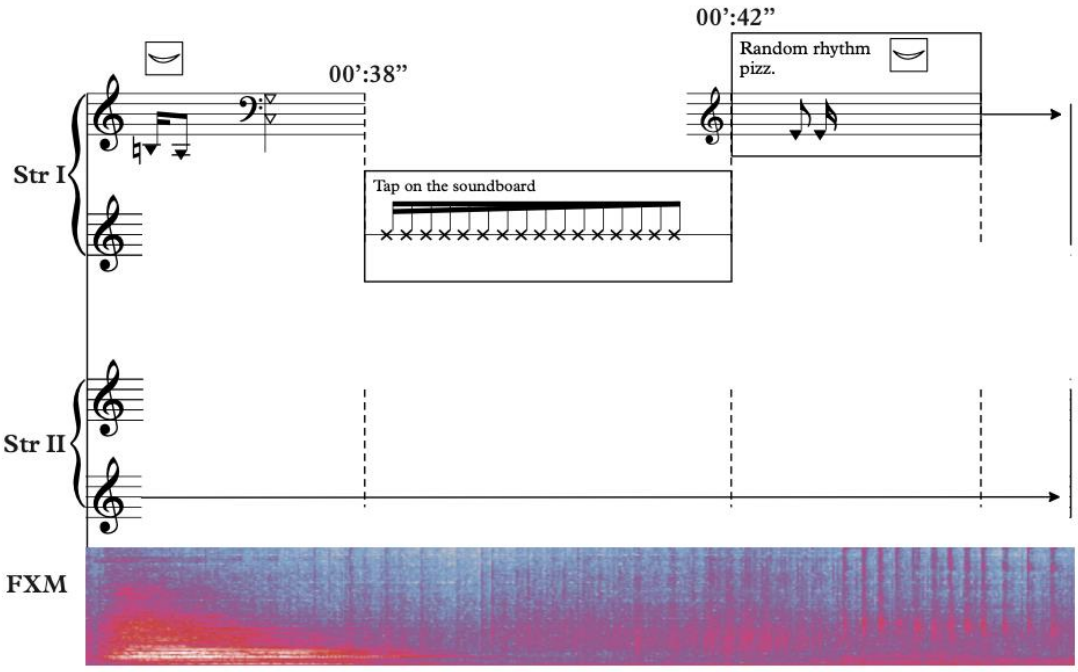
What appears to be a grand love story turns sour when parents-to-be discover that their unborn child will likely be born with serious birth defects, as a result of the mother's exposure to chemical weapons during the Iran-Iraq war. The father does not want to have a disabled child, but the mother insists on going through with the pregnancy.

M for Mother

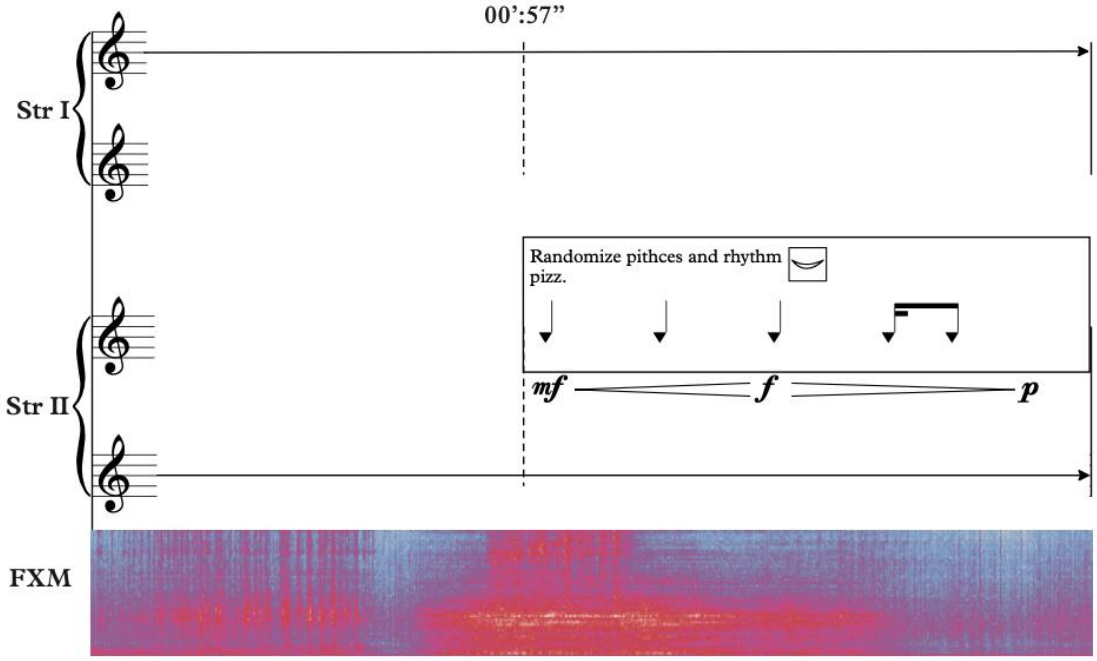
For two Santoors and Fixed Media

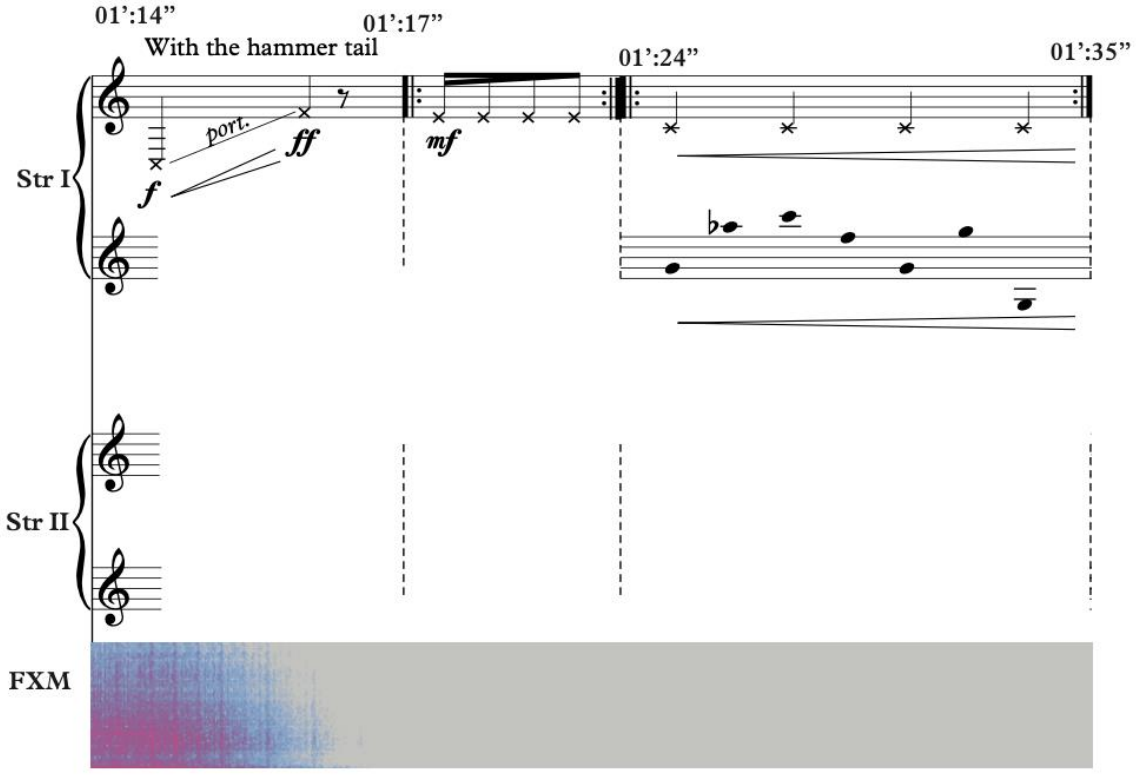
Mehrnoosh Zolfaghari
2021

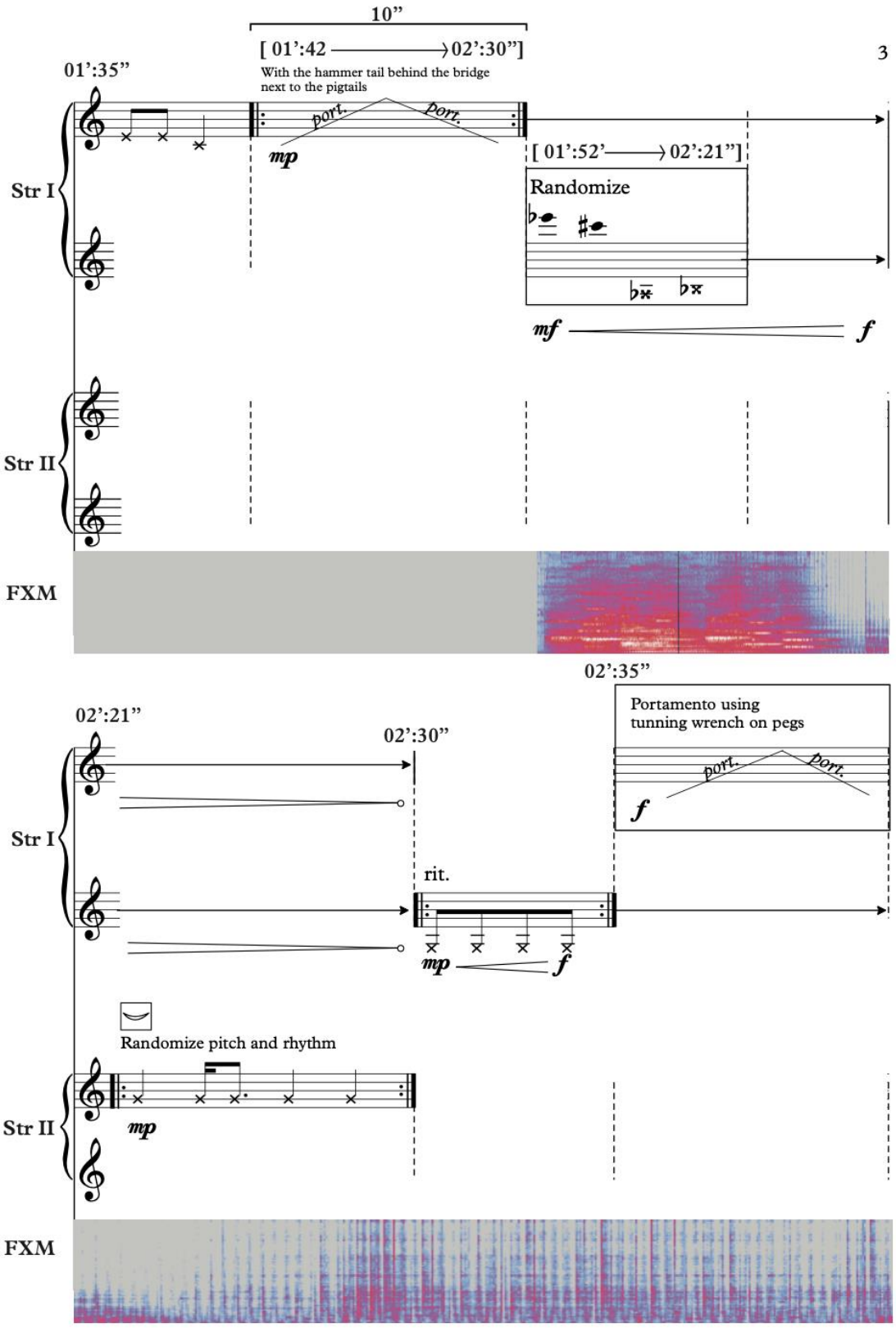


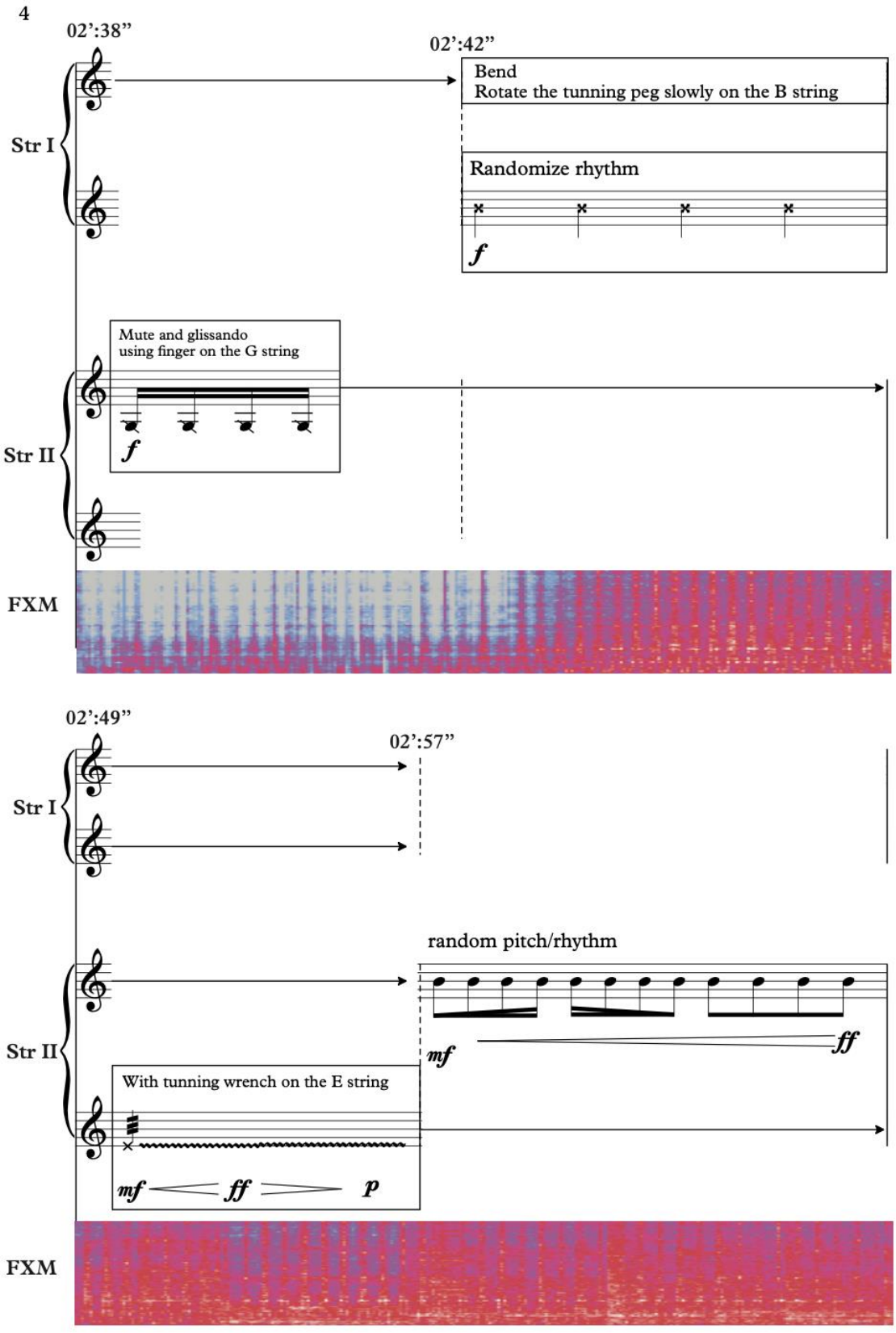


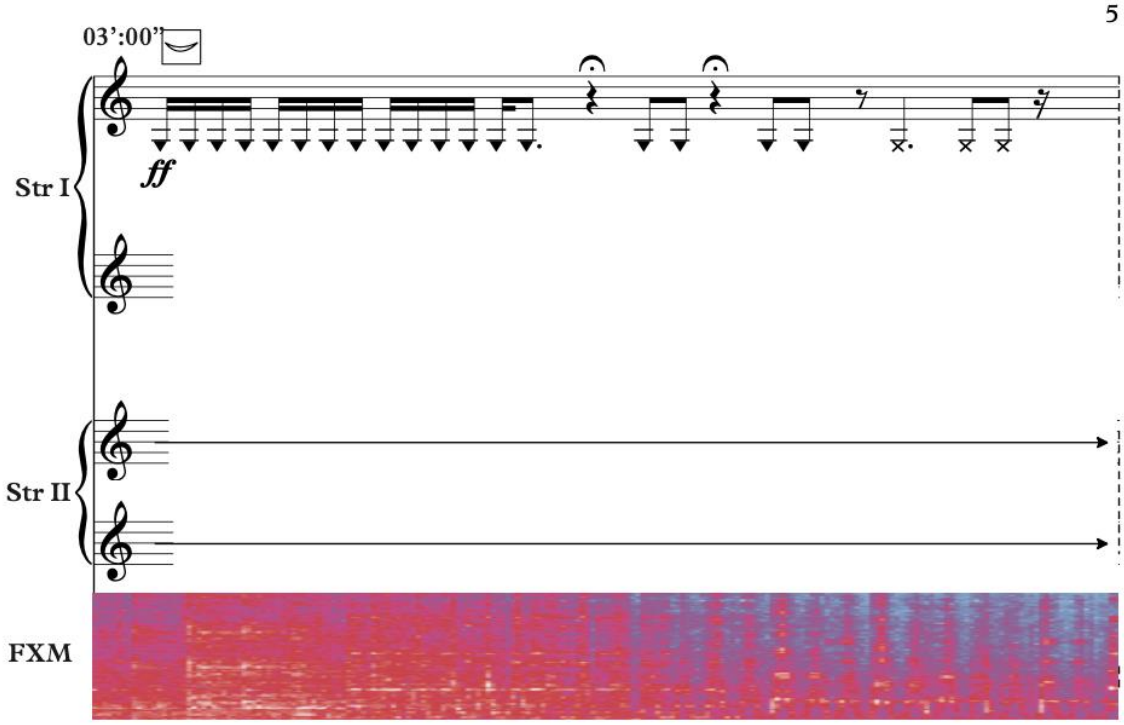
2

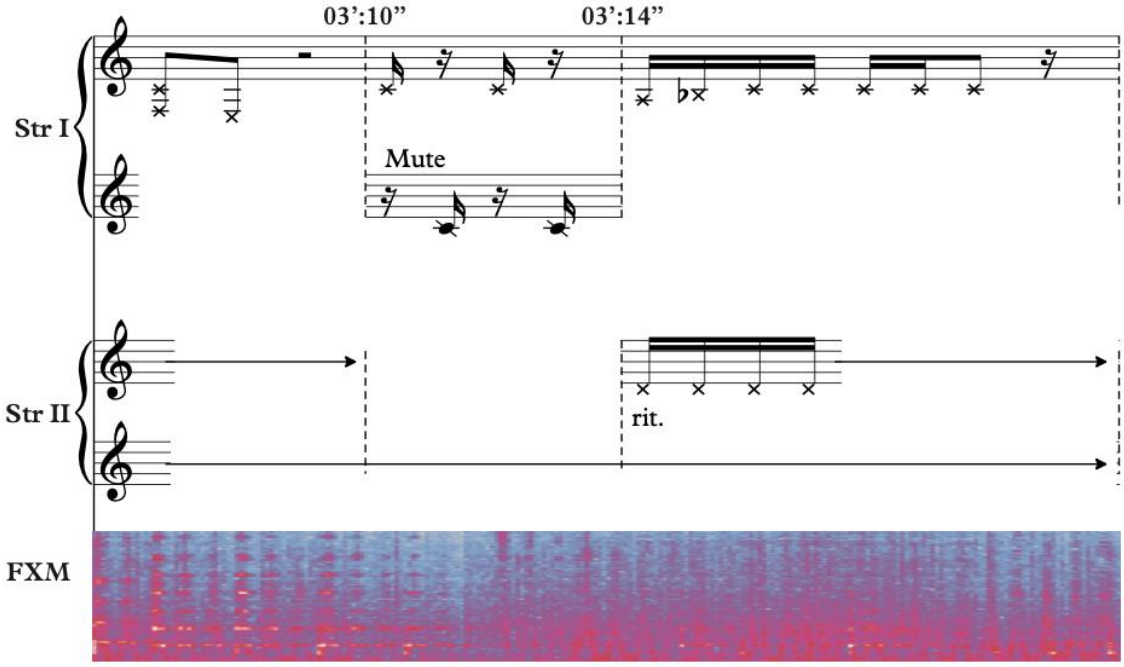

00':57"
Str I
Randomize pithces and rhythm
pizz.
mf
f
p
Str II
FXM

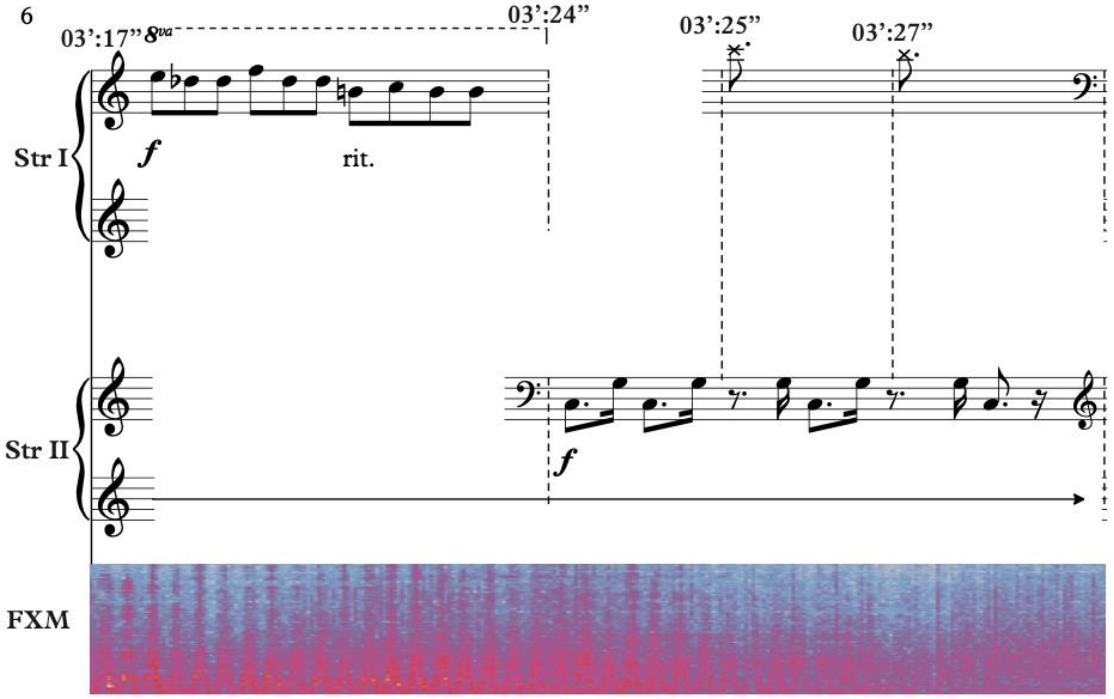

01':14"
With the hammer tail
01':17"
01':24"
01':35"
port.
ff
f
mf
Str I
Str II
FXM

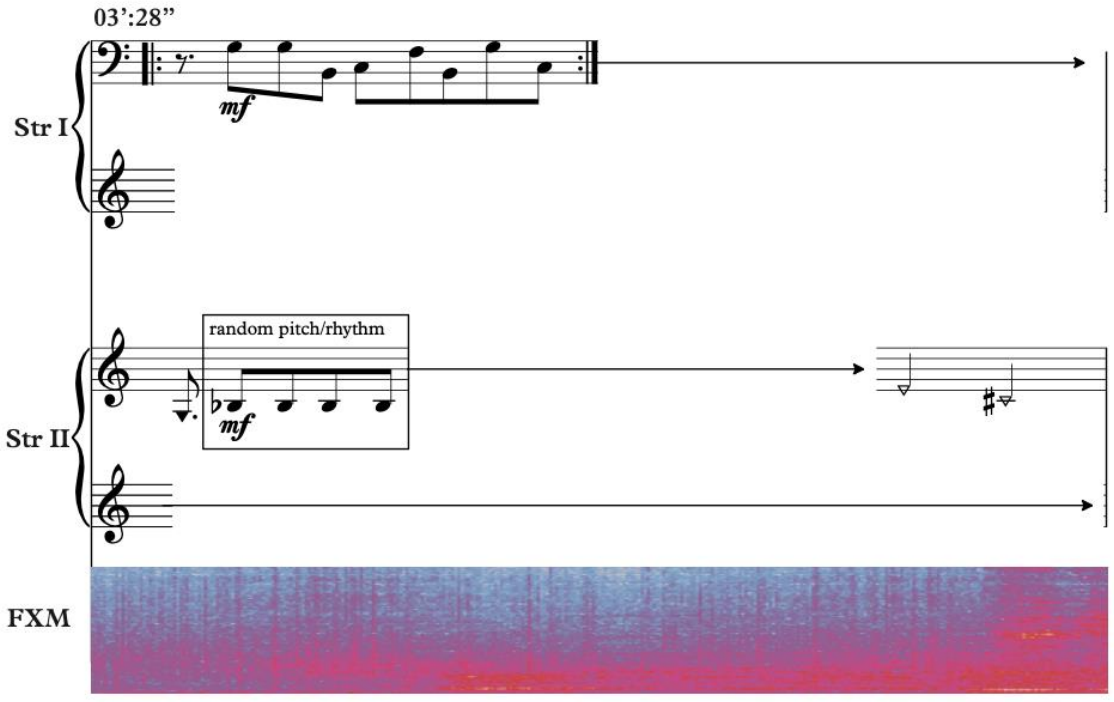

10”
[01’:42 ——→ 02’:30”]
3
01’:35”
With the hammer tail behind the bridge
next to the pigtails
port.
port.
mp
[01’:52’——→ 02’:21”]
Randomize
Str I
mf
f
Str II
FXM
02’:35”
Portamento using
tunning wrench on pegs
02’:21”
02’:30”
port.
port.
f
Str I
rit.
mp
f
Randomize pitch and rhythm
Str II
mp
FXM

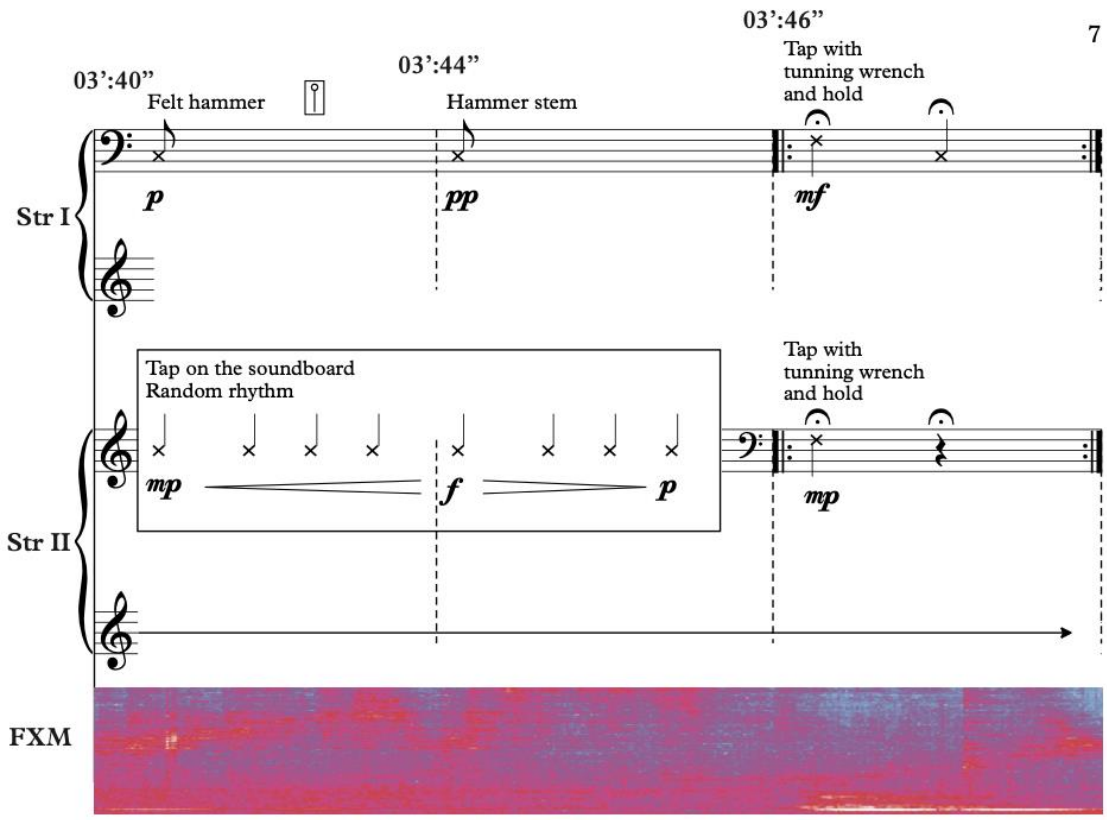

4
02':38"
02':42"
Bend
Rotate the tunning peg slowly on the B string
Str I
Randomize rhythm
f
Mute and glissando
using finger on the G string
Str II
f
FXM
02':49"
02':57"
Str I
random pitch/rhythm
mf
ff
Str II
With tunning wrench on the E string
mf
ff
p
FXM

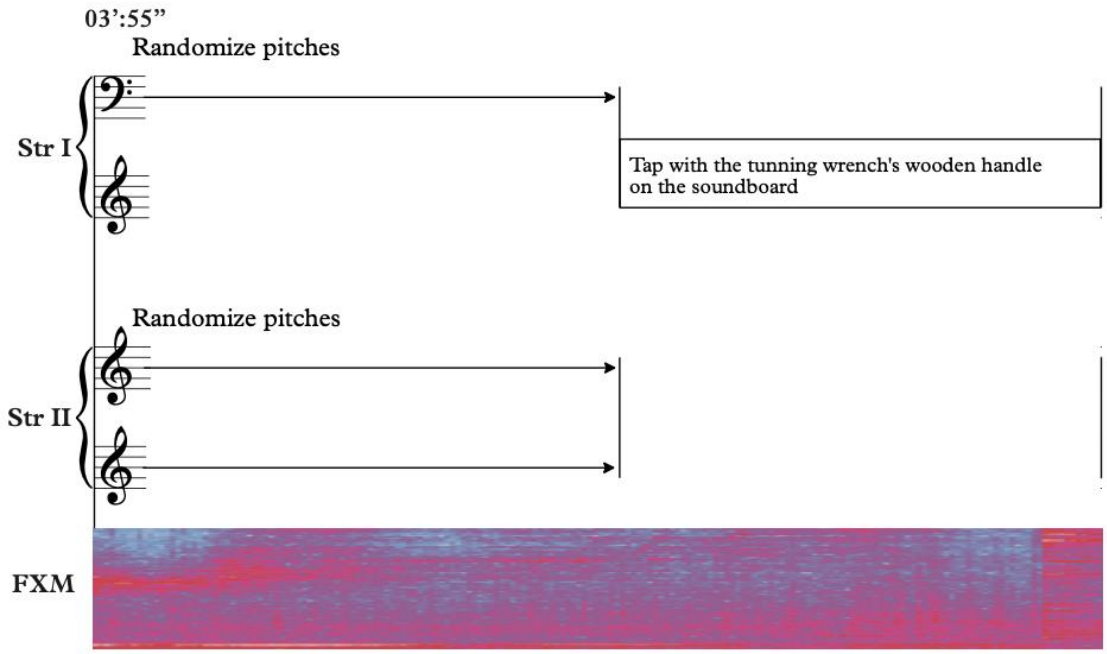

03':00"
ff
Str I
Str II
FXM


03':10"
03':14"
Str I
Mute
Str II
rit.
FXM

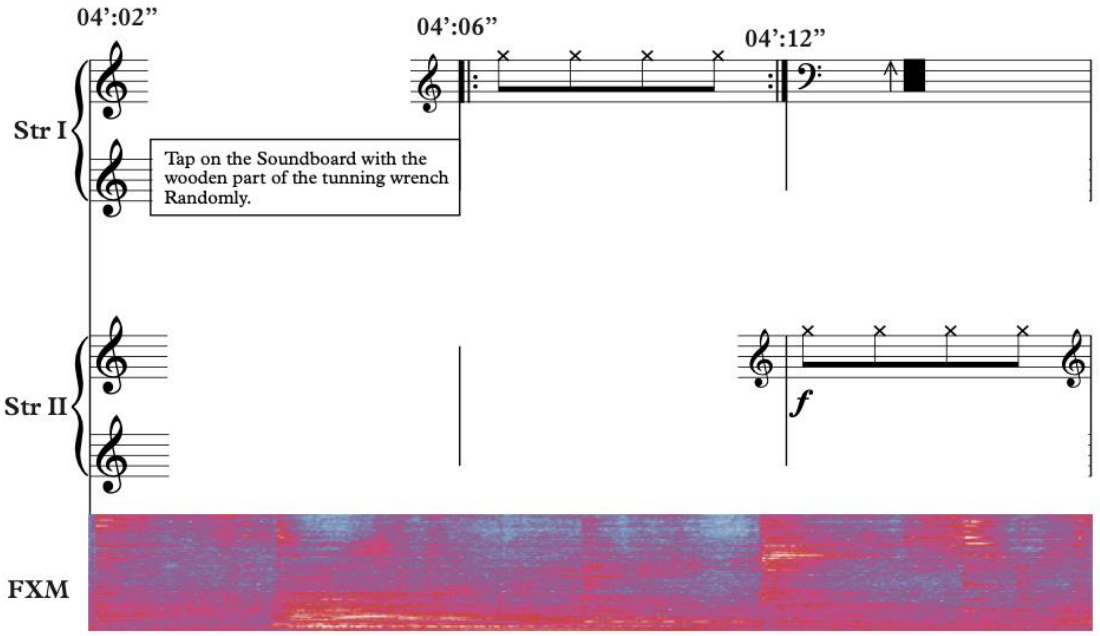

6
03':17"
8va
03':24"
03':25"
03':27"
Str I
f
rit.
Str II
f
FXM

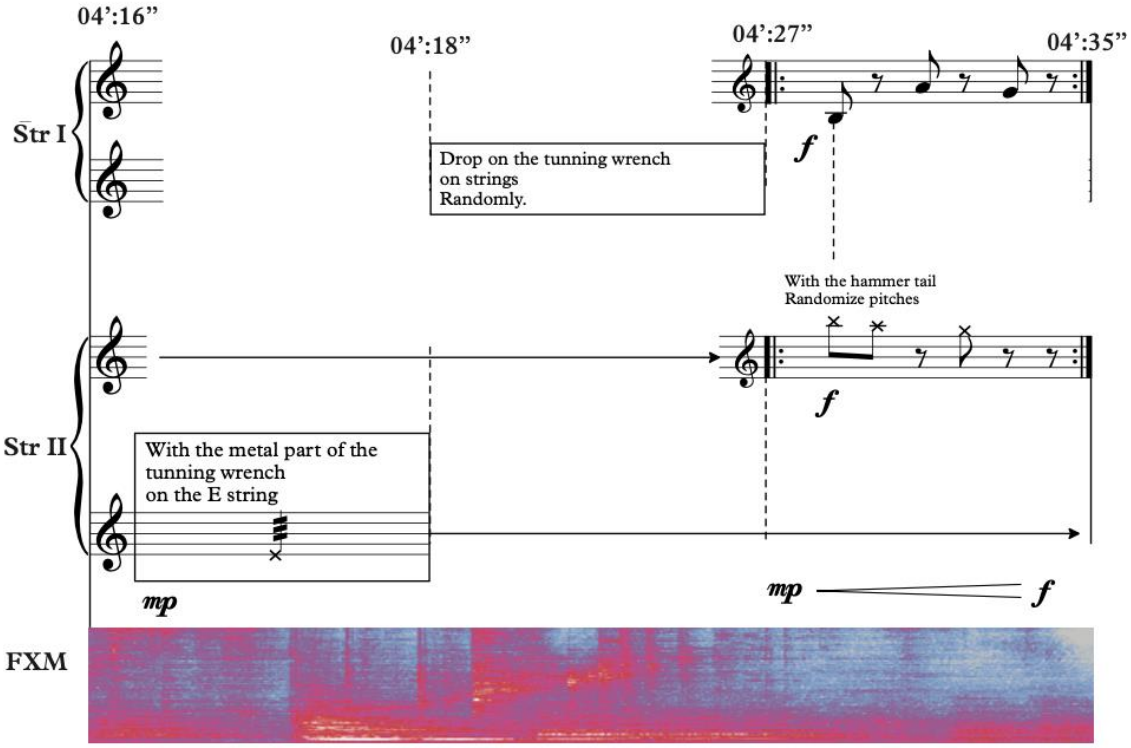

03':28"
Str I
mf
random pitch/rhythm
Str II
mf
FXM

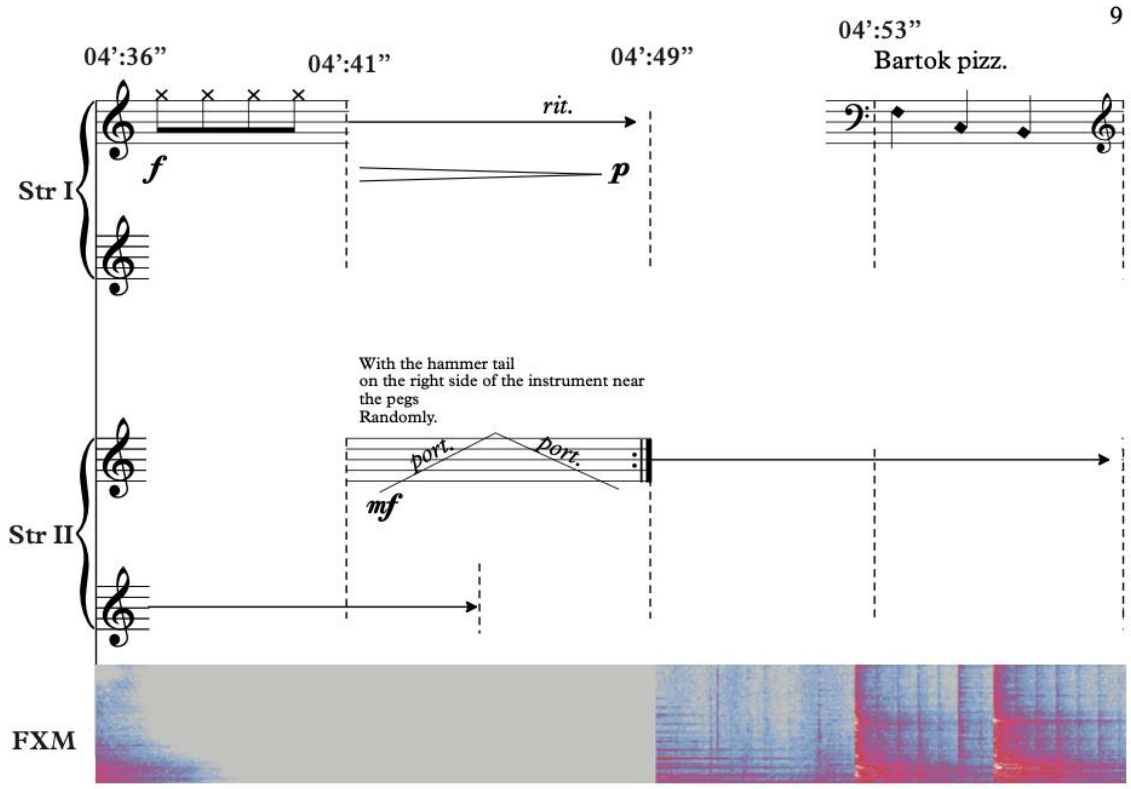

7
03':40"
Felt hammer
03':44"
Hammer stem
03':46"
Tap with
tunning wrench
and hold
Str I
p
pp
mf
Tap on the soundboard
Random rhythm
Tap with
tunning wrench
and hold
Str II
mp
f
p
mp
FXM

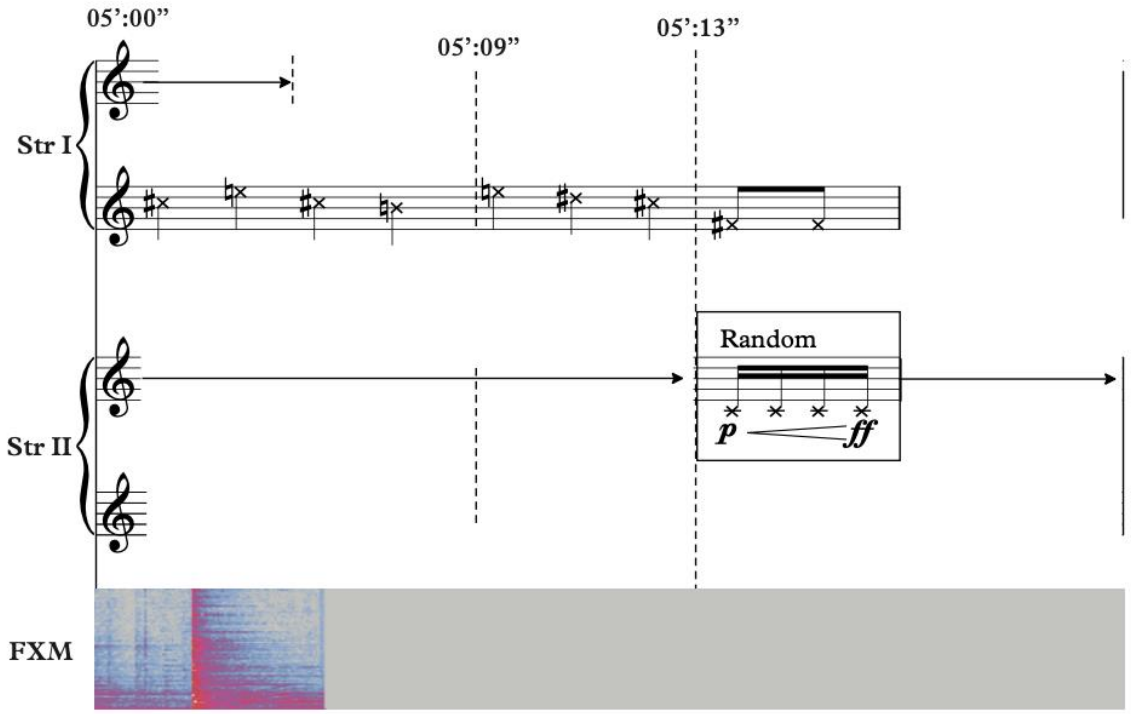

03':55"
Randomize pitches
Str I
Tap with the tunning wrench's wooden handle
on the soundboard
Randomize pitches
Str II
FXM

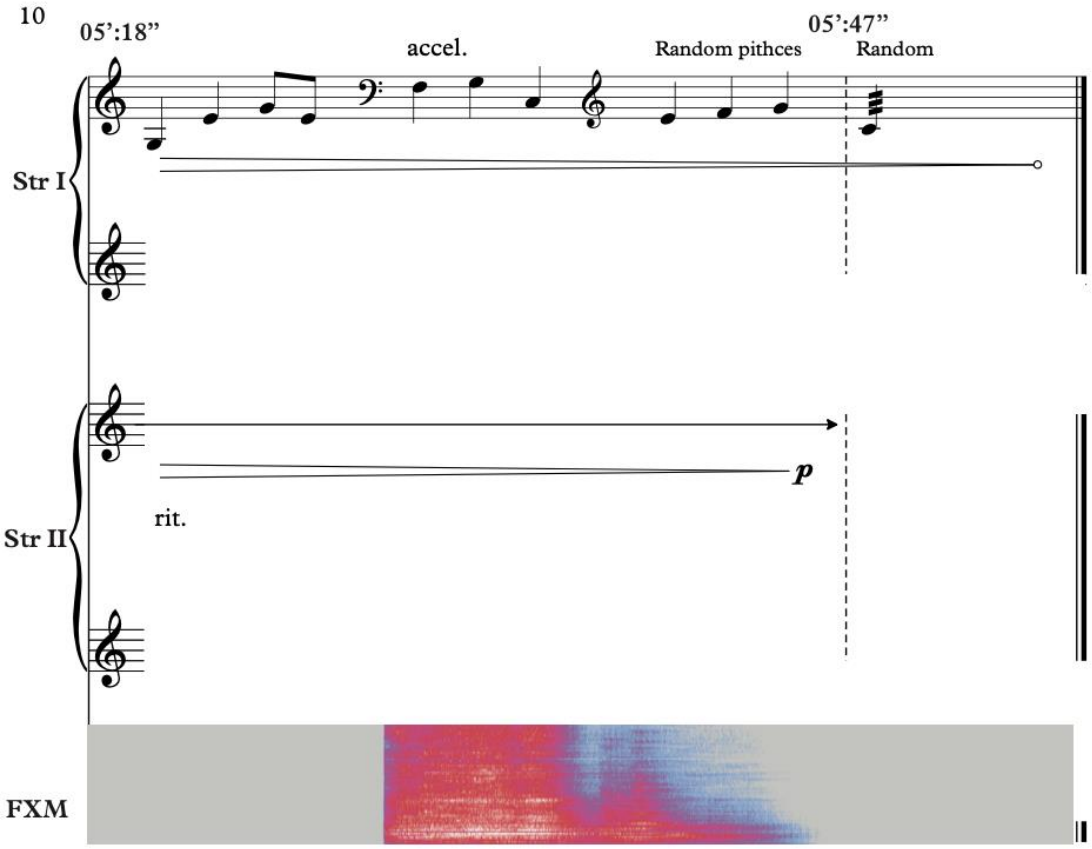
8


04':02"
04':06"
04':12"
Str I
Tap on the Soundboard with the wooden part of the tunning wrench Randomly.
Str II
f
FXM


04':16"
04':18"
04':27"
04':35"
Str I
Drop on the tunning wrench on strings Randomly.
f
With the hammer tail Randomize pitches
Str II
With the metal part of the tunning wrench on the E string
mp
mp
f
FXM


04':36"
04':41"
04':49"
04':53"
Bartok pizz.
rit.
f
p
Str I
With the hammer tail
on the right side of the instrument near
the pegs
Randomly.
port.
port.
mf
Str II
FXM


05':00"
05':09"
05':13"
Str I
Random
p
ff
Str II
FXM



For additional videos and insights related to this research, please visit:
https://www.youtube.com/@MehrnooshZolfaghari/videos