Applications of Béla Bartók’s techniques of pitch organisation to jazz improvisation

Niran Jay Dasika
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Applications of Béla Bartók’s Techniques of Pitch Organisation to Jazz Improvisation

This thesis is presented in partial fulfilment of the degree of Master of Arts (Performing Arts)

Niran Jay Dasika

Edith Cowan University
Western Australian Academy of Performing Arts
2021
Abstract

The music of Hungarian composer Béla Bartók (1881-1945) reconciles hauntingly lyrical beauty with harsh, atonal dissonance, appealing to music fans, musicians, and theorists alike for over a century and suggesting a rich resource of inspiration for improvising musicians. The composer Pierre Boulez commented that “Whether it is in a brutal violence animating a sound material in fusion, or in a tranquil gentleness glowing in a halo of grating sounds and colours... Bartók is incomparable and remains unique”. Informed by Bartók theorists Elliott Antokoletz, János Kárpáti, Erno Lendvai, and by Bartók’s own writings, this research identifies four melodic techniques: 'mistuning', ‘chromatic compression and diatonic extension’, ‘polymodal chromaticism’, and ‘inversional symmetry’. These four techniques inform a reflexive practice-led research project developing a collection of practice methods aimed at internalising and executing the techniques in improvised performance. The resulting practice methods were implemented and documented over a one-year period, exploring and evaluating concepts of automaticity and motor program theory. The research culminates in a collection of recordings along with this exegetical text reflecting on the process and results of the research. This project aims to expand my improvising practice, fuel the creation of new, interesting music, and to generate insights into ways other musicians and jazz students may approach the work and analysis of composers such as Bartók as a source of inspiration.
Declaration

I certify that this thesis does not, to the best of my knowledge and belief:

i. incorporate without acknowledgment any material previously submitted for a degree or diploma in any institution of higher education;

ii. contain any material previously published or written by another person except where due reference is made in the text of this thesis; or

iii. contain any defamatory material.

Signed 28 November 2020

Niran Jay Dasika
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The inspiration for this project owes a lot to Steven Bowler who introduced me to the music of Bartók in high school; to Mr Bowler I probably owe a lot of my enthusiasm for music theory.

Finally, I would like to thank my family and friends for being always available to proofread my writing and to bounce ideas off, and for enduring the highs and lows of my emotional turbulence over the past three years. Your love and support has made possible this work and my continued wellbeing.
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Thesis Components

This thesis takes the dual form of:

1. **Assorted Drone Music Vol. 3**, an album of music produced throughout the course of the research. The album follows **Assorted Drone Music Vol. 1** and **Vol. 2**, produced and released earlier in 2020. **ADM Vol. 3** consists of fourteen tracks of improvisations on Bb trumpet and piccolo trumpet demonstrating the techniques of pitch organization explored in this research project:

   - Improvisation No. 1 (recorded July 23rd 2020)
   - Improvisation No. 2 (recorded July 23rd 2020)
   - Improvisation No. 3 (recorded August 19th 2020)
   - Improvisation No. 4 (recorded August 19th 2020)
   - Improvisation No. 5 (recorded August 4th 2020)
   - Improvisation No. 6 (recorded August 5th 2020)
   - Improvisation No. 7 (recorded August 7th 2020)
   - Improvisation No. 8 (recorded August 6th 2020)
   - Improvisation No. 9 (recorded August 7th 2020)
   - Improvisation No. 10 (recorded August 12th 2020)
   - Improvisation No. 11 (recorded August 16th 2020)
   - Improvisation No. 12 (recorded August 20th 2020)
   - Improvisation No. 13 (recorded August 27th 2020)
   - Improvisation No. 14 (recorded September 5th 2020)
2. This written exegesis. This text may be read after listening to *Assorted Drone Music Vol. 3* but can also be read on its own. Transcriptions and examples from the album are mentioned in Chapter Five of this text with time markers so a reader may refer to the specific audio examples in real time along with the text.
1. Introduction

1.1. Overview

This thesis poses the question: what can a contemporary improvising musician learn from the non-tonal pitch organisation techniques of the seminal Hungarian composer Béla Bartók? A wealth of research has been conducted – from within Bartók’s lifetime in the early twentieth century to the present day – in attempt to identify techniques, patterns and influences throughout his music, spurred on by Bartók’s own reticence to offer any comprehensive breakdown of his composition process. This study draws on the work of Bartók scholars, particularly Elliott Antokoletz, János Kárpáti, Erno Lendvai, Malcolm Gillies, Paul Wilson and Lazlo Somfai, to first come to an understanding of the theories that have been developed regarding Bartók’s musical processes before adapting a selection of theorised techniques into an improvisation practice.

This research is not motivated by pastiche and does not aim to offer a method for improvising musicians to play in the style of a Béla Bartók composition. Rather, it hopes to, by looking at theory and writings outside of the standard jazz pedagogy, gain insights into Bela Bartok’s techniques of pitch organisation and explore ways of transforming some of Bartók’s compositional techniques into melodically generative improvisatory skills. In doing so I hope to provide novel insights for other improvising musicians to use in conjunction with their personal musical language to generate new music. As such, the study is less goal-driven and is more concerned with the processes involved in developing improvisatory language. Were the aim of this study to audibly replicate sonic characteristics of Béla Bartók’s compositions, the research may have been more concerned with score study or deeply internalising a selection of Bartók compositions. I was less interested in emulation – a goal that may be achieved and measured – than I was in putting theory into practice: to follow processes to an unknown end.

The results of the research take the form of a collection of recorded music and this accompanying exegesis. This document will place the research in context, examine relevant literature, document the creative process through which the techniques were adapted for improvisation, and evaluate the creative outcome using analytical techniques.

1.2. Artistic background of the researcher

I am a trumpeter and composer focused primarily in jazz and improvised music. I completed my Bachelor of Music at Monash University in 2015 and I have worked on over 20 albums, some through major international labels including Blue Note Records and Sony Music Artists Inc. I have been active as a performer in Melbourne, Australia, Tokyo, Japan, and most recently Perth,
Australia. I have released six albums of my own music, the most recent being *Kiri* through ABC Jazz, and *Assorted Drone Music Vol. 1 and 2* in 2020. In 2017 I was awarded 2\textsuperscript{nd} place at the National Jazz Awards at the Wangaratta Jazz Festival and I have also performed often at jazz festivals including the Melbourne International Jazz Festival, Tokyo Jazz Festival, TILDE New Music Festival, Wangaratta Jazz Festival and Perth International Jazz Festival. Though I perform almost exclusively my own compositions, the predominant focus of my work is improvisation on the trumpet. I consider my main body of work to be my constantly evolving and highly personal vocabulary of improvisation and wide range of expressive devices on the instrument.

1.3. Context: Australian jazz and personal influences

Although the aim of this research is to develop new techniques of improvising, it is also necessary to acknowledge the background of the artist (myself) and how this background will come to influence the course, and results, of the research. My practice as a musician draws deeply from the distinctive stylistic influence of the local Australian jazz community and my teachers during my formative undergraduate years still hold a significant influence on my work. As an undergraduate I spent some time studying with trumpeter Scott Tinkler, whose pragmatic approach to atonal improvisation has had a profound impact on me. Seeing local musicians – notably Scott Tinkler, Paul Grabowsky, Marc Hannaford, Joe O’Connor, Erkki Veltheim and their collaborators – regularly perform their uniquely adventurous, honest, and questionably un-jazz-like music at local jazz clubs in Melbourne instilled in me an urgency to seek out and consume music outside of the mainstream standard jazz canon. The Melbourne jazz community seemed to me a community that valued individuality and sophistication of concept, aggressively rejecting derivation and discernible imitation. These influences, along with elements of my personal practice, influenced the four techniques that I chose to make the focus of this project.

1.4. Four techniques of pitch organisation

This study arrived at four melodically generative techniques of pitch organisation that could be applied to jazz improvisation. A melodically generative technique, in this context, meaning a technique that can used to generate melodic content.

1. Polymodal Chromaticism (from the primary source of Bartók’s own Essays)
2. Chromatic Compression and Diatonic Extension (also of Bartók’s Essays)
3. Perfect and Mistuned Structures (from the work of János Kárpáti)
4. Inversionally Symmetrical Pitch Structures (from the work of Elliott Antokoletz)
These techniques share two important characteristics. Firstly, they each offer a process of either generating melody or generating pitch content that can be used to construct melody; more specifically, they each can be used to construct non-tonal melody: melodic content that cannot be identified as following any diatonic pitch collection. Secondly, the four techniques all offer a different perspective regarding the process of moving from tonal to non-tonal pitch environments; in jazz language, these are four techniques of moving between inside (diatonicism) and outside (chromaticism). Bartók’s music demonstrates a fluidity of tonality that inspired this project in the first place, and this objective – to apply these qualities of tonal fluidity to my improvisation language – has inevitably influenced the selection of the four techniques.

This study is heavily influenced by the above-mentioned Australian musicians, both in concept and structure. There is no doubt that I wouldn’t have had the idea to look at the music of Béla Bartók, a composer in the western art music canon, as a resource for extending my improvisation practice had I not been familiar with the music and research of Hannaford, O’Connor, Maclean, Barry and others. And gratitude must be extended to Steven Bowler, my year twelve Music Styles teacher, who introduced me to the music of Béla Bartók in the first place. The four techniques will be explained in further detail and used to generate techniques of improvisation later in this document, and these techniques of improvisation are also demonstrated in the recorded component of the thesis.

### 1.5. Creative outcome: recorded improvisations

In order to evaluate and demonstrate the applicability of the four techniques, the thesis consists most significantly of a creative outcome: an album of music. The music is related to my solo project titled Assorted Drone Music in which I produce tracks of improvised trumpet accompanied by synthesiser drones and occasional collaborations with other improvisors. Moreover the music component of the thesis functions as an illustration of the techniques discussed in this paper, a practical demonstration of the theory put into practice. This written document is intended to accompany the creative outcome, providing the background of the research and the theory behind the work. The text contains the resulting drills and exercises compiled into one document, along with significant observations and details from the practice process, placed in context with current dialogue relating to improvisation and Bartók literature.

Through a process of trial and error and hours of recorded practice, this thesis aims to show how these four techniques can be used by an improvisor to generate music in real time. Chapter Two provides an historic overview of Bartók theory, noting omissions and limitations that informed
the selection of the four techniques. Chapter Three introduces the structure and design of the research, including foundational concepts and vocabulary used throughout the study. In Chapter Four of this paper, each of the four techniques is explained with reference to surrounding literature and examples from Bartók’s compositions, and in Chapter Five the development of each technique through practice is detailed with notated drills and practice referents. Chapter Five also connects the literature and theory with the musical component of the thesis, using annotated transcriptions of segments of the performances. Finally, Chapter 6 concludes the paper by summarising some of the key insights gained throughout the research and posing some further lines of questioning.
2. Literature Review

2.1. Overview

This chapter places the research in context by outlining the background and historical factors that this project draws upon. Firstly, the context of practice-led jazz research in Australia in the 21st Century, among which this project situates itself, needs to be acknowledged. This is followed by a cursory background examination of Béla Bartók himself, followed by an overview of the analytical writings relating to Bartók’s music that I refer to throughout the project.

2.2. Post-2000 jazz research in Australia

Maclean’s work (mentioned previously) is a part of what might be seen as a movement in the small world of Australian jazz research. Marc Hannaford’s 2011 master’s thesis “Elliott Carter’s Rhythmic Language: A Framework for Improvisation”, Joseph O’Connor’s 2016 PhD thesis “Developing Approaches to Jazz Composition and Improvisation Informed by the Dissonant Counterpoint Methods of Charles Seeger and Ruth Crawford”, Maclean’s 2018 PhD thesis “A New Way of Moving: Developing a Solo Drumset Practice Informed by Embodied Music Cognition”, Steve Barry’s 2018 thesis “Pitch-class sets, Serialism and Intervallicism, and the Integration of Systematic and Intuitive Music Making”: there is an observable trend, as the movement of practice-led research gains traction among jazz practitioners, of research that looks into western art music composers and other fields of academia and literature to inform and extend an improvising practice. This is not however to discount the influence of performer practitioners, notably the members of the Artisans Workshop and the Antripodean Collective, whose improvised music informed by 12-tone composition techniques inspired Hannaford’s research. And this review would be remiss without mentioning Andrea Keller’s The Bartók Project, a reworking of Bartók’s Mikrokosmos for a quintet of improvisors.

James MacLean’s definition of ‘Antripodean Improvising’ is of some relevance to my personal background as an improvising musician and to my formative experiences as a musician leading towards this project. The Antripodean Collective is a group of improvising musicians situated between Melbourne, Sydney and Brisbane which has contained musicians Marc Hannaford, Scott Tinkler, John Rodgers, Simon Barker, Ken Edie, and Paul Grabowsky. McLean’s definition of ‘Antripodean Improvising’, however, refers more broadly to a distinctive approach to improvisation embodied by these musicians and their extended collaborative circles, characterised by:

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• A predilection to foreground rhythm as a primary element of musical manipulation within improvisation;
• A highly developed, shared, rhythmic language, combining a nondiscriminatory approach to subdivision with fluent control of number grouping sequences;
• An aesthetic tendency towards obtuseness; manifestations of which include frequently eliding musical pulse and a general avoidance of unified musical activity;
• The combination of influence from many musical cultures, including Jazz, 20th century classical, Indian Carnatic and Korean shamanic music, wherein overt stylistic reference is avoided in favour of repurposing procedural knowledge, and;
• A democratic approach to improvisation, in which all ensemble members are expected to contribute equally, thereby eschewing any sort of soloist/accompanist duality.  

Many of my teachers at Monash University and personal heroes in the Australian jazz community are strong exponents of the Antipodean style, and thus Maclean’s definitions offer a highly relevant backdrop to this research. Particularly, the combination of stylistic elements from jazz, twentieth-century classical music, and traditional Eastern music cultures.

2.3. The appeal of Bartók’s music

Béla Bartók (1881-1945) was a Hungarian composer active in the early Twentieth Century. Bartók is known for his ethnomusicological work researching and documenting the folk music of Hungary and Romania, which is often credited for his unique voice as a composer. Bartók composed works for orchestra and chamber ensembles, many works for solo piano, six string quartets and some works for stage.

The music of Béla Bartók has attracted interest from analysts because of its apparent retention of residual tonal centricity within a musical context which is sometimes densely chromatic.

Whether it is in a brutal violence animating a sound material in fusion, or in a tranquil gentleness glowing in a halo of grating sounds and colours, Bartók is incomparable and remains unique.

The above two quotes – the first from musicologist David Cooper and the second from composer Pierre Boulez – demonstrate the universal appeal of Bartók’s music, drawing fervent academic analysis while retaining a universal, timeless beauty and wide appeal with audiences. Bartók’s six string quartets have been described as “the greatest since Beethoven’s” and “the most

30 Ibid., 16–17.
distinguished body of work in that medium since Beethoven”\textsuperscript{34}, and the Conerto for Orchestra and Music for Strings Percussion and Celesta remain popular orchestral repertoire around the world.

The music of Béla Bartók seemed immediately attractive to me as a source of inspiration; my personal introduction to Bartók’s music was in a high school music class, where I was presented with a score of Music for Strings, Percussion and Celesta to study alongside extracts from Erno Lendvai’s \textit{Béla Bartók: An Analysis of his Music}. This was my first introduction to structure and form within non-tonal music, and the elegance of Lendvai’s numerical analysis was deeply moving to me as a student. Throughout my education and career as a jazz musician, Bartók’s music has continued to inspire me; the themes of Music for Strings, Percussion and Celesta have always to me possessed a haunting beauty that seems to transcend their atonal surrounding. Even throughout my ongoing jazz education, I have not come across a jazz improviser who could demonstrate the same unique balance of dark, dissonant, and geometric angular symmetry and yet with an economy of melody and folk-song-like beauty. Inspired by these melodic qualities, the goal of this research was to examine Bartók’s music along with the writings of notable theorists to identify techniques and tendencies within Bartók’s compositions that can be repurposed as expressive tools in an improvisation practice.

\textbf{2.4. Chromaticism in Jazz}

One key concept that informs the background of this research is that of chromaticism in jazz improvisation. Chromaticism within jazz pedagogy generally refers to techniques of playing non-diatonic or chromatically altered material while improvising; notable jazz saxophonist and educator Dave Liebman offers the following helpful definition of chromaticism for jazz improvisors:

\begin{quote}
The artistry of [chromaticism] is dictated by the skill with which the improviser weaves these chromatic colors within and against the prevailing tonality creating another tapestry of contrasting harmonies and melodies. Chromaticism does not necessarily replace diatonicism, but co-exists alongside it... In the end, the artistic goal is to have more choices during improvisation and composing so that a deeper emotional and expressive palette can be realized\textsuperscript{35}
\end{quote}


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Visual metaphors such as Liebman’s *tapestry* and *palette* are rife in jazz pedagogy but a common thread is the portrayal of dissonance as *colour*, a desirable, necessary tool. For jazz improvisers, dissonance is a parameter to control with the use of melodic and harmonic devices; an improviser’s capacity for control over dissonance grants them a more fluid, expressive palette of melodic devices. Improvising musicians striving for individuality treat new systems of harmonic and melodic devices as tools and colours to add to their constantly expanding palette of expression. The “tonal centricity within a musical context which is sometimes densely chromatic”36 throughout Bartók’s music speaks to an applicability to improvised chromaticism; balancing tonal centricity with chromaticism introduces new methods with which to incrementally move between tonality and dissonance, and ultimately makes for a ‘deeper emotional and expressive palette’. The four techniques identified and investigated through this project each approach chromaticism in different ways; they provide various methods for moving between diatonic and chromatic pitch sets.

### 2.5. Bartók’s influence on jazz

I am not, it must be acknowledged, the first jazz musician to have studied Bartók’s music; Bartók’s influence has been widespread and well documented particularly (and most relevantly) in the jazz tradition. In recent years, there have been studies approaching Bartók analysis to inform jazz composition, most notably the work of Ramos37. These studies are of use when approaching the theory, however the application and results will be significantly different when applied to an improvising practice. John Coltrane was said to have practised improvising along to Bartók’s Concerto for Orchestra38, and Coltrane’s famous composition Giant Steps bears a curious similarity to Bartók’s harmonic axis system. Chick Corea has performed and recorded several of Bartók’s Bagatelles39 and Corea’s album *Children’s Songs*40 reference Bartók’s Mikrokosmos. Australian pianist Andrea Keller’s *Bartók Project*41 similarly performed and recorded adaptations of Bartók’s Mikrokosmos arranged for an improvising ensemble. In short, there exists plenty of precedent for jazz musicians approaching Bartók’s music for inspiration. Chick Corea and Andrea Keller’s

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36 Cooper.
37 Diego Alejandro Celi Ramos, ‘Polymodality, Counterpoint, and Heptatonic Synthetic Scales in Jazz Composition; and Its Application in an Original Piece Polymodal Jazz Suite for Quartet’ (University of Illinois at Urbana–Champaign, 2016).
39 Gary Burton Chick Corea, ‘Native Sense - the New Duets,” *(Stretch Records, 1997).*
40 Chick Corea, ‘Children’s Songs,’ *(ECM Records, 1984).*
41 Andrea Keller, “Mikrokosmos,” *(ABC Jazz, 2002).*
adaptations of Bartók’s compositions show a kind of homage, and anecdotal accounts describe some of the pioneering figures of jazz, Thelonious Monk, John Coltrane, Charlie Parker listening to Bartók’s music for inspiration but there has yet to be a documented methodology for approaching and applying Bartók’s musical language to an improvisational practice. This project aims to reach beyond these tribute projects and bridge the theoretical literature surrounding Bartók’s compositional techniques and a jazz improvisation practice.

2.6. Controversiality in Bartók research
Despite incessant attempts to codify an overarching system from Bartók’s compositions, there is still no consensus; quite the opposite – the field of Bartók analysis has splintered into countless schools, described by Somfai (1995) as “disturbingly uncoordinated and controversial”\(^5\). The persisting enigma of Bartók’s music is by no accident. As if in challenge to future theorists, Bartók wrote in 1943:

I was never concerned with general theories to be applied to the works I was going to write. Now that the greatest part of my work has already been written, there appear certain general tendencies, general formulae from which to deduce theories. But even now I would prefer to try new ways and means instead of deducing theories.\(^4\)

Notable Bartók scholar Malcolm Gillies marvels that “perhaps it is a measure of Bartók’s true greatness as a composer that his music can accommodate so many different approaches, yet, somehow, defy them all!”\(^4\) Theorists – Erno Lendvai, Elliott Antokoletz and others – have taken up Bartók’s challenge and continue to search for a fundamental, all-encompassing Bartók theory, while more conservative academics will admit that the goal is unattainable. The aim in reviewing literature, then, was not to necessarily search for the most correct framework, but to search for analysis and analytical frameworks that would be most applicable to my research.

Various Bartók study guides have been of great help in approaching the mountain of available literature. Elliott Antokoletz’s “Béla Bartók: A Guide to Research” provided a comprehensive summary of existing literature up to 1997\(^6\). Malcolm Gillies’ “Bartók Analysis and Authenticity” (1995) presents a chronological review of analysis with particular note to the historic availability of primary sources. Gillies notes that the widespread availability of Suchoff’s compiled ‘Essays’ from 1976 changed the landscape of Bartók analysis in the English-speaking world, leading

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to a renewed movement of authentic analysis.47 Iván Waldbauer’s article ‘Theorists’ Views on Bartók from Edwin von der Nüll to Paul Wilson’ (1996) breaks the chronology of Bartók analysis into “the Null phase, the Lendvai phase, the post-Lendvai phase, and the phase of recent American theorists”, while later conceding that “the post-Lendvai phase is the largest of the four…in which interest in pitch organization becomes paramount”48. More recently, Antokoletz’s 2016 article provided a useful summary of the “diverse, often conflicting interpretations [that] characterize the world of Bartók theory and analysis”49. Antokoletz summarises:

Studies include principles of traditional harmonic function, modality, polymodal chromaticism, polytonality, pitch-class set theory, atonality, and a new kind of tonality derived from the joining of the concepts of the interval cycle and inversional symmetry.50

David Walker’s Master thesis ‘Bartók Analysis: A Critical Examination and Application’ (1996) breaks down the history of Bartók analysis down to six major scholars: Malcolm Gillies, Elliott Antokoletz, Paul Wilson, Erno Lendvai, Lazlo Somfai and János Kárpáti. From these scholars’ work I narrowed the focus to a selection of four techniques that might be used in improvisation.

2.7. Choosing four techniques of pitch organisation

Out of the broad, divergent schools of Bartók analysis, the following scholars offer significant theories relating to melody and pitch organisation: Erno Lendvai, János Kárpáti and Elliott Antokoletz. Bartók himself also serves as a rich, albeit limited, resource on his own compositional processes. In a series of lectures at Harvard in 1943, Bartók described two major compositional processes involving pitch organisation within his own music; the first technique I address is polymodal chromaticism52 and the second is chromatic compression and diatonic extension53. For the third technique I have chosen to focus on János Kárpáti’s broad theory of perfect and mistuned structures54, or more generally mistuning. The fourth technique I address is that of inversional symmetry55, drawing on analysis by both Erno Lendvai and Elliott Antokoletz. These techniques are explained in full throughout Chapter Four of this paper with examples from Bartók’s compositions.

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47 Gillies.
49 Ibid., 3.
50 Ibid., 3.
52 Béla Bartók, Essays (University of Nebraska Press, 1995), 367.
53 Ibid., 581.
To choose the aforementioned four techniques is to omit all other observed and theorised techniques in the music of Béla Bartók. However, it would be beyond the scope of this research to investigate and implement every observed and theorised compositional technique of Bartók. In order to stay true to the initial motivations of this research - my personal love of Bartók’s music - and to tailor the content to suit a practice-led study, it was necessary to narrow down the scope to a smaller number of theories that appealed to me on an aesthetic level, and which appeared to intimate a practical use in improvised music. The four techniques chosen each offer a method for constructing non-tonal melody, and each offer a method of moving between tonal and non-tonal pitch environments. I was originally drawn to Bartók’s music by the beauty of his melodies that seem at once violently atonal and tantalisingly lyrical - the haunting third movement theme of Music for Strings Percussion and Celesta,56 the opening cadenza to Violin Concerto No. 1,57 the cadenza passages of Miraculous Mandarin,58 - and such melodies remain the driving inspiration of the research. It was helpful to continue to relate analysis back to my favourite compositions to make sure I was staying relevant to my initial goals and keeping with the facets of Bartók’s musical aesthetic I wished to embody within an expanded artistic practice. The four techniques also seemed, when viewed through the lens of jazz improvisation, to present novel possibilities for melodic improvisation.

2.8. Overlap with existing jazz theory
As has been acknowledged, chromaticism is nothing new to jazz improvisation. Polymodality, in application to jazz improvisation, runs the risk of overlapping with the common improvisation technique of superimposition; Liebman writes on the topic of chromaticism that “[superimposition] means that the improviser is thinking and hearing in a contrasting key or tonal center at the same time (s)he is operating in the given home key”59. Similarly, symmetrical scales and patterns have been used by jazz improvisers since John Coltrane discovered Nicholas Slonimsky’s Thesaurus of Melodic Scales and Patterns.60 Slonimsky’s book of symmetrical scales and patterns, published in 1947, has been used as inspiration for musicians throughout the

59 Liebman.
60 Nicolas Slonimsky, Thesaurus of Scales and Melodic Patterns (Schirmer Trade Books, 1986).
twentieth century; Demsey writes “Slonimksy may be the most direct link between John Coltrane and structural principles of the late nineteenth century”⁶¹.

The concept of expanding the range of a melody has been explored in further depth since Bartók’s time, most notably Stockhausen’s Mantra (1970) in which scales are expanded over time to eventually take up the entire piano keyboard. In Mantra, the intervallic material is gradually expanded from very small intervals (seconds and thirds) to very large intervals (up to multiple octaves). Stockhausen’s use of expansion also extends to the duration of each note too, compressing durations down to three seconds and expanding to up to three minutes.

In the face of overlapping theory and use of similar techniques by other composers, and in order to maintain rigour and focus in this particular study, it was therefore important to remain close to the source material – the use of the techniques within Bartók’s music and the specific perspective of Bartók theorists - that way the practice remain grounded in Bartók’s real-world use of the techniques.

2.9. Omissions: Lendvai, GS proportional analysis, axis harmony
Erno Lendvai’s highly influential book Béla Bartók: An Analysis of his Music⁶² introduced two main concepts to the field of Bartók analysis. His proportional analysis claims that proportions of the Golden Section and as a derivative the Fibonacci sequence can be seen to guide the underlying substance of Bartók’s compositions; the most convincing evidence of simultaneous macro and micro-applications of the Golden Sequence is made from Lendvai’s in-depth analysis of the fugal first movement of Bartók’s Music for Strings Percussion and Celesta⁶³. More controversial however is Lendvai’s observation of the pentatonic scale as a manifestation of the [1, 2, 3, 5, 8] Fibonacci sequence; Kárpáti challenges the seemingly deliberate omission of the minor 2nd interval⁶⁴.

Lendvai also introduced the now widespread theory of axis harmony, through which chords and pitches separated by a minor third or tritone interval can serve the same tonal function and thus substitute for each other.

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⁶³ Ibid.
⁶⁴ János Kárpáti, "Axis Tonality and Golden Section Theory Reconsidered" (paper presented at the International Conference Held by the Bartók Archives, Budapest, 2006).
Lendvai’s theory of harmonic axes explains that a given tonality will generate a set of three axes: tonic, subdominant, and dominant. Lendvai (among others) posits that Bartók’s treatment of harmony often makes no distinction between major or minor. Within each of the three axes, all four axis points can be interchangeably used in their given function – either tonic, subdominant or dominant. Though never substantiated beyond speculation, it has been observed that John Coltrane’s Giant Steps and other compositions appear to follow a similar system of tonal substitution. Through Coltrane’s enormous influence, chord substitutions that seem to follow the axis system’s minor third/tritone relations have become almost commonplace with contemporary jazz improvisors, so it doesn’t seem likely that further investigation into uses of the axis system in jazz improvisation will yield any further results.

Another noteworthy contribution of Lendvai’s work to Bartók analysis is the observation of asymmetrical and symmetrical rhythmic patterns as a defining characteristic of Bartók’s music. This study may incidentally touch on Bartók’s rhythmic characteristics, but the focus is primarily on pitch-related techniques.

The four techniques investigated in this thesis – polymodal chromaticism; chromatic compression and diatonic extension; mistuning; and inversional symmetry – were the result of a thorough review of the field of Bartók-related analysis and theoretical writings. They will be explained and codified in Chapter 4 and developed further in Chapter 5. The following chapter, however, will describe the methodology and theoretical frameworks within which this project operates.

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65 Lendvai, 3.
3. Methodology

3.1. Research design

The research is designed to achieve the following two goals. Firstly, the research aims to extend my improvisation practice. To achieve this, a practice-led method is most apt; by using my practice as an improvising musician as a tool of research, I am able to directly apply the theory to my practice in real time and refine the techniques in response to real time evaluation. Secondly, the research aims to create new music. To this end, a documented performance will enable me to provide concrete examples of the results at its conclusion and provide a vehicle to disseminate the results to a wider audience.

![Flow chart of research design](image)

*Figure 2. Flow chart of research design*

The above diagram demonstrates the interwoven processes of reflexivity that guide the research process. Once the literature related to theories of Bartók's pitch construction have been reviewed and the techniques are refined, the standard process of practice begins. The practice will first be continually evaluated for efficacy, and all significant changes to the practice are chronicled in this exegetical document. Once performance using the techniques begins, an additional cycle of reflexivity begins wherein the performances provide valuable insight into the techniques and practice process. These insights inform both the ongoing practice and the insights of the research. The audio portfolio is a final, curated selection of recorded performances that demonstrate the emergent knowledge of the research; it is accompanied by this written exegesis, containing
additional insights about both the processes of inquiry and transcription-based analysis of the performance.

3.2. Practice-led research

One of the most guarded tenets of research is that for it to produce data or results that may legitimately be recast as knowledge, it needs to be either independently verifiable or self-evidently irrefutable.... In the performing and fine arts especially, the creation of new ideas and knowledge transcends replication... [For new ideas the arts generally depend upon idiosyncratic and subjective experimentation by individuals and collaborative teams.]

Burke and Onsman, in Disturbing Perspectives of Research in Music, observe a conflict between the traditional expectation for research to be replicable and the work of performing artists who regularly create valuable knowledge through their highly individual and therefore unreplicable artistic practice. This conflict has predicated the need for a theory of practice-led research that encompasses the work of artist practitioners as knowledge-creators.

In music, as in most knowledge domains, new data is generated primarily by experimentation... Improvisation in jazz is a specific form of experimentation; one in which a jazz sensibility, the jazz canon, and the jazz tradition are mostly adhered to but often challenged.

To Onsman and Burke, the act of improvisation is a form of experimentation in itself. The vast reserves of knowledge created through the experimentation of improvisors across the history of jazz improvisation cannot be denied or understated; it stands as a testament to the creative power of improvising musicians to learn from previous innovators, challenge accepted norms and pass their innovations to the next generation.

The double articulation between theory and practice, whereby theory emerges from a reflexive practice at the same time that practice is informed by theory... is central to practice-led research.

Barbara Bolt’s conception of practice-led research as being a reflexive process through which knowledge is generated by the artist, while external theory informs the artistic practice, resonates strongly with my own artistic practice. In reflexive research, the artists themselves are crucial to the process of knowledge acquisition; inevitably, the results are as dependent on my personal experiences as they are on any other procedural considerations. Because jazz improvisation

67 Ibid., 205-06.
involves the unconscious use of procedurally developed motor programs\textsuperscript{69}, the improvised results of the research will unavoidably demonstrate pitch material, motifs and rhythmic content that I have spent time in the past developing. In short, everything I have practised, performed, listened to or experienced up until this point will have an influence, however small, upon the results of the research. It won’t be possible to suppress pre-existing auditory and motor patterns from my improvisation; melodies, rhythms and intervallic material I have practised in the past will intermingle with the new material in unforeseeable ways. For this reason, the documentation of the practice process will take the form of a recorded audio and written notes that document the incremental changes that occur within my improvised playing from the start to end of the research period.

The aims of this study can therefore only be met with practice-led research techniques due to the following reasons: Firstly, the experiences of a practicing artist are indispensable to creating innovation in an artistic field. Secondly, the process of experimentation – central to the generation of new data – is a highly individual process within the field of music, particularly improvisation; in short, the research tools are the tools of my individual artistic practice. Finally, the research aims to create not just knowledge, but art – in this case music – which can only be achieved through a personal, developed artistic practice. The dual-form integration of artwork and accompanying exegesis has been found to be a solution to both the inarticulacy of art on its own and the futility of writing on art, as Bolt explains:

Praxical knowledge takes a number of forms and it is this multiplicity that provides creative arts research with its distinctive character. Whilst the artwork is imminently articulate and eloquent in its own right, tacit knowing and the generative potential of process have the potential to reveal new insights: both those insights that inform and find a form in artworks and those that can be articulated in words.\textsuperscript{70}

The knowledge that emerges through creative arts research takes the form of artwork itself and the written exegesis. Each is necessary as together, they are able to present insights into the processes and practices that create art. In the case of this thesis, the audio component comprises the artwork and this written text the exegesis. Viewed together, they may offer insights into the processes undergone throughout the research.

3.3. Practising improvisation: automaticity
Within an improvisor’s practice resides the essential process of practising – the act of perpetual development and self-examination through which an improvisor develops new language and concepts, usually in isolation and removed from an audience. Beyond the physical demands of each instrument, how does one practise improvisation? Jeff Pressing’s Improvisation: Methods and Models introduces the valuable concept of automaticity, which in Pressing’s words

...can be simply viewed as a natural result of considerable practice, a stage at which it has become possible to completely dispense with conscious monitoring of motor programs, so that the hands appear to have a life of their own, driven by the musical constraints of the situation... In a sense, the performer is played by the music.71

This resonates with my own approach to improvising and to practise, which consists largely of repetitive practice of specific pitch material and processes over long periods of time. This approach allows me to develop the ability to incorporate the material into an improvisation up to very fast speeds (at the point at which it becomes impossible to process and audiate individual notes in real time). I consider material to have been incorporated into my improvising vocabulary when it may appear by in a performance without conscious, deliberate thought. Hargreaves (2012) observes that “jazz practice shows that... the re-emergence of the ideas in the form of audiated fragments during improvisation occurs without conscious direction”72. Facility at high speeds is to me an indicator that knowledge has made the transition from theoretical knowledge to Merleau-Ponty’s “knowledge of the hands”73.

Pressing observes that “automaticity in improvisation can be frequent in both free and highly structured contexts, since task requirements are often self-chosen”74. In other words: due to the personal and expressive nature of both idiomatic and non-idiomatic improvisation, the process of developing automaticity remains the same and only the material differs. The treatment of improvisation as a collection of motor programs has been more recently elaborated by Norgaard in his article “How jazz musicians improvise: the central role of auditory and motor patterns” (2014). Norgaard applies Schmidt’s schema theory of ‘general motor programs’ to jazz improvisation, concluding that an improvised performance consists of chains of motor programs that control varying combinations of pitch, rhythm, timbre and other musical parameters75.

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74 Pressing, 9.
75 Norgaard, 272.
and Hargreaves support the notion that improvisation, particularly in jazz, is fundamentally constructed from material that musicians practise with the goal of automaticity.

3.4. Practising improvisation: woodshedding

In *Improvisation: Its Nature and Practice in Music*, Derek Bailey describes his own practice methods, which involve a combination of technical practice and what Bailey describes as woodshedding: the stage of practice by which learned material is integrated into improvisation, through a highly personal process of chaining motor programs in new and creative ways with old, pre-existing material. In Bailey’s words:

> ...woodshedding... the bridge between technical practice and improvisation. As personal as improvising itself, it approximates to it but is really quite different... The playing might be much the same as when improvising but the focus of attention will be on the details of playing rather than on the totality, and what is being exercised is choice.\(^7^6\)

From Bailey we can surmise a second method of practice, one that is much less rigid than the technical, repetitive practice suggested by Pressing, Norgaad et al. Bailey’s woodshedding is described as improvisation within a controlled environment, with potentially predetermined goals. The musician will improvise with a focus on specific details, and – through exercising the process of choice itself – become more accustomed to making specific musical choices during an improvisation. When the improvisor later engages in performance, these musical choices will be more readily accessible. Through this process a musician can consciously develop new habits and develop over time a highly personal voice as an improvisor.

Jeff Pressing’s concept of the referent is helpful when it comes to designing a routine of practising improvisation, especially regarding this practice of woodshedding. A referent is defined as the "underlying formal scheme or guiding image specific to a given piece, used by the improviser to facilitate the generation and editing of improvised behaviour"\(^7^7\). For an improvisor, a referent can be anything – notated or graphic, physical or imagined – that guides the improvised behaviour or activity:

> The relationship between improvised behaviour and referent is variable. It may be imitative, metaphoric, allegorical, antagonistic, canonic, contrapuntal, variational or independent, just to mention a few possibilities; and the time scale for behavioural response may vary from very short to long. In strict improvisation contexts compatibility between referent and behaviour is continuous, in freer contexts the expressive continuity of the improvised material may cause temporary abandonment of the referent.\(^7^8\)

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\(^7^8\) Ibid., 348.
This research draws on the concept of the referent both in practice and in performance. A practice referent can take the form of scores, diagrams, or merely written directions that direct the process of improvised practice. In performance, the referent most often takes the form of a notated composition, a set of chord changes or simply a melody to launch the improvisation from. In the case of this project the performance referent may be as simple as the concept of symmetry or the concept of mistuning, and it is important to note that ‘temporary abandonment of the referent’ mid-improvisation is to be expected and demonstrates a freedom of expression indicative of having incorporated the techniques into one’s language.

Through a combination of technical practice and deliberate, controlled improvising in the practice room, an improviser can develop and expand their expressive palette. This research applied concepts of Pressing, Norgaard and Bailey to pitch material and techniques derived from the music of Béla Bartók. After examining and coming to an understanding of each technique, this study evaluated whether a repetitive technical practice method or a looser, woodshedding practice method was more effective in putting the technique into practice. It was necessary to devise practice referents to guide these looser improvised practice methods, and notated exercises for the technical, repetitive practice. I aimed to add new vocabulary to my improvisational language that integrated the elements of Bartók’s music that resonate with me; in particular, the melodic and harmonic devices Bartók used to incrementally move in and out of dissonance. I have come to anticipate Bartók-like melodies that help construct atonal melodies that have a discernible internal logic and most importantly, beauty.

3.5. Tools for discussing the creative output: reflexivity, transcription

In August of 2020, in the final stage of the research, I began a daily process of recorded improvisations in order to document the practical usage and generative power of the four techniques. In addition to providing a snapshot of where the techniques had come, these recordings – which should also be thought of as the first performance of the techniques – also alerted me to some shortcomings of my practice. This reflexivity is key to any improvisers practice; a technique or concept is workshopped and developed in the practice room but evolves through performance. As Bailey writes, in practice “the focus of attention will be on the details of playing rather than on the totality”79. It follows that in performance the attention shifts back from the details to the totality. When the improviser is focused on creating music, painting in broader strokes of cohesion, variation, tension, resolution, or any number of aesthetic devices –

79 Bailey.
intentionally or not – these techniques start to interact with each other in unintended ways, often revealing a new possibility of developing a concept further. These insights manifest in new developments in the practice room, and the cycle of reflexivity begins anew.

Transcription – named by Laurent Cugny in *Analysis of Jazz: A Comprehensive Approach* the primary and crucial (yet problematic) tool of jazz analysis[^80] – plays an important role in evaluating the performance output. To demonstrate the emergence of this study’s techniques in the performance, segments of the improvised performances will be transcribed to notation, illustrating pitch structures and scales relevant to the research.

Pitches are often the most objective elements, the ones that are least subjective to interpretation. Options frequently occur, though, for notes the emission of which are problematic... or those the pitch of which varies in a very short time. It is also sometimes necessary to make choices with regard to enharmonic in the case of fixed identified pitches[^81]

Cugny warns of the agency of the transcriber in affixing enharmonic decisions to pitches in transcription, which can alter the perceived function of a pitch in relation to harmony. This is of particular relevance to this study in which pitch structures and function play a central role. Fortunately, as the performer I have a unique insight into the intended harmonic and enharmonic function of the notes, however the danger of mis-assigning enharmonic qualities remains.

Cugny advises that “the objectives of the analysis determines the degree of comprehensiveness required from a transcription”[^82]. The objectives in this case are concerned almost entirely with pitch content, so the transcription will often take the form of pitch sequences alone, ignoring metre and bar lines. This speaks to the strengths of transcription as an analytical tool; problematic when aiming to represent or embody a performance in full, but indispensable when used to restrict the parameters of analysis to a set of values. It is only necessary to remind oneself that “a descriptive score is only a report on the work itself and can never fully account for it. Transcription gives the image of the work but neither carries nor embodies it”[^83].

Informed thus of the dangers and uses of transcription, I arrived at the following notation scheme. Where possible and feasible, the notation reduced transcribed excerpts to pitch content alone. This served the objective of illustrating each technique, as they were each first and foremost techniques of pitch organization. They were therefore best illustrated by a notation scheme that

[^81]: Ibid., 395.
[^82]: Ibid.
[^83]: Ibid.
foregrounded the pitch content, as any attempt to accurately notate the rhythmic content would only serve as a distraction.

Where it was necessary to illustrate pitch relations, a numbering scheme was used, starting from 1 (the tonic pitch) and ascending to indicate scale degrees for the techniques of polymodal chromaticism, compression and extension, and mistuning, because these three techniques are concerned with pitch in terms of scale degrees.

Figure 3. Notation example: Pitch reduction numbered in scale degrees

In Figure 2 above, the pitches are presented devoid of almost any rhythmic information, just in order of sounding. The only rhythmic information visible is the notation of extended notes as hollow (minim-appearance) and all other notes as solid (crotchet-appearance). This is to assist the reader to follow along with the examples in the audio, without distracting from the foregrounded pitch content. In the example above, each note is numbered to demonstrate its equivalent scale-degree structure. The techniques shown in these examples are explained in detail in Chapter Four.

When discussing inversional symmetry, pitches are measured not in scale degrees but in distance from the central axis. In these examples, pitches are numbered in terms of semitones in distance from the axis pitch, which are indicated with a “0” (zero). For example, a note one semitone above the axis is numbered “+1” and a note one semitone below the axis is numbered “-1”.

Figure 4. Pitch reduction numbered in distance, in semitones, from axis pitch

In Figure 3, a set of five notes is, again, presented without any rhythmic information. Each note is numbered to demonstrate how many semitones above or below the axis pitch (“0”) it is. This technique, along with the others, is explained in detail in Chapter Four of this paper.

In the following chapter, the four techniques of pitch organisation will be explained, including relevant vocabulary and notation that will be used in Chapters 4 and 5. The design of the study means that over-abstractions are inevitable. As stated in the beginning of this paper, pastiche is not the goal of this project; the benefit of an open-ended process is that the results are unforeseeable, regardless if this runs the risk of treading on pre-existing theory. Intersections with
existing techniques for improvisation are acknowledged, explored, and commented on throughout the research; intersections with known techniques can often provide reference points and transferable ways of thinking and practising.
4. Techniques

4.1. Overview
In this chapter I will explain the four techniques addressed by this study, with reference to the surrounding theory and examples from Bartók’s compositions:

1. Polymodal Chromaticism
2. Chromatic Compression and Diatonic Extension
3. Mistuning
4. Inversionally Symmetrical Pitch Construction

Once the mechanisms of each technique are fully understood, we can move from treating them as tools of analysis to techniques for creating music.

4.2. Technique 1: polymodal chromaticism

A chromatically-altered note of a chord is in strict relation to its non-altered form; it is a transition leading to the respective town of the following chord. In our polymodal chromaticism, however, the flat and sharp tones are not altered degrees at all; they are diatonic ingredients of a diatonic modal scale.\(^{84}\)

The first technique Bartók himself explained is *polymodal chromaticism*, in which two modes are superimposed in order to create a 12-tone environment while retaining a modal, diatonic function within every pitch. By interchanging and alternating chromatically complementary modes – those that contain few or no common tones – Bartók was able to write modal music that included all 12 tones without approaching tone rows or serialism and while still retaining his folk music influences. Bartók demonstrates combining the Lydian and Phrygian modes; what results are distinctive melodies that balance folk-like tendencies with chromaticism. What distinguishes polymodal chromaticism from serialism, and other techniques that remove any kind of hierarchy from the 12-tone set, is that within polymodal chromaticism there does remain a hierarchy of pitch within the 12-tone set; within each modality there is a gravity towards a tonic pitch. The hierarchy is shifted, however, from a standard tonal environment, where scale degrees function as diatonic and chromatic notes function as alterations, to this polymodal environment in which none of the 12 tones are alterations. All notes exist as diatonic degrees of either one of the two concurrent modes and reside within their respective diatonic pitch hierarchy.

In this wider conception of modality all notes of the tonal system are equal - this, too, is a step towards free atonality - and the mode is chiefly determined by the relationship of the

\(^{84}\) *Bela Bartok Essays*, 357.
interval structure between the lowest and highest notes of the melody, and the prominence of repeated notes and final notes.\textsuperscript{85}

In Bartók’s Chamber Music, Kárpáti acknowledges that it isn’t enough to simply use the notes of two chromatically complementary modes. The tonal centre of each mode must be made clear by the melodic construction; interval content, repeated notes and melodic cadences must be used in a way to show the modes’ tonic pitch (whether sounded or unsounded). This is to reinforce the diatonic – not chromatic – roles of each note within the respective modal hierarchies.

Bartók’s Bagatelle No. 1\textsuperscript{86} is often cited as an example of polymodal chromaticism, with the right hand in C# Aeolian and the left hand in C Phrygian - almost completely chromatically complementary modes, missing only the D natural.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure5.png}
\caption{Bagatelle 1, measures 1-5}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure6.png}
\caption{Hybrid 11-tone collection from C# Aeolian and C Phrygian}
\end{figure}

In this case, the two modes do not start on the same fundamental note, however the tonal centre of each mode is made very clear by the range of the left-hand and right-hand melodies. In the right hand, the melody covers C#, D#, E, F# and G#, beginning on the C# and resting on the E (the third degree having a strong diatonic function); this clearly suggests a C# minor tonality. The left hand plays a repeated phrase descending through G, F, Eb, Db, and C, both times ending on the C.

Kárpáti’s observation that “the mode is chiefly determined by the relationship of the interval


structure between the lowest and highest notes of the melody
to a diatonic scale characteristic that, when superimposed or combined, result in 12 tones or close to 12 tones. A defining
characteristic is that each of the 12 notes are treated, not as chromatic alterations, but diatonic scale degrees. Additionally, the melodic treatment of the notes must suggest - through repeated or stressed notes, rhythmic cadences, melodic contours, or final notes – that they are indeed of a diatonic scale that begins on the same fundamental pitch. Moving from polymodal chromaticism as a framework of analysis to polymodal chromaticism as a process to generate music: one might learn to incrementally introduce polymodal chromaticism to an improvised melody, so that the melody line is uninterrupted as is the case with traditional jazz sidestepping techniques. Or a melodic improviser might learn to internalise chromatically complementary modes in order to introduce them over a pre-existing modal musical environment. These applications will be further explored in Chapter 5 as the techniques are put into practice.

4.3. Technique 2: chromatic compression and diatonic extension

The chromatic melodies of this style are, as a matter of fact, nothing else than diatonic melodies of the neighbouring areas, compressed into a chromatic level... The compression simply works in two directions: in horizontal distance for the melody, and in vertical distance for the intervals or distance between the two parts.

The second technique is what Bartók describes as the chromatic compression and diatonic extension of a melody. Through this process, the range of a diatonic melody can be reduced by compressing intervals smaller with a prevalence of semitone movement, and a chromatic melody can be extended into a diatonic or modal context by expanding intervals. Bartók uses this to create variations of melodic themes and also to maintain a sense of unity even when moving between diatonic sections and chromatic (atonal) sections of a composition. In diatonic extension, the melody consists of notes from a particular diatonic mode, usually using steps of major/minor seconds and major/minor thirds, although larger intervals can be used. In chromatic compression the melody maintains the same contour of the diatonic theme, but all intervals are compressed;

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87 Kárpáti, 170.
88 Bela Bartok Essays, 382.
whole tones become semitones, major thirds become minor thirds or major seconds, and so on. This is a result of a process of remapping a melody from a diatonic pitch collection to a chromatic pitch collection, maintaining scale degree relations. The compressed melodies lose all semblance of diatonicism and are able to fit into Bartók’s symmetrical, atonal harmonic worlds. This seems to have immediate applications to jazz improvisation; creating melodies and variations of melodies is a large part of improvisation and moving between chromatic and diatonic material is a standard method of creating tension and release in an improvisation. As Liebman writes, “one can only create tension in relation to the eventual resolution which inevitably occurs at some point in the music. This is why the ability to play diatonically in a credible manner is essential to the chromatic approach.” 89

![Figure 7](image1.png)

**Figure 7. Compressed fugal theme from Music for Strings Percussion and Celeste**

In figure 7, the fugal theme of Music for Strings, Percussion and Celeste is seen in the first movement in its chromatic/compressed iteration.

![Figure 8](image2.png)

**Figure 8. Extended theme from Music for Strings Percussion and Celeste**

In figure 8, the same theme later appears in the fourth movement of Music for Strings, Percussion and Celeste in its diatonic/extended iteration, in this instance mapped to Bartók’s commonly used acoustic scale (otherwise known as the Lydian Dominant mode). The melodic contour remains the same, but intervals are expanded as pitches are mapped to a diatonic mode.

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89 Liebman.
When both melodies are transposed to have a starting note of C, the contour is revealed to be an exact replica:

![Diagram of chromatic and acoustic scales with compressed and extended iterations of a theme from Music for Strings, Percussion and Celeste](image)

**Figure 9. Compressed and extended iterations of a theme from Music for Strings, Percussion and Celeste**

In Figure 9, the melodies from Movement 1 and Movement 4 are reduced to pitch alone. On the left is shown the pitch set (scale) derived from the melody, ordered and numbered in scale degrees from 1 to 7. The compressed iteration from Movement 1 follows a chromatic scale (though only within the range of seven steps) and the extended iteration from Movement Four follows the acoustic scale (otherwise called the Lydian Dominant scale). When the notes from the melody are represented numerically as scale degrees, we can see that the process of extension involves remapping the scale degrees from a chromatic pitch set onto a diatonic pitch set. Now that the process is revealed, we can move from analysis onto using it as a generative tool for improvisation. These applications are explored in depth in Chapter 5.

### 4.4. Technique 3: Kárpáti, perfect and mistuned structures

The phenomenon of mistuning may roughly be defined as small scale augmentation or diminution of perfect structures, or in a more definite form one semitone augmentation or diminution of the structures based on a perfect octave or fifth.90

János Kárpáti expands on Bartók’s own description of polymodality and introduces a new theory of mistuning. Mistuning stems from the concept of *scordatura* notation in which string instruments are tuned with one or more strings tuned a semitone away from the original pitch but made to play diatonic material; the result is that the musician plays with the inflections and phrasing they would use for the written material, but the pitch content is altered without their control. Kárpáti’s concept of mistuning as a compositional tool applies this principle as a way to distort a diatonic

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melodies into seemingly atonal structures with hints of diatonic coherence\textsuperscript{91}. Kárpáti demonstrates that Bartók replaces perfect intervals - 4ths, 5ths and octaves - with mistuned intervals, displaced by a semitone.

![Figure 10. Chart of perfect and mistuned intervals in semitones\textsuperscript{92}](chart)

It may be necessary to clarify that, despite what the name might suggest, mistuning does not involve alternate tuning systems, quartertones, or any other kind of microtonal technique. It functions in units of semitones – of equal temperament – that are used to augment or diminish intervals or pitch structures.

Kárpáti’s analysis helps explain how Bartók’s melodies set up and betray the listener’s expectations. Mistuned folk-inspired melodies seem initially predictable yet the crucial perfect structures - the 4th, the 5th, upper octave - are displaced by a semitone, resulting in Bartók’s signature haunting, dark melodies. When most pitches, except one or two mistuned pitches, suggest a recognisable major or minor mode, there can be a resulting uncanniness from the augmentation or diminution of individual isolated pitches. Applied to improvisation, mistuning appears to be a method to improvise Bartók-like angular yet folk-influenced melodies that blur the lines of diatonicism and modal improvising, and to introduce melodic characteristics into free, non-tonal improvising, without explicitly suggesting a particular tonality. Below, Kárpáti identifies two instances of a theme from Bartók’s String Quartet no. 5, first appearing mistuned and later appearing in its perfect iteration. When transposed to the same key the process becomes apparent; the fifth degree has been mistuned down a semitone.

\textsuperscript{91} Ibid., 367-70.

\textsuperscript{92} Ibid., 367.
In Figure 11 above, both iterations are presented transposed to the key of C for direct comparison; the fifth degree of the mistuned version is shown to be chromatically displaced downward while the rest of the melodic contour remains unchanged. This process, in which a melody appears at different points in a composition in both perfect and mistuned versions, seems – similarly to the technique of chromatic compression and diatonic extension – to offer a technique for adding variation to an improvised melody. A mistuned melody can add tension to a phrase, to be resolved with the voicing of its perfect version.

4.4.1. Degree wavering

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Kárpáti contends that the opening passage of Bartók’s Violin Concerto No. 1 demonstrate degree wavering in the key of B minor. Perfect diatonic steps of the 3rd and 5th (bar 3) and tonic octave (bar 8) are set up to be chromatically displaced, betraying the listener's expectations.

![Figure 13. Opening passage of Violin Concerto No. 1](image)

Figure 13. Opening passage of Violin Concerto No. 1

![Figure 14. Mistuned and perfect versions. Mistuned tones are boxed.](image)

Figure 14. Mistuned and perfect versions. Mistuned tones are boxed.

In the case of the above example, the perfect version is never voiced within the music. Kárpáti argues:

...not only the mistuned structures should be examined but also those which remain 'tuned', i.e. perfect tuning is the condition of mistuning. As a matter of fact, this is an immanent logical requirement because tuning is the condition of mistuning. It is naturally another question that there are many cases of mistuning where the tuned or perfect form does not appear but stands in an imaginary way in the background.

The process of mistuning then, doesn’t require the evident contrast between perfect and mistuned versions of a structure (melody, chord, pitch set). It can be used to generate material by mistuning an imagined perfect structure.

### 4.4.2. Mistuned scales

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94 “Violin Concerto No.1, Sz.36.”

In addition to the above examples of single mistuned intervals, Kárpáti introduced the concept of *mistuned scales*. Kárpáti frames passages such as the below (from String Quartet No. 5 mm 761) as 8-note scales with chromatically displaced upper tetrachords\(^96\). By mistuning the upper tetrachord of a scale, Bartók generates new synthetic octatonic scales – original eight note scales that have roots in traditional modes.

![Figure 15. Passage from String Quartet No. 5](image)

In Figure 13 above, the mistuned scales from String Quartet No. 5 are shown to be simply mistuned major scales, with the second tetrachord lowered (in the ascending scale) or raised (in the descending scale). Mistuned scales offer potentially novel melodic techniques, as much of my improvising draws upon scales and modes to generate melody. An improvisor may draw upon either one of, or a combination of, the degree-wavering of a single interval and the broader mistuned scales with up to four notes diminished or augmented.

\(^96\) Ibid., 370.
Kárpáti’s theory of mistuning as a technique of pitch organisation within Bartók’s music offers several possibilities for generating music, spanning from the mistuning of isolated notes in a structure, to the degree wavering of segments of a melody, to the construction of synthetic mistuned scales. Regardless of the results, Kárpáti’s theory presents another novel lens to approach chromaticism in improvisation. The applications of these techniques are explored in depth in Chapter Five.

4.5. Technique 4: Inversionally symmetrical pitch construction

Symmetrical pitch collections, which tend to negate those properties of traditional major and minor scales that establish a sense of tonality, have a fundamental function in many of Bartók’s works in establishing a new sense of pitch-class priority. 97

In The Music of Béla Bartók: A Study of Tonality and Progression in Twentieth-Century Music, Elliott Antokoletz introduces the notion of symmetrical pitch collections as an important element of Bartók’s music. The quality of symmetry, to Antokoletz, replaces traditional major and minor pitch hierarchies with the tonal centre offered by an axis of symmetry 98. To construct a symmetrical pitch collection is simple enough, Antokoletz explains:

Any collection of two notes is symmetrical, since the two notes are equidistant from an imaginary axis. If we join a second dyad to the first, with the first two notes of the second dyad equidistant from the same axis of symmetry, a four-note symmetry results. 99

Below are shown three examples of symmetrical dyads (collections of two notes), with an imagined axis indicated in parentheses. Equidistance is shown by measuring the distance, in semitones, from the imagined axis of symmetry. In the third example, the axis lies between the two pitches of Ab

98 Ibid., 67-76.
99 Ibid., 69.
and A but, as Antokoletz states, any dyad is symmetrical; the equidistance must then be measured in distance in semitones from the two-note axis in parentheses.

![Figure 17. Two-note symmetry](image)

The process can be extended further simply by adding additional dyads, of which both notes are equidistant to the same axis, to create a four-note symmetrical pitch set. Below are shown two examples of four-note symmetry – the first implying a single note axis and the second implying a mid-note axis:

![Figure 18. Four-note symmetry](image)

As a tool for analysis, these sets can be identified within Bartók’s compositions to illustrate a possible system active within Bartók’s non-tonal melodic writing; Bartók’s Bagatelle no. 13 *Elle est morte* demonstrates a clear and elegant use of transformational symmetry:
The left hand alternates exclusively between Eb minor and A minor triads (conforming to Lendvai’s axis theory suggesting that tritone-separated keys are functionally interchangeable in Bartók’s music – see chapter 3.6). The right-hand melody weaves together symmetrical collections of notes, stacking repeated intervals one above the other and folding in on itself in characteristic Bartókian style; pitch sets – see cell 2 and cell 3 below – are outlined and reinforced by repetition and by

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exploring the various intervallic relationships that can be found within each set. This treatment of
the pitch content makes the symmetrical nature of a pitch structure much more evident:

![Musical notation with annotations]

*Figure 20. Pitch content from right hand of Bagatelle 13, annotated*

The above figure isolates the right-hand pitch content and identifies cells with inversionally
symmetrical qualities. Each pitch is annotated with a measurement in semitones from a central
axis, sounded or implied. They allow for both a single-pitch axis, and of an axis that exists between
two semitones. In cell 4, the central axis of Bb is sounded and indicated with a 0. For the rest of the
identified cells, the axis is both unsounded and lies between pitches; for example, the central axis
of cell 1 exists between a C# and D, and the central axis of cell 2 lies between the A and Bb. Both
four-note sets confirm to Antokoletz’ guidelines for symmetrical pitch construction, consisting of
two dyads, each equidistant from the axis pitch. This equidistance can be determined by the
positive (ascending) and negative (descending) intervals being numerically balanced.
Antokoletz’ work is also highly concerned with the function of interval cycles:

In traditional tonal music, composers worked according to a system in which the octave was divided into unequal parts... In contrast, the pitch relations in Bartók’s music are primarily based on the principle of equal subdivision of the octaves into the complex of interval cycles... In Bartók’s music, the interval cycles and derivative symmetrical segments have an important function in the large-scale structure.\textsuperscript{102}

For Antokoletz, there are only six interval classes, each with a corresponding inversion. These six interval classes each generate an interval cycle that continues until it reaches the starting pitch again. For example, the semitone generates the 1/11 interval cycle, accounting for both the semitone (1) and its inverse the major 7\textsuperscript{th} (11). Likewise, the minor third will generate the 3/9 interval cycle – both the minor third (three semitones) and its inverse the major sixth (9 semitones).

\textbf{Figure 21. Lendvai’s diagram of Music for Strings Percussion and Celeste closing theme}\textsuperscript{103}

Lendvai makes similar observations, above using the closing theme of Music for Strings, Percussion and Celeste to demonstrate three interlocking 1:5 models in the construction of a melody\textsuperscript{104}. A 1:5 model is an interval cycle consisting of an alternating semitone and perfect fourth (five semitones). Lendvai’s observations of 1:2, 1:3 and 1:5 models overlap with Antokoletz’ observed interval cycles, generating melodic and harmonic pitch content through the interweaving of interval cycles and symmetrical cells; although Antokoletz considered the 1:5 models to be an example of four note symmetry he named the Z-\textit{Cell}.

\textsuperscript{103} Lendvai, 65.
\textsuperscript{104} Ibid.
Above, the theme is demonstrated to draw heavily from the 1:5 model (semitone and perfect fourth interval cycle), and the prevalence of consecutive fourths demonstrates the interval cycle 5 (perfect fourth).

Interval cycles and properties of inversional symmetry are largely presented as tools for analysis; however, they can be reversed into a tool for creating music, composed or improvised. Through some experimentation I arrived at some methods to incorporate techniques of interval cycles and inversional symmetry into my improvisation practice. These are discussed and evaluated in Chapter 5 of this paper.
5. Techniques in Practice

5.1. Practice routines
Informed by the theory observed in the previous chapter, I developed a collection of practice exercises with the goal of assimilating the above-mentioned melodic techniques into my improvisational language. The material itself was informed by the theory and analysis of Bartók scholars - particularly Antokoletz, Kárpáti, Lendvai and Bartók himself - and the methods informed by jazz pedagogists such as Hal Crook\(^1\) and Derek Bailey. Over the course of one year, I incorporated the techniques into my practice routines. Through a process of trial and error I came to realise which techniques could be applied using repetitive, technical practice – drills with the aim of achieving automaticity, or unconscious facility of the motor programs and processes – and which would require deliberate cognitive practice in the style of Bailey’s woodshedding, consisting of deliberate, directed improvisation practice. The practice processes were documented through a series of irregular journals, which monitored progress as well as alterations to the practice material that may arise. For example, a drill may be internalised much faster than anticipated, in which case I would further develop it to maintain and diversify the challenge, in keeping with the reflexive design of the research. The exercises were practised over a static harmonic backing. This involved drones of individual pitches and single prolonged chords. Practice over a drone makes the transition to playing in an ensemble environment easier and will allow my ears to acclimatise to the sound of these pitch techniques in a (basic) tonal environment; it is also immediately applicable to the frequent situations when I am performing in group improvisations with drone accompaniment or no chordal progression.

5.2. Techniques in performance: music for trumpet and synthesiser
Over the three years that I undertook this research - with some breaks as personal life interrupted on a few occasions - my musical tastes went through some changes. In 2017, my major artistic outlet was a more or less conventional jazz ensemble, consisting of a pianist, bassist, drummer, and myself on trumpet, for which I composed music that could very much be categorised as contemporary jazz. My compositions followed conventional jazz forms, with composed melodies interspersed with designated solo sections for one of us to play improvised solos over a set of prescribed chord changes. When I first had the idea to apply the music and techniques of Béla Bartók to jazz improvisation, I imagined using them in this context – conventional jazz.

improvisation over forms of chord changes. At the tail end of the project in September 2020, I found myself with different musical priorities to when I made the proposal in November 2017. My current primary creative output – the creative product to which most of my practice is dedicated - takes the form of completely improvised performance on the trumpet, with a strong focus on sustained sound, repetition, minimalism, and timbre. I think it is important to recognise that the research goals were originally conceived of with a very different creative outcome in mind. However, throughout the changes in my musical style, I remained focused on this research, experimenting with the techniques in my practice and finding new ways of practising and applying them to performance.

My most significant musical output of 2020 has been channelled into a project called “Assorted Drone Music” (ADM). ADM\textsuperscript{10} consists of a daily ritual of recording a short track - between 2 to 5 minutes - of trumpet improvisations accompanied by various different textures. Some consist solely of a single line of trumpet improvisation, some feature a synthesiser drone as accompaniment, and others include multiple lines of trumpet improvisation, recorded over multiple tracks. The main ethos of Assorted Drone Music is that I record only a single take; this is somewhat inspired by the philosophy of ensô from Zen Buddhism, in which a circle is painted in one stroke, then left unaltered as a reflection of the artist and the moment in time it was created. This change to my musical practice was influenced by the lock-down laws of 2020 and restrictions on social gatherings which made live music performance and ensemble rehearsals unfeasible from March 2020 onwards, so in itself is a reflection of the moment in time it was created.

To demonstrate the four techniques - polymodal chromaticism; mistuning; chromatic compression and diatonic extension; and inversionally symmetrical pitch structures - I, towards the end of the process, recorded a series of tracks that use a single technique or combinations of multiple techniques as a focal point. The result is an album of music, all improvisations without preconceived arrangements, that by design reflects the results of my practice. The album contains tracks that express a single technique and also includes tracks that express multiple techniques simultaneously. Excerpts of these tracks are transcribed and annotated in this chapter, demonstrating the ways the techniques emerged through improvised performance. Some improvisations are accompanied by prefabricated synthesiser drone tracks, some consist solely of solo trumpet improvisation and others contain multiple trumpet tracks, and all demonstrate some combination of the four techniques.

The lack of chordal accompaniment takes this project further away from traditional jazz.

music, but many examples of non-chordal jazz improvisation exist through the history of the genre. Ornette Coleman, while he wasn’t the first to make non-tonal or non-chordal improvised jazz, coined the term ‘free jazz’ with his 1960 album *Free Jazz*. In his 1980 book *Improvisation*, Derek Bailey makes a distinction between free jazz and *non-idiomatic improvisation*. While free jazz improvisors are defined by how they pulled away from traditional, tonal jazz language, free jazz improvisation still has roots in the idiom of jazz. Bailey’s non-idiomatic improvisation eschews any idiom at all.

The music that will result from this study will draw from both the long tradition of non-tonal free jazz improvisation and non-idiomatic improvisation. This study hopes to produce new techniques of improvisation that can be appended to the vocabulary of a practising improvisor, either from a jazz or a non-idiomatic background. For this broad purpose, the minimalist environment of ADM is a useful setting in which to present the techniques uncluttered by style or idiom.
5.3. **Exercise 1: Polymodal chromaticism**

The first version of my polymodal chromaticism practice was very specific. I applied some Hal Crook concepts and sketched some very basic melodic shapes and colour-coded the modal interchange. I chose to start with the Lydian/Phrygian mode pair because it was the pair that Bartók himself used as an example to demonstrate the technique in his Harvard Lectures. With most of the exercises to follow too, I used the examples in Bartók’s music as a starting point so that I began at least with a grounding in Bartók’s music.

![Figure 23. Initial practice design for polymodal chromaticism](image)

To practise the above exercises, one improvises a melodic line in consultation with the contour guides and mode guides. Starting on any pitch you ascend in steps when indicated and descend in steps when indicated. When the colour changes you switch from playing notes from one scale to the other; in a sense the element of choice is removed because there is a correct and incorrect answer when moving to the next note. When I went to improvise, however, I found it not at all conducive to creativity and it reminded me that the goal and real challenge would be to find techniques to improvise melodies that combine these chromatically complementary modes in a sufficiently sophisticated way that they retain the accessibility of modal music and yet the moment of modal interchange isn’t immediately apparent.

The next stage was to apply Bailey’s idea of woodshedding: less structured, improvisation with the primary focus on alternating between the two modes Lydian and Phrygian. I would open up to a file of the mode pairs and attempt to improvise melodies that moved between the two modes. After several weeks of practice, I found that the modal interchange is much less audible if it occurs midway through a melodic trajectory. For example, switching to the chromatically complementary mode midway through an ascending line or through a descending line. Pictured below is a sample melody that includes all 12 tones but retains distinctly modal qualities.
Figure 24. Modal interchange midway through melodic trajectory

I also found the technique less obvious too when the resultant melody avoided consecutive semitones. Consecutive semitones stick out as being non-diatonic and also disrupt the diatonic hierarchies of all the modal pitch content. These consecutive semitones could be avoided by, when possible, limiting the modal interchange to only occur on certain pivot points, the most obvious choices being the two common tones (the tonic and fifth degree) of the two modes.

Figure 25. Pivot points (common tones) of the Lydian and Phrygian modes

While the practice had thus far been limited to the Lydian/Phrygian combination as illustrated by Bartók himself in the Harvard lecture, it seemed prudent to investigate which other modes combinations are chromatically complementary in the same way. The modes of the major scale and melodic minor (also called the jazz minor scale) are the most commonly used in jazz improvisation and offer a wide selection of modal content, so I created an illustration below of all modes of the major and melodic minor scales with the number of resultant tones – how many discrete pitches are covered by the two modes when combined:
| Modes  | ion | dor | phryg | lyd | mixo | aeol | loc | mel min | dor b2 | lyd aug | lyd dom | mixo b6 | loc #2 | alt |
|--------|-----|-----|-------|-----|------|------|-----|---------|--------|---------|---------|---------|--------|------|-----|
| ion    | 7   | 9   | 11    | 8   | 8    | 9    | 12  | 8       | 10     | 9       | 9       | 9       | 11     | 12   |
| dor    | 9   | 7   | 9     | 10  | 8    | 8    | 10  | 8       | 8      | 11      | 9       | 9       | 11     | 9    |
| phryg  | 11  | 9   | 7     | 12  | 10   | 8    | 8   | 10      | 8      | 12      | 11      | 9       | 9      | 9    |
| lyd    | 8   | 10  | 12    | 7   | 9    | 11   | 12  | 9       | 12     | 8       | 8       | 10      | 11     | 11   |
| mixo   | 8   | 8   | 10    | 9   | 7    | 9    | 11  | 9       | 9      | 10      | 8       | 8       | 10     | 11   |
| aeol   | 9   | 8   | 8     | 11  | 9    | 7    | 9   | 9       | 9      | 11      | 10      | 8       | 8      | 10   |
| loc    | 12  | 10  | 8     | 12  | 11   | 9    | 7   | 11      | 9      | 11      | 10      | 10      | 8      | 8    |
| mel min| 8   | 8   | 10    | 9   | 9    | 9    | 11  | 7       | 9      | 10      | 10      | 10      | 10     | 12   |
| dor b2 | 10  | 8   | 8     | 12  | 9    | 9    | 9   | 9       | 7      | 11      | 10      | 10      | 10     | 10   |
| lyd aug| 9   | 11  | 12    | 8   | 10   | 11   | 11  | 10      | 11     | 7       | 9       | 10      | 10     | 10   |
| lyd dom| 9   | 9   | 11    | 8   | 8    | 10   | 10  | 10      | 10     | 9       | 7       | 9       | 10     |      |
| mixo b6| 9   | 9   | 9     | 10  | 8    | 8    | 10  | 10      | 10     | 10      | 9       | 7       | 9      |      |
| loc #2 | 11  | 9   | 9     | 11  | 10   | 8    | 8   | 10      | 10     | 10      | 9       | 9       | 7      | 9    |
| alt    | 12  | 11  | 9     | 11  | 11   | 10   | 8   | 12      | 10     | 10      | 10      | 10      | 9      | 7    |

Figure 26. Resultant tones between modes of the major and jazz minor scales

This chart arrives at the following seven combinations of modes that when combined generate 12 tones.

- Lydian Augmented + Phrygian
- Lydian + Phrygian
- Lydian + Locrian
- Ionian + Locrian
- Ionian + SuperLocrian (Altered)
- Melodic Minor + SuperLocrian (Altered)
- Dorian b2 and Lydian

In Ron Miller's *Modal Jazz Composition and Harmony Volume 1*, Miller lays out the following two guidelines for organising modes in terms of brightness and darkness:

1. The shifting of the semitones from right to left increases the amount of darkness
2. The increase of darkness is a realisation of the effects of alteration by “flattening”\textsuperscript{111}

Following Miller’s definition of darkness in modes, these seven sets can be organised with the light (natural second degree) on the left and dark (flattened second degree) on the right, and ordered vertically from light to dark - from least to most flattened degrees.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure27.png}
\caption{Seven chromatically complementary modal pairs ordered from light to dark}
\end{figure}

When ordered in this manner, we can see that the light modes on the left have all a natural second, sixth, seventh and - with the exception of the melodic minor - third degree, and the dark modes on the right all have a lowered second, third, sixth and seventh degree. To reduce the seven sets to subtle variations of the same light scale and dark scale suggests that, once aware of which set(s) lies adjacent, an improvisor can move between adjacent pairs by only altering a single note at a time. For example, if improvising in a Lydian/Locrian space, the improvisor may move to an Ionian/Locrian pitch space by only altering the fourth degree of the light mode. Once in an Ionian/Locrian pitch space, the improvisor may then move to an Ionian/SuperLocrian space by only

altering the fourth degree of the dark mode and so on. Once sufficiently experienced, the improvisor could freely move up and down the sets, further obscuring the individual modes.

Below are notated some short extracts from practice, transcribed from informal practice recordings. The pivot points are highlighted in purple, showing the moment the mode changes and also that effort was made to restrict my practice to only change modes on the specific pivot point tones.
Figure 29. Practice extract illustrating polymodal chromaticism using a selection of three mode pairs

At this point the practice is still treating the melodies as standing alone devoid of a harmonic context. Traditionally in jazz pedagogy, modal interchange is used to add tension by alternating between an inside mode and an outside mode. However, in this technique, both modes should have equal validity. When practising polymodal chromaticism it was important to maintain the equal weighting of both modes, and to not treat one as a temporary tension point to be resolved from. This ties back to Bartók's conception of the technique as a means to remove the transitory feeling of altered, or chromatic, pitches.

After internalising the chromatically complementary mode pairs and their pivot points (through a combination of repetitive practice and guided woodshedding improvisation), I was equipped to perform some improvisations using polymodal chromaticism freely, with a broader focus on the totality of the music; instead of the attention being predominantly directed to the execution of the technique, it can be focused on things like developing an improvised motif, creating form, timbral inflection and other intersecting processes.

5.3.1. Polymodal chromaticism in performance

Uses of polymodal chromaticism can be found in Improvisation No. 3, Improvisation No. 6, and Improvisation No. 12. Some notable examples are discussed below with reference to transcriptions and pitch reductions from the aforementioned tracks.

Improvisation No. 6 follows a loose exploration of the polymodal chromaticism technique, in the key of Bb, and uses various permutations of the light/dark mode pairs. In this example, there is only a single melodic line, so I intersperse pitch content from the light and dark modes. To this end the use of pivot point technique is apparent in this track.
In the above extract, the melody line moves primarily between the Ionian/Locrian mode pair and uses the common tones of the Ab (tonic) and Db (fourth degree) as pivot points to change modes. One pitfall of using polymodal chromaticism in this way – alternating pitch content in a single line of improvised melody – is that the improvisor might (as I did) fall into habits of chromatic superimposition and present either the light or dark mode as the *inside* and the other as the *outside*, which distracts from Bartók’s intent and use of the technique.

In Improvisation No. 12, I recorded myself improvising over two tracks, expressing polymodal chromaticism across two voices. The first track features a free improvisation using Lydian and Lydian Augmented modes, and the second track features myself again improvising along using the Phrygian and Locrian modes. I recorded the upper track on piccolo trumpet first, then recorded a second track of improvisation on Bb trumpet, reacting in real time with the first track playing through headphones. I chose these two pairs of adjacent modes – adjacent in Miller’s scale of light to dark and nearly identical with only one pitch different – as an experiment to see whether the subtle extra note would help slightly expand my expressive palette. This improvisation was inspired by Bartók’s Bagatelle No. 1, in which the right- and left-hand play chromatically.
complementary modes. The result was interesting, and I found my ears acclimatised to the sounds quicker than I expected. Because I was thinking in terms of the same tonal centre, both tracks gravitate towards the Bb tonic, resulting in some points of apparent tonal unity.

![Image of musical notation]

*Figure 31. Partial transcription of Improvisation No. 12 (0:14 to 0:31)*

In the above fragment, melodic phrases in both the upper (dark) voice and the lower (light) voice emphasise the tonic Ab pitch, often beginning and ending phrases on it – the prevalence of the repeated tonic pitch in both parts is shown in the annotated transcription; brackets indicate phrases that begin and end on Ab. As Kárpáti suggests, the effect of resolving to the Ab, one of the two common tones, is to strengthen the connection between the two otherwise very distinct pitch sets. It also demonstrates the difference between simply improvising with the directive of playing Ab Lydian and E Ionian. The results may well have been similar in terms of pitch content, but the shared consciousness of the Ab tonal centre between both voices manifests in the way the phrases resolve to the Ab and other key pitches. This places the technique distinct from jazz superimposition techniques, wherein the superimposed tonality is presented as at odds with the true key centre. As Bartók himself claims:

> These seemingly chromatic degrees... are totally different in their function from the altered chord degrees of the chromatic styles of the previous periods. A chromatically-altered note of a chord is in strict relation to its non-altered form; it is a transition leading to the respective town of the following chord. In our polymodal chromaticism, however, the flat and sharp tones are not altered degrees at all; they are diatonic ingredients of a diatonic modal scale.\(^{115}\)

\(^{115}\) *Bela Bartok Essays*, 367.
Using polymodal chromaticism, the chromatic degrees are not in conflict with each other and neither is presented as the inside or outside mode. Both light and dark modes are presented as equally valid – equally inside and equally outside - which makes this a very useful tool for an improvisor.

Polymodal chromaticism also affords the additional expressive range granted from accessing adjacent modes on the shifting scale of light and dark modes. As each light mode corresponds with two chromatically complementary dark modes and vice versa, the improvisor can access these additional degrees as expressive tools. In Improvisation No. 12, the upper line draws on both the Lydian and Lydian Augmented modes, using the natural and augmented fifth degrees to create motion and variation; when both the light voice and dark voice have a pair of modes to choose between, it opens up the possibility of chromatic tension and release within each voice, as each has the option of chromatically altering certain degrees within the diatonic twelve-tone environment. The lower line of the example above draws on both the Phrygian and Locrian modes, alternating the natural and diminished fifth degree for variation. The result is to avoid the feeling of stasis that may result in extended use of a single, unaltered mode, without detracting from the equal weighting of either voice; both mode pairs are equally valid – equally inside.

5.3.2. Polymodal chromaticism: Evaluation

From experimentation, I was able to use the technique of polymodal chromaticism by following the following steps:
1. Learning and understanding the existing sets of chromatically complementary modes
2. Internalising the modes and mode pairs through a process of technical, repetitive practice
3. Practising the process of modal interchange, using Derek Bailey’s concept of woodshedding to exercise the choice of modal interchange and restricting the point of modal interchange to only the designated pivot points

Further modal pairs can be discerned by assessing 12-tone resultant combinations of common modes. Through a process of evaluating the number of resultant tones when combining each of the modes of the major scale (Ionian) and the modes of the jazz minor (ascending melodic minor) scales, this study found seven mode-pairs that together resulted in all twelve tones being covered. This knowledge equips a musician (improvisor or composer) with a greater expressive range of sounds to use.

Using Miller’s categorisation of light and dark modes, the seven mode pairs can be grouped into two columns, light and dark, and within these two categories be ordered from lightest (most raised degrees) to darkest (most lowered degrees). This reveals that each mode has two
corresponding modes to pair with that can result in twelve tones, giving the musician another expressive device.

It was a positive result to find that polymodal chromaticism provides a very useful environment for 12-tone improvisation in multiple voices using modes in which neither is inside or outside. The improvised performance over two voices confirms that, as Bartók claims, chromatic notes do not function as altered scale degrees within polymodal chromaticism; they function as unaltered – and therefore inside – scale degrees. However, when using on one voice I found myself thinking of one of the modes as the inside and the other as the altered, or outside mode.

This inside and outside thinking shows the overlap between these techniques and jazz techniques of chromatic side-stepping. On the surface there is a similarity between improvising drawing upon two modes that cover twelve tones and the common jazz practice of temporarily playing material in a chromatically adjacent key to create tension through chromaticism. To me, the biggest difference lies in the shared tonal centre of the modes and the awareness that all pitches are diatonic scale degrees. To think in terms of inside and outside is to misuse the technique because it presupposes that one of the mode pairs is altered rather than an equally valid set of pitches.

Although examples from Bartók’s composition are not limited to 12-tone resultant mode pairs, my practice pursued primarily 12-tone combinations in order to limit the scope – I must also acknowledge that my mind personally found the 12-tone combinations much neater and more satisfying to pursue. A deeper investigation could expand the scope to 11-tone combinations or 10-tone combinations too. Further, the practice-led investigation was unable to implement the concept of shifting mode pairs suggested in 5.3, by which improvisor could move across all seven mode pairs explored in the study by following the adjacent pairs through common tones. This could be explored in future work. Messiaen offers examples of polymodality in The Technique of My Musical Language that use three superimposed modes14; further exploration of this technique could also consider the use of three or more voices, and the categorisation of twelve-tone-resultant mode trios and greater. This was beyond the scope of this project, however, but very similar techniques – that of determining 12-tone resultant modes, pivot points, directing multiple individual voices to use chromatically complementary modes – would be directly applicable to three or more voices too.

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5.4. Exercise 2: Chromatic compression and diatonic extension

The second exercise aimed to develop an ability to improvise, with increasing complexity, melodies in both chromatic/compressed and diatonic/extended variations. The first iteration of my exercise for this technique was to notate the equivalent scales. To start, I defined the chromatic/compressed scale as the first 7 notes of the chromatic scale, and the diatonic/extended scale as the acoustic scale (Lydian Dominant), because my primary example from Music for Strings Percussion and Celeste uses these two pitch sets. As with the technique of polymodal chromaticism, I used Bartók’s own example as a starting point from which I expanded the technique further.

The key to developing the skill of translating melodic material through chromatic compression and diatonic extension seemed to depend on considering the compressed 7-note chromatic scale and whichever extended diatonic scale to have equivalent scale degrees. In order to internalise the equivalent scale degrees, I notated the compressed scale on the left and the diatonic scale on the right, indicating with square brackets which scale degrees were equivalent between them. To begin with, I set myself a comparatively simple three-note range and expanded up to the entire seven-note range. Then repeated the exercise in all 12 keys.

![Figure 32. Referent for practicing transformations from compressed to extended phrases](image-url)
It became clear that this technique could not be internalised through simply learning scales by muscle memory, as the pitch content is generated in real time in response to previously improvised material. The technique of woodshedding, again, was necessary to exercise the cognitive process of translating a compressed phrase into an extended phrase and in the reverse. I would improvise a short melody using the compressed scale, then repeat it translated onto the extended scale. This was very challenging to start with, but after only about two weeks of practice, I noticed a significant improvement in translation speed, particularly up to five-note range. The next iteration of the exercise included the entire seven-note scales side by side in all 12 keys.

![Figure 33. Full notation of seven-note scales, both compressed and extended (partial extract)](image)

Translation in this context needs to be defined as the process of replacing notes of a melody with their equivalent scale degrees of the opposing pitch set. This translation needs to be instantaneous - as it will occur in real time improvisation - so the improviser needs to be constantly thinking in both languages (pitch sets) simultaneously. When the technique is successful for me, the chromatic translation is simultaneously audiated or visualised while I improvised a diatonic melody. The back and forth practice is a means to achieve accurate translation of pitch sequences between compressed and extended forms.

Another key observation from practice was that my mind started to develop key reference points. I found it very helpful to conceive of the first, third and fifth degree of the compressed/chromatic scale (the notes C, D and E) as reference points; reminding myself that an
extended major triad would compress into a three-note whole tone sequence. This is illustrated in Figure 29 below.

![Figure 34. Compressed and extended triad](image)

Having these reference points and internalising them across all 12 keys made it significantly easier to compress and extend other scale degrees. It should be noted that when referring to this technique, pitches are numbered in terms of scale degrees, beginning from one. At this stage the improvisor can extend the technique to any number of diatonic scales.

![Figure 35. A selection of seven-note scales, compressed and extended](image)

Below are some examples of improvised melodies from my practice:
At this stage I found it difficult to process melodies in my head that don’t begin on the tonic note. Further, the technique is so far limited to a very small range and doesn’t allow for descending below the tonic note. Another limitation is that the technique is still limited to such question-and-answer phrases as long as that is the only way I practice. Bartók’s most effective use of the technique is when the compressed and extended iterations of the melody appear quite distant from each other, and the effect is one of subtle unity. The example mentioned in Chapter Four shows the compressed theme occurring in the first movement of Music for Strings Percussion and Celeste, and the extended variation occurring in the fourth movement, creating a bridge between the far-removed sections.

A further development of the technique occurred to me, involving recontextualising extended phrases as compressed and extending them further – a ‘double-extension’. A simple illustration shows how the range would expand further.

From step 1-2, the phrase is translated from a chromatic/compressed scale to the diatonic/extended scale (in this case a major scale). In step 3 the phrase is recontextualised as steps...
of the chromatic scale, and in step 4 the same phrase is extended back onto steps of the major scale. I wrote the following practice referent to help conceptualise both extension and double extension of a melody:

![Chromatic/Compressed](image1)

![Diatonic/Extended (Aeolian)](image2)

![Double-Extended (Aeolian)](image3)

**Figure 38. Practice referent for double extension using C Aeolian**

Below is shown a transcription of an improvised practice following the referent shown in Figure 36 in the key of C Aeolian. In the excerpt, a phrase is translated from compressed form to extended form, then into double-extended form. A second phrase is translated from double-extended into extended form, then into compressed form, demonstrating that the technique can be used in both directions.

![Compressed/Chromatic](image4)

![Extended](image5)

![Double-Extended](image6)

**Figure 39. Practice extract demonstrating technique of double extension**
5.4.1. Chromatic compression and diatonic extension in performance

The technique of chromatic compression and diatonic extension can be found in Improvisation No. 5, Improvisation No. 10 and Improvisation No. 13. Some partial transcriptions and pitch reductions from tracks Improvisation No. 5 and Improvisation No. 10 are used below to demonstrate the use of the technique in performance and to illustrate some insights that emerged from the performance stage of the research.

In Improvisation No. 5, I perform an improvisation that uses the technique of compression and extension. It may be because I have yet to fully integrate it into my thinking, but the musical result was a set of call and response phrases, some compressed then extended, others extended then compressed. A prevailing result from this technique was that the way I had gone about practising the technique, in call and response, had an effective, but also restrictive effect on how I thought of it in performance.
Figure 40. Partial transcription of Improvisation No. 5 (0:10 – 1:19)

The above figure isolates the pitch content from a section of Improvisation No. 5. Compressed and extended variations of a phrase are boxed and identified. A few things are evident from the transcription. First is that the phrases still have a tendency to begin on the fundamental (tonic) pitch. For an improviser, constantly returning to the tonic note is very helpful to stay grounded and makes the translation process much easier. However, it may become a crutch that limits the range of expression if not challenged. Secondly, the improvisation opens with short phrases and extends to longer sequences of notes. This is probably because I was gaining confidence throughout, however it has an effective musical role in creating tension as the phrases get longer.

The technique of compression and extension is very effective as a disruptor, in that it functions as a tool that removes some agency from the improvisor. When the technique is engaged,
I find myself often surprised by the resulting compressed or extended sounds. When it is applied to several different modes, it becomes even more difficult to predict the results. This feels, to me, like proof that the technique is functioning as an autonomous process. When a technique is autonomous like this, the musician can trigger the process without audiating the specific notes that will result; the musician can enact a process of which the sonic outcome is, to varying degrees, unknown. Audiation refers to the process of imagining notes, melodies or other musical content, and writers such as Hargreaves have theorised that musical improvisation involves audiation immediately before playing or simultaneously while playing:

> Audiation-generated ideas appear to be unconsciously formulated but presented to the conscious mind in a manner that the brain mentally “hears” and processes without sound being present... Being able to audiate music is naturally a defining characteristic of audiation-generated ideas.¹¹⁵

My practice translating short phrases between compressed and extended pitch sets may have effectively trained me to audiate the technique – to hear and process the resulting compressed or extended variation of a phrase.

During Improvisation No. 10, it occurs to me to alternate range as well as translating between compressed and extended phrases. This may reveal something of the differences between woodshedding practice and improvised performance. In practice, the focus is on the process, whereas in improvised performance the focus is on the music. When the priority shifts from executing a technique correctly to making music, the technique and concepts develop in new unexpected ways.

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¹¹⁵ Hargreaves, 560-61.
Figure 41. Transcription of Improvisation No. 10 (3:20 to end)

The above transcription from Improvisation No. 10 follows pitch content of the extract, numbered in reference to scale degrees. The extended/diatonic segments indicate in this example degrees of the Bb Aeolian mode. In this figure, the beginning and ends of phrases are delineated by square brackets. The compressed and extended variations share, with a few subtle variations, the melodic contour with each other and this can be proven by annotating with numbers the identical scale-degree relations from compressed to extended variations. These variations often take the form of repeated notes or, in the case of the final phrase, omitted notes. The extract also illustrates that thinking in terms of scale degrees may have some pitfalls, for example when descending below the tonic (1st degree) note. In this case it is unhelpful to think of the Ab as the seventh degree of the diatonic set; instead, it must be considered as one step below the tonic – then it may be translated accurately. This can be extended to any number of degrees below the tonic, although it may reach a point beyond an octave or two octaves where it is unwieldy. With the potential for negative scale degrees, the tonic pitch should perhaps be thought of as an axis pitch instead. See Figure 42 below for an illustration of negative scale degrees:
Figure 42. Negative scale degrees mapped to diatonic and chromatic sets

Viewed in this way, the technique bears some similarity to that of inversional symmetry, in that both require a central point of reference. Unlike when constructing and using symmetrical pitch structures though, the central reference is not an axis of symmetry but the first scale degree, so will be numbered beginning from 1, not 0.

Figure 43. Pitch reduction of Improvisation No. 5 (1:53 - 2:42)

A similar phenomenon can be seen later in Improvisation No. 5. The second extended and compressed set in Figure 43 above descends to -1 (negative one scale degree) in both extended and compressed iterations. Both sets, unlike the previous two examples, demonstrate a less rigid use of the technique; rather than an exact remapping of the melody, what is carried across are the upper and lower limits of the phrase, in terms of scale degrees, and the general contour of the melody. In the second phrase, both iterations follow the shape [6, 5, 4, -1, 1, 6, 5, 4, -1, 1], with variation through repeated notes and leading notes. When the technique is applied to the fundamental
melodic shape and variation is created within compressed and extended iterations, the sense of continuity is retained but there is more scope for expression by the improviser. This opens up more possibilities for the technique to be used in less explicit ways and allows for an individual improvisor's creative interpretation of what consists the fundamental shape of an improvised melody.

5.4.2. Chromatic compression and diatonic extension: Evaluation

The process of practice-led inquiry revealed the process of translation as a necessary step in putting the technique of chromatic compression and diatonic extension into practice. This refers to the translation of melodic patterns from a chromatic/compressed to a diatonic/extended pitch environment while maintaining scale degree relations. It is necessary for the improviser to be aware – on some level – of the scale degrees of the improvised phrases, so that they can be transferred from one pitch set to another. In my experience, reinforced knowledge of key scale degrees – the 1, 3, 5, 7 – across both pitch sets are enough to develop some proficiency at the technique of translation.

This technique was one of the more difficult to put into practice because of this; proficiency of translation can’t be achieved through technical practice (perhaps my stronger area), only thoughtful, woodshedding practice. This practice involved careful improvisation with the compressed and extended pitch sets – scale degrees annotated – translating very short phrases from one to the other. These short phrases began as sets of two or three notes and with practice over time gradually extended up to 6 or more notes in a row. Because the technique produced new pitch sets in response to improvised material, it could not be addressed by writing and practising licks – predetermined patterns of notes; rather, it requires carefully directed improvised practice. The construction of – and adherence to – practice referents were very important in developing the technique within my improvisational practice. These took the form of pitch sets presented side by side with equivalent scale degrees made clear using numbers. This facilitated the act of translating sequences of notes from the chromatic set to the diatonic set (or the reverse). This process of remapping scale degree relations bears some resemblance to Seeger’s theory of melodic neumes explored by O’Connor\textsuperscript{16}; however, neumes are numbered in order of lowest to highest, not in specific scale degrees.

Looking further than the scope of this project, the technique could be extended in several ways. First, Bartók’s use of chromatic compression and diatonic extension in Music for Strings,

\textsuperscript{16}Joseph O’Connor, ‘Developing Approaches to Jazz Composition and Improvisation Informed by the Dissonant Counterpoint Methods of Charles Seeger and Ruth Crawford’ (Monash University, 2016), 41.
Percussion and Celeste places the compressed and extended variations of the theme quite distant from each other. For an improvisor to bring back a motif from several minutes ago, translated, would be an impressive and powerful use of the technique, however this would require further practice-led enquiry into the nature of audiation and memory. Secondly and more broadly, the technique of translation need not be confined to chromatic and diatonic pitch sets of 7 degrees. Once understood, it can be applied to any pair (or any multiple) of scales or pitch sets to generate variations of a melody. Lastly, my practice hinted at the possibility of a double extension and double compression technique but was unable within the scope of the research to develop any techniques or strategy to implement this idea into improvisation.

5.5. Exercise 3: Mistuning
The third exercise addresses Kárpáti’s concept of mistuning. Kárpáti observes mistuning occurring from individual notes to whole tetrachords (see Chapter 4.4), so the practice will explore a collection of increasingly mistuned pitch collections. To start with I explored diatonic collections with individual mistuned steps. I then extended the exercise to various synthetic mistuned octatonic scales, in which the upper tetrachord of diatonic modes is mistuned.

![Figure 44. Sketch of a selection of mistuned pitch collections](image)

I tried to implement the technique of mistuning a single note, by improvising over a single mode but allowing only a single note to be mistuned up or down.
### Perfect intervals and Mistuned intervals

<table>
<thead>
<tr>
<th>Perfect intervals</th>
<th>Semitones</th>
<th>Mistuned intervals</th>
<th>Semitones</th>
</tr>
</thead>
<tbody>
<tr>
<td>octave</td>
<td>12</td>
<td>augmented</td>
<td>13</td>
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<tr>
<td></td>
<td></td>
<td>diminished</td>
<td>11</td>
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<td>fifth</td>
<td>7</td>
<td>augmented</td>
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<td></td>
<td></td>
<td>diminished</td>
<td>6</td>
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<tr>
<td>major third</td>
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<td>fourt</td>
<td>5</td>
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<tr>
<td></td>
<td></td>
<td>minor third</td>
<td>3</td>
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</table>

**Figure 45. Perfect and mistuned intervals**

Kárpáti’s chart includes the octave, the fifth and the major third inside the definition of perfect intervals. When you apply each mistuned interval to a given scale you get the following six variations:

**Figure 46. Mistuned scale degrees**

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From the above variations on a major scale some immediately seem less useable; lowering the octave overlaps with a major seventh degree and raising a major third overlaps with the perfect fourth. When you apply this same process to other modes you result in several different overlaps.

![Figure 47. Mistuned scale degrees, overlapping degrees removed](image)

On the Lydian mode, the lowered 5 overlaps with the sharp four, and the lowered octave still overlaps with the major seventh.

![Figure 48. Individual mistuned scale degrees](image)

On the Aeolian mode, the raised fifth overlaps with the scale’s lowered sixth, and the lowered third overlaps with the natural second degree. Discounting the overlaps still results in some interesting possibilities for adding variation to a modal improvisation. Instead of thinking in terms of pitch sets, I approached the practice from a purely woodshedding perspective. The directive: to improvise using the scale as a pitch set and allowing the third, fifth and octave to be mistuned at any point in the music.
The extract from practice (transcribed from a recorded practice session) in Figure 49 above shows some improvised applications of single note mistuning. I started out by outlining the mode, highlighting the triad and resolving to the tonic pitch of C, before mistuning some individual scale degrees: first the tonic (raised), then the fifth (lowered) and finally the third (raised). I found it felt quite unnatural in the moment to resolve melodies down to a mistuned tonic (in this case raised) in particular, although listening back afterwards I found the resulting sounds quite successful; the process is not overtly audible to my ears (despite having played it myself, as a listener I am not consciously aware of any process or technique in place) yet trace elements of non-tonal harmony are introduced with each mistuned degree. This idea is further explored in performance – see chapter 5.5.2.

5.5.1. Mistuned scales

The study then moved onto looking at Kárpáti’s mistuned scales – scales with the top four notes lowered or raised by a semitone. The first experiment was to implement some mistuned scales into my technical warmup, in preparation for improvising with them. I practised the mistuned major scale in all 12 keys daily so that I wouldn’t have to think about the pitch content when I started improvising using the scale. Below is an extract from my practice in which I improvise using the G mistuned major scale.
Improvising exclusively within a single mistuned scale generates complex-sounding melodies that can be very lyrical. This may be because the mistuned scales allow for long, scalic phrases that contain a lot of familiar-sounding major and minor tetrachords, and yet the overall sound is somewhat alien and avoids suggesting a single major or minor tonal centre. The G mistuned major avoids a perfect fifth and, depending on the phrasing (repeated notes, stressed notes, or outer limits of the melodic range) can feel weighted to either G or Db, due to the coexistence of both the G and Db major tetrachord.

A number of other mistuned scales can now be generated by applying the same technique of raising or lowering the upper tetrachord of other common scales (allowing for, as Kárpáti does, the upper octave to count as the 8th degree). Below are notated some more examples of mistuned scales to experiment with. I chose to focus on mistuned scales that kept to semitone or whole tone steps; some raised tetrachords resulted in a minor third interval between the fourth and fifth degree, and some lowered tetrachords resulted in repeated notes. When the mistuned scale consists of entirely minor seconds (semitones) or major seconds (whole tones), there is less apparent a seam between perfect and mistuned: unaltered and altered. When there is a repeated note or a minor third between the perfect and mistuned tetrachords, it can be immediately obvious where the divide has been made. Keeping to major and minor seconds allows for stepwise melodies and long scalic runs similar to those observed by Kárpáti in Bartók’s music.
Under this restriction we can generate the following mistuned seven modes of the major scale:

And the same process can be applied to the seven modes of the melodic minor / jazz minor scale:
These scales can be found notated in all twelve keys later in Appendix 2. For me, scales are internalised through repetitive technical practice. When there is a scale or pitch collection I want to internalise so that it can be triggered effortlessly in an improvisation, I find a way to incorporate the scale in all 12 transpositions into my daily practice routine. For these mistuned scales, I used them as material to practise using my double-tonguing technique on the piccolo trumpet because this was a concurrent goal of mine at the time. I began with only the perfect and mistuned major scales, then added the perfect and mistuned melodic minor scales, and then the perfect and mistuned Aeolian scales.

Another result of experimenting in the practice studio was the realisation that the technique of mistuned scales can be used to add variation and tension to the original scale by alternating between the original pitch material and the mistuned scale’s pitch material. The result
allows for further expressive range; see below for a notated improvisation using the mistuned melodic minor with a lowered upper tetrachord.

These mistuned scales, once identified, can be internalised and applied using a process of technical practice; I simply practised each of them as part of my regular technical practice routine, playing each mistuned scale in all twelve keys until I no longer had to read from notation. I would play each scale in the key of F, then each scale in E, then descending chromatically until I reached F#. With new scales, I use extreme speed as another indicator of internalisation following memorisation (not having to read the written scales). If there is no barrier to play each scale as fast as my technique will allow, it has generally been internalised deeply enough to draw upon in improvisation.

5.5.2. Mistuning in performance

The technique of mistuning can be found in Improvisation No. 1, Improvisation No. 2, Improvisation No. 7, Improvisation No. 8, Improvisation No. 11 and Improvisation No. 14. In this section I will draw upon examples from tracks Improvisation No. 1, Improvisation No. 2 and Improvisation No. 14 to illustrate the ways the technique emerged in performance.
In Improvisation No. 1 I improvised using Bb Aeolian and mistuned Aeolian (raised upper tetrachord) scales. In performance, I found myself thinking of the mistuned scale variation very similarly to the technique of polymodal chromaticism. Without practising them, I noticed myself using pivot point techniques that I had developed for the polymodal chromaticism. The tonic and fourth degree of the scale function as useful pivot points for all of the mistuned scales, due to their 4+4 construction. In Figure 44 below, pivot points are indicated with vertical dashed lines.

![Figure 44. Partial transcription of Improvisation No. 1 (0:00 – 0:36)](image)

Above, the improvisation remains mostly within Ab Aeolian, however shifts temporarily into Ab mistuned Aeolian, using the tonic note of Ab as a pivot point. To return, the common tone of Db functions as a pivot point, making for a natural-sounding transition. Unlike polymodal chromaticism, there are several more available common tones with which to pivot between perfect and mistuned scales. Also, unlike polymodal chromaticism, the perfect/mistuned dichotomy fits neatly within the jazz language of inside/outside; it functions very well as a technique of tension and release, but on a subtler level than alternating completely chromatically complementary modes.

In Improvisation No. 2 I improvised alternating between Gb melodic minor and Gb mistuned melodic minor. The mistuned segments of the scales often function in the music as momentary, fleeting ornaments. They often manifest in transient, scalic runs between key notes in the improvisation. In the partial transcription below, the ornamental runs are notated with stems.
to indicate the prevalence of the mistuned tetrachord used as an ornament, particularly towards the end of the segment:

![Partial transcription of Improvisation No. 2 (1:06-1:25)](image)

Improvisation No. 14 began with composing a short melody using a pentatonic pattern (original handwritten sketch is shown below in Figure 44), spanning only six bars of 4/4, underneath which I annotated the direction “mess with 1, 3, 5, (7?)”. This means that the 1, 3, 5, and maybe 7th degrees are available to mistune: either by semitone augmentation or diminution.

![Composed ornamented-melody referent involving mistuning](image)

This is an example of what Jeff Pressing would call “The Ornamented Melody”:

Here a given melody is used as referent, and some aspects are changed while others essential to the preservation of its identity are maintained. Stereotyped ornamentation formulae typically develop, alongside free embellishment.\(^{118}\)

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\(^{118}\) Pressing, 458.
The composition here functions as referent, guiding the improvised performance by providing a starting point and direction for note choices, while leaving much of the rest unspecified. I recorded a performance over 4 minutes long of the performance with the directive in mind.

The above pitch reduction (written in Bb trumpet pitch) shows the various ways the degrees of the pentatonic structure were mistuned throughout the improvised performance. The downward arrows indicate a semitone diminution and the upward arrows indicate a semitone augmentation. The pitch material follows an A major pentatonic tonality - the 1, 2, 3, 5, 6th degree of A Ionian – with some passing use of the 7th degree. The technique is very effective on pentatonic sets, as any mistuning of a single degree disrupts the intervallic relationship of the rest of the pentatonic set and disturbs the nature of the whole set; unlike with seven-note scales, any of the five degrees of the pentatonic can be either raised or lowered without overlap with adjacent scale degrees.

5.5.3. Mistuning: Evaluation
The practice-based enquiry found two distinct techniques from the analysis of János Kárpáti: single-degree mistuning and mistuned scales. Single-degree mistuning involves the semitone augmentation or diminution of individual, key intervals; Kárpáti identifies the octave, fifth and
major third as common targets of mistuning. The second technique of mistuned scales involves the semitone augmentation or diminution of the upper tetrachord of a scale. I initially approached both single-degree and mistuned scales from a technical practice perspective. This was much more successful with internalising and putting to use the mistuned scales; as the technique generates mistuned variations of scales, a simple process of repetitive technical practice works to internalise and put the pitch technique into practice as an improvisor. The improvisor merely needs to refer to the notated mistuned scales in the appendix of this document, or to apply the same technique of tetrachord augmentation or diminution to any other scale.

The single-degree mistuning, however, was more difficult to put into practice using technical methods. I had some success approaching single-degree mistuning in practice using woodshedding techniques, giving myself directives to alter certain scale degrees. Another breakthrough occurred during performance when I devised a referent of a pentatonic melody with directives to mistune Kárpáti’s designated degrees – the octave, fifth and major third, which could now be raised or lowered at any point in improvisation. The single-degree mistuning should therefore be categorised as more of a cognitive process to be approached using focused woodshedding practice, with a limited pitch range (a pentatonic set or similar) to exercise the decision-making process in a freer, experimental setting. Because of the limited selection of pitches, having any single degree mistuned significantly alters the sound of the whole pitch environment. The presence of multiple thirds also reduces the risk of overlapping enharmonics as there is room for several notes to be chromatically augmented and diminished.

5.6. Exercise 4: Inversionally symmetrical pitch structures

The fourth area of practice addressed the goal of incorporating inversionally symmetrical pitch structures into my improvising language. Antokoletz proposes that the fundamental method of generating inversional symmetry within Bartók’s music is through dyads and dyad pairs. To Antokoletz and Lendvai, any dyad (a pair of notes) implies an axis of symmetry in its centre (for example, C and E implies a D axis of symmetry). By extension, any pair of dyads of the same interval implies an axis of symmetry in the centre of the central interval. This axis is either on a pitch or between two pitches (for example, C and F implies an axis between D and Eb).
Figure 58. Dyad pairs, with a middle interval of a semitone, whole tone or minor third

The first sketch I wrote consisted of three sets of six dyad pairs. The first line shows pairs of semitone dyads separated by an interval of increasing distance from 1 (a minor 2nd) to 6 (a tritone). The second and third lines follow the same pattern of increasing internal interval size but with pairs of whole tones and minor 3rds respectively. After some attempts to improvise using the notes it became evident to me that I was unable to work out the pitch sets in different transpositions, so I wrote out all twelve transpositions of the pitch sets, in order of the upper note of each central interval.

The second iteration followed all 12 transpositions of the first collection of dyad pairs. I found, however, that I wasn’t addressing Antokoletz’s key premise of tonality being derived from a single axis of symmetry. I experimented by notating pairs of pitches expanding from first a semitone axis, then a whole-tone axis, then a minor third axis of symmetry.

Figure 59. Diagram of inversionally equivalent intervals with three axes

After practising the third version, I found that the concept of a two-note axis was too difficult for me to internalise. I had also taken the concept too far removed from the applicability to
jazz improvisation; for that purpose, an axis of a single pitch would be sufficient to start with. It also became apparent to me that central to the goal of improvising inversionally symmetrical pitch collections is the internalisation of symmetrically equivalent intervals. If the axis is F, one must instinctually know that a D must be counterbalanced with an Ab, and a C with a Bb, and so on. I simplified the notation and allocated each symmetrically equivalent dyad a number to indicate the interval class from the axis.

![Figure 60. Mirrored intervals from a single note axis of symmetry](image)

I practised improvising melodies that combined multiple symmetrical dyads together, letting my ear guide which to combine. After several weeks of practice, I was able to conceive of collections of five note sets, consisting of the axis pitch and two symmetrically equivalent dyads. During practice, I found myself gravitating to certain sounds, at first the combination of the major fifth (7) and major 7th (11). I notated the resultant five-note set in all 12 keys and practised improvising using only the five pitches at a time.

![Figure 61. Mirrored major fifth and major 7th intervals](image)
After some weeks playing around improvising symmetrical melodies, I found there were some gaps in my interval knowledge; I had not yet completely internalised all the equivalent intervals. Particularly the major 6th and minor 7th. In order to solve this problem, I applied some more technical practice techniques in order to internalise the equivalent intervals in all keys. If I were to regularly include all equivalent intervals in all twelve keys as a part of my technical practice, I would surely eventually internalise every note’s mirror equivalent.

![Figure 62. Drill devised to internalize mirrored intervals in all twelve axes](image)

I settled on the above pattern as it encouraged me to associate the equivalent intervals without first referring to the axis pitch. The exercise takes some influence from surrounding techniques used in jazz voice leading, expanding outwards from the semitone (1) to the whole octave (12) on either side of the pitch axis. Once this surrounding pattern began to feel easier and I could play each key from memory I shortened it to only a single time on each interval.

![Figure 63. Advanced drill for internalizing mirrored intervals](image)

After some time, I had memorised the interval pairs of all twelve keys and I was better able to improvise melodies that followed an inversionally symmetrical pitch set. Below is a notated improvisation from my practice with four symmetrical cells identified. The extract centres around
the axis or tonality of Eb and the numbers above the pitches show the distance in semitones from the central axis pitch.

Figure 64. Annotated extract of practice using symmetrical pitch structures

Cell 1 consists of a 7-note collection, including the intervals a minor second, major third and perfect fourth above and below the axis pitch of Eb. It was the result of me trying to balance the descending melody with their corresponding ascending intervals. Cell 3 features the minor sixth (8 semitones) and major sixth (9 semitones) above and below the axis pitch, but without the axis present. It should be noted that these cells are for illustrative purposes; I was not deliberately conceiving of each cell during the improvisation; I was only consciously trying to balance descending intervals with their corresponding ascending interval, and ascending intervals with their corresponding descending interval. Other symmetrical pitch sets may also be observed from the same improvisation extract.
The results of the aforementioned practice showed, to me, that an important key to training oneself to improvise melodies that follow inversionally symmetrical pitch structures lies in first internalising the sets of inverse intervals. For my study, this involved devising repetitive technical exercises that covered all inverse intervals up to an octave, surrounding the central axis pitch. I used this content to simultaneously practice my multiple-tonguing technique; other musicians who are interested in following a similar technique are encouraged to investigate their own practice methods to find the best way to include the same interval material.

The second stage involved a kind of focused woodshedding improvisation practice wherein I improvised melodies with a very strong focus on balancing descending or ascending intervals with their corresponding inverse. This was both with a fixed drone of the axis note, and with no accompanying sound at all. For the sake of practice, it should not matter really how successful the improvising is, as long as the focus remains on inverse intervallic relationships.

5.6.1. Inversional symmetry in performance
The use of inversionally symmetrical pitch structures can be found in Improvisation No. 4, Improvisation No. 9 and Improvisation No. 13 of this thesis’ audio component. Below, I will use notated examples from tracks Improvisation No. 4 and Improvisation No. 9 to illustrate the how the technique and practised material emerged in these improvised performances, making note of any insights gained in the process.

Improvisation No. 4 features some symmetrical techniques, particularly around the axis of C, although the axis later shifts. Incidentally, this idea to shift axis mid-performance had never occurred to me during practice, and it opens up some new possibilities for creating tonal movement within non-tonal pitch environments. This was a result of reflexivity in play; when the priority moves from process to the musical totality, the techniques develop in unexpected ways. Another development was that the axis pitch was mostly unvoiced for most of the performance.
In the above transcription two cells are identified and numbered in relation to an axis pitch of Bb. Pitches are shown measured in terms of distance, in semitones, from the central axis in order to demonstrate symmetrical qualities. Improvisation No. 4 also featured a lot of double-tonguing technique. This goes to show that when a technical exercise is prescribed to internalise a pitch technique, the form of the exercise should be considered from a musical, aesthetic lens as it will influence how the techniques do emerge in improvised performance.

In Improvisation No. 9, beginning around the symmetrical axis of Eb, the improvisation starts simple, with individual mirrored intervals. As it goes on, it expands to two mirrored degrees at a time and then looser to less rigidly defined phrases that draw on symmetrical patterns: chromatic, octatonic and whole tone material.
In the above annotated transcription, two cells suggesting an axis pitch of Eb are identified interspersed with other, less clearly structured, material, among which can be identified some octatonic fragments. This less rigid use of the technique is where performance differs from practice; it is important in practice to limit the decision-making – what Bailey calls “choice” – to develop habits, but in performance these limits on choice should be removed. When this happens, the freedom of improvisation can reveal new connections with other musical ideas.

5.6.2. Inversional symmetry: Evaluation

The result of the two-stage practice is an ability to create melodies in which symmetrical pitch structures can be observed, and to that end I have been successful. Some key concepts emerged from my practice that were essential to developing the ability to improvise the technique; those of inversionally equivalent intervals and the mirroring of small pitch sets across a single note pitch axis.

Implementing symmetrical pitch structures into improvisation requires a two-step process. First is to deeply internalise the inversionally equivalent intervals around all 12 possible axis pitches. This can be achieved through repetitive, technical practice; the exercises I used are included in the Appendix of this document. Second is to deliberately, thoughtfully, engage in
focused woodshedding improvisation around a given pitch. This exercises the decision-making processes and allows the improvisor to more readily access the technique in performance.

The most noticeable difference between recorded woodshedding and recorded performance was the unpredictable ways the technique intersected with the rest of my improvising language. Transcription of the performance tracks reveals shifting axes mid-improvisation and looser, less strict combinations of symmetrical intervallic content with modal content.
6. Conclusions

6.1. Outcomes and general insights

While Bartók himself didn’t explain much of his musical processes, there is a wealth of analysis to explore for music theorists, practising composers and performing musicians. The “disturbingly uncoordinated and controversial” field of Bartók theory was actually a boon to my research as it didn’t bother me that some theories contradicted others; this project was not attempting to find a definitive theory, but merely drew on any existing theory as resources. I was able to treat these resources as different angles from which to approach a similar goal: to expand my improvisatory practice with non-diatonic melody generating techniques. From the literature, I was able to derive four techniques of pitch organisation. All were concerned with chromaticism (non-diatonic melody generating techniques) and all were applicable to my improvising practice.

Through this practice-led research project, I was able to internalise and execute the pitch techniques through a combination of technical practice and cognitive (woodshedding) practice. Chapter Three details how this distinction emerged as a necessary means to address the different requirements of each technique, particularly relating to improvisation. I suspect this is common practice among advanced improvisors, and many musicians, including myself, will speak of a technical warmup which occurs before repertoire or musical practice. The language of Pressing and Bailey suggested to me that this distinction can be used as a problem-solving device for adding specific musical techniques or characteristics to an improvisor’s practice. An improvisor needs to be able to act and react instantaneously, so a deep level of internalisation – in addition to an intellectual understanding – is necessary to execute a technique in performance. The practice-led process arrived at the following distinction between:

1. Tasks involving fixed pitch sets that can be internalised using technical practice
2. Tasks involving algorithmic processes that generate new pitch sets in real time, which require more cognitive, deliberate, woodshedding practice

Technical practice includes repetitive practice of scales, patterns, interval sets over an extended period of time (daily practice over several months in my case) to the end that the musician is able to execute the material at the limits of their physical technique, not hindered by mental process or memory delay. This kind of practice is effective at internalising fixed pitch sets because - though a process of inquiry occurs when creating the practice material – muscle memory, rather than thought, triggers the action in performance.

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119 Somfai, 1.
As Chapter Two’s literature review revealed, cognitive, or woodshedding, practice, involves guided improvisation under a controlled environment, with specific goals. This is necessary for internalising techniques that don’t involve a fixed pitch set; in other words when the technique generates pitch material in real time. This was particularly necessary when addressing the technique of chromatic compression and diatonic extension, because the technique produces new pitch content in response to melodic content improvised in real time. There is no way to pre-empt these results in the practice room, short of memorising a set of compressed and extended patterns which would limit the scope of the technique. By following the practice methods I have explained in this paper, an improvising musician can apply these same pitch techniques to their own musical vocabulary. Of course, the results will still vary based on the individual’s musical background and aesthetic tastes. I hope still that this paper can function as a resource for musicians to apply not only the four Bartók-inspired techniques from this research but any other compositional techniques into an improvising practice. I believe the processes of this study are replicable to a wide variety of musical techniques.

The outcome of this research can be measured in multiple ways. There is firstly the creative output consisting of my recorded improvisations, demonstrating the creative use of the techniques put into action. Then there is this document, chronicling the progression of my work from literature to performance, with guidelines for replicating the practice. But the recordings and extracts in this paper are only a narrow reflection of the moment in time they are recorded. It may be more accurate to say the outcome resides in the embodied knowledge I gained through the research process. As with all improvisation, the performance does not encapsulate the entirety of the work; rather the entirety is found in the improvisational potentiality that manifests in moments of performance.

6.2. Further questions
To conclude this paper, I wish to point out some limitations with the project and thoughts for further research on the subject material.

Firstly, it feels necessary to mention once again the influence of my personal practice, particularly the most fundamentally limiting aspects: my instrument (the Bb trumpet and piccolo trumpet) and my pre-existing musical vocabulary and aesthetic. The Bb trumpet and piccolo trumpet, the vehicles on which I conducted this research, are limited both in its monophony – they can only play one note at a time – and their limited range. Although some of the recorded performances use multi-tracking to explore polyphonic uses of the techniques, this research project would have been dramatically different had the primary vehicle been a piano. A pianist may
have explored polyphonic and textural approaches that would have never occurred to me as a trumpeter. The range of the trumpet manifests in two main ways: firstly, a two-and-a-half-octave range is quite narrow and precludes extremely wide-ranging melody range and extreme intervals of over two octaves; secondly, even within the range of the instrument wide intervals are very difficult to execute, encouraging a limitation of intervals of up to one octave in general conditions. It would significantly extend this research to have a musician of a different instrument replicate the practice-led parts of the research, taking the same four techniques through their own improvisatory practice.

The aesthetic influences are not insignificant either. As aesthetic considerations influenced the project from its inception, a different improviser may have examined the same Bartók theory and arrived at four different techniques to explore. Once again, for the same literature to be examined by another improvising musician researcher would result in further, deeper insights into the role of the artist-researcher’s pre-existing aesthetics influence the research. This study was strictly limited to applications of the techniques as applied to improvisation, with a particular focus on free improvisation with no pulse, meter, or rhythmic backing. Although the initial plan was to develop the techniques – and present the performance outcome – with an ensemble of improvisors, the research coincided with a period of severe lock-down restrictions in Australia. These were particularly restrictive in Melbourne, where I was unable to meet other musicians for most of the year of 2020. This resulted in the performance outcome taking the form of a collection of solo recorded improvisations, conducted in my home studio. The nature of practice-led research is such that changes to an artist’s practice are make a huge difference to the research results; in this case, the move to solo trumpet improvisations allowed the resulting techniques of the research to be heard un-inhibited by external chords or rhythms. Nonetheless, this goes to show that even another improvising jazz trumpeter (or even the same trumpeter working under different conditions) would most likely have arrived at dramatically different results. Additionally, this study deliberately avoided the subject of composition, although I hope the four techniques are explained in such a way that they might be useful for a composer, regardless of style. A composer may too approach the four techniques completely differently, adding new dimensions to the research and resulting in further new creative work.

### 6.3. Personal impact

Each of the four techniques developed in unexpected ways throughout the time of this project and I will probably continue to use each of them in my improvising for many more years into the future. I personally have come to love the sound of many of the mistuned scales – my favourites are
probably the mistuned Aeolian and mistuned Jazz Minor – and the sound of simultaneous modal pairs from my work with polymodal chromaticism. Some symmetrical pitch structures and mirrored intervals also now feel like an indelible part of my improvising language. Out of the four techniques, I feel that compression and extension hasn’t entered my improvisation language as much as the other three. I suspect, informed by past experience, that the concepts of chromatic compression and diatonic extension will take several more years of conscious and unconscious thought before they crystallise into a personal part of my improvising. This might require some further work in my practice routines on and off in the future.

At no point in the year did I feel like I was compromising my personal practice goals for the sake of this research project, and I would suggest that was because I was letting my personal tastes guide the development of each technique at every point. This felt unavoidable; I was only going to be able to motivate myself to practice an exercise or technique regularly (often daily) if I enjoyed the sounds it produced and felt personally and artistically invested in the processes. To follow the course of the research then, is to witness the process of my improvising language changing. The resulting album of music captures the end product of the research, by which point the techniques have entered my improvising language – albeit to varying degrees – and this document provides explanations for the techniques and documentation of the processes that led to being able to execute the techniques in improvised performance. This thesis demonstrates and teaches new techniques, informed by the music of Béla Bartók, for improvising non-tonal melody that are still rooted in tonality. I hope that, in addition to extending my own practice, insights from this research can inspire and inform other new musical work.
Bibliography


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Appendix: Exercises and practice referents

In this section I have included the following material, created during the research to assist with practicing each of the techniques:

1. 12-tone resultant mode pairs, for the technique of polymodal chromaticism. Each pair has its common tone (in addition to the tonic pitch) indicated in boxes, as well as arrows indicating which tones are altered to move to an adjacent mode pair. *(From page 90).*

2. Compressed and extended modes of the major scale, for the technique of chromatic compression and diatonic extension. *(From page 97)*

3. Mistuned modes of the major and minor scales. Both perfect (original) and mistuned versions shown side by side with the mistuned tetrachord indicated in boxes. *(From page 103)*

4. Symmetrically mirrored intervals, starting from all twelve axis pitches. Intervals are measured in numbers of semitones from 1 (semitone above/below the axis) to 11 (major seventh above and below the axis). *(From page 115)*
Chromatic Compression and Diatonic Extension

Chromatic | Modes of the Major Scale (Light to Dark)
Mistuned Scales

F Major / Ionian

Dorian

Phrygian

Lydian

Mixolydian

Aeolian

Locrian

Melodic Minor / Jazz Minor

Dorian b2

Lydian Augmented

Lydian Dominant

Mixolydian b6

Locrian #2

Superlocrian / Altered
B Major / Ionian

Dorian

Phrygian

Lydian

Mixolydian

Aeolian

Locrian

Melodic Minor / Jazz Minor

Dorian b2

Lydian Augmented

Lydian Dominant

Mixolydian b6

Locrian #2

Superlocrian / Altered

lowered

raised

lowered

lowered

lowered

raised
Symmetrically Inverted Intervals

F

Bb

Eb

Ab

Db

Gb