A Constraints-Led Approach to Improvisational Saxophone Practice

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Statement of Originality

I certify that the intellectual content of this thesis is the product of my own work and that all the assistance in preparing this thesis and sources have been acknowledged. This thesis has not been submitted for any degree or other purpose.

Sam Gill
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Abstract

This practice-led research project documents the application of the constraints-led approach within my self-regulated improvisational saxophone practice. The constraints-led approach is a pedagogical framework founded on the theoretical principles of ecological dynamics, within which learners are conceived of as complex adaptative systems with the capacity to spontaneously form self-organising patterns of behaviour in response to organismic, environmental, and task constraints. Constraints-led learning designs harness this self-organising tendency, implementing practice tasks that guide learners to explore new methods of identifying and acting upon information sources within their performance environment. My practice project unfolded across a 13-month developmental period in three overlapping phases of practice, each of which featured a unique learning design founded on constraints-led principles including nonlinear learning, constrain-to-afford, task variability and representative practice design. The phase one design is referred to as *multi-parameter patterning*, the phase two design is referred to as *subdivision recontextualisation*, and the phase three design is referred to as *metrical positioning shifting*. These three learning designs were oriented towards skill acquisition and the development of improvisational dexterity rather than the internalisation of musical vocabulary, with task constraints implemented to promote the exploration of new movement patterns on the saxophone. A corresponding self-assessment model was developed to evaluate the efficacy of the practice tasks in promoting the formation of new stable patterns of coordination and control. Research outcomes include newly generated understandings of the relationship between saxophone-specific movement-based processes and resultant improvised musical production, and the development of practice processes to overcome movement-based instability during performance. Outcomes also include a creative component, featuring four original works created at three different points within the research period. Together, these outputs contribute new knowledge to current understandings of improvisational learning and practice, as well as illuminating the utility of the constraints-led approach within self-directed musical learning projects.

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Chapter One

Introduction

1.1 Introductory remarks

I am a saxophonist with over a decade of professional musical activity and two decades of musical study at the time of writing. My creative work has primarily involved performing with and composing for ensembles that I lead and/or co-lead, as well as participating as a collaborator in other musicians' projects. My work with these ensembles has fallen primarily within the domain of exploratory forms of contemporary jazz and free improvisation.

As a musical introduction to my creative work, I present excerpts from four recorded performances that I am featured on that were created prior to the commencement of this practice project[1]. These recordings are drawn from releases by Sam Gill's Scattered (*Perspectival*, Radial Sounds, 2020), Sam Gill & Simon Barker (*Afterimage*, Radial Sounds, 2020), Franklin | Gill (*To My Left is Where the Lake Is*, Creative Sources, 2020), and Microfiche (*Everything & Other Infinities*, Creative Sources, 2021). The performances were all documented within a four-month period between September-December 2019, showcasing my playing at a similar point of development across a broad spectrum of musical contexts.

Audio 1.1. Excerpt from *Linger* (S. Gill), released by Sam Gill's Scattered

Audio 1.2. Excerpt from *A Shimmering (Airborne)* (S. Barker/S. Gill), released by Sam Gill & Simon Barker

Audio 1.3. Excerpt from *Pillaring (part 1)* (J. Franklin/S. Gill), released by Franklin | Gill

Audio 1.4. Excerpt from *May As Well Be Infinity* (S. Gill), released by Microfiche

I undertook an artistic audit at the commencement of this research project, self-assessing my improvisational approach based on recent recordings. Through this process, I identified what I perceived to be a limitation on the diversity of creative ideas that I was able to explore during improvised performance. I found myself producing similar musical materials across multiple performances, despite the otherwise unique musical demands of each individual performance. I attributed this emerging behavioural pattern to two related causes: that sometimes I would conceive of musical ideas that I could not execute due to insufficient instrumental technique, and that I sometimes could not conceive of musical ideas that adequately engaged with the unfolding improvisation. The impetus to commence this research project grew out of my desire to

[1] These recordings were all made in the early stages of my research before the practice-component of the project had commenced. The recordings therefore present my playing prior to the influence of my constraint-based practice.

orient my instrumental practice towards the broadening and strengthening of my instrumental technique and creative imagination, with the intended outcome of playing with more spontaneity and variety when interacting with others during improvised performance.

In order to design an effective practice approach, I first sought to gain a deeper understanding of the recurring creative ideas that I had identified within my existing improvisational approach. I identified two dominant modes of playing that I would utilise during an improvisation:

1) Melody-based phrasing featuring clear articulation, metrically precise rhythmic content and defined pitch contents; and
2) Abstract gestural phrasing with a focus on density, timbre and pitch contour, with less clearly parsable details within the phrase.

These two improvisational modes will not be subject to musical analysis, and are introduced here purely as an outcome of the self-assessment that I undertook at the commencement of this project. When reflecting on these two improvisational modes, I observed that my playing would often oscillate between them as a way of introducing musical contrast. The melodic phrasing was precise and detail-oriented, while the abstract phrasing was concerned with larger gestures and usually featured less detailed articulation, pitch contents and rhythmic phrasing[2]. Identifying this oscillation tendency gave me a greater understanding of the limitations I had perceived within my playing: the binary nature of these oscillations meant that at any given moment, my only creative options when responding to the musical opportunities within an unfolding improvisation would be to either continue playing in the mode I was in, or to move to the other mode.

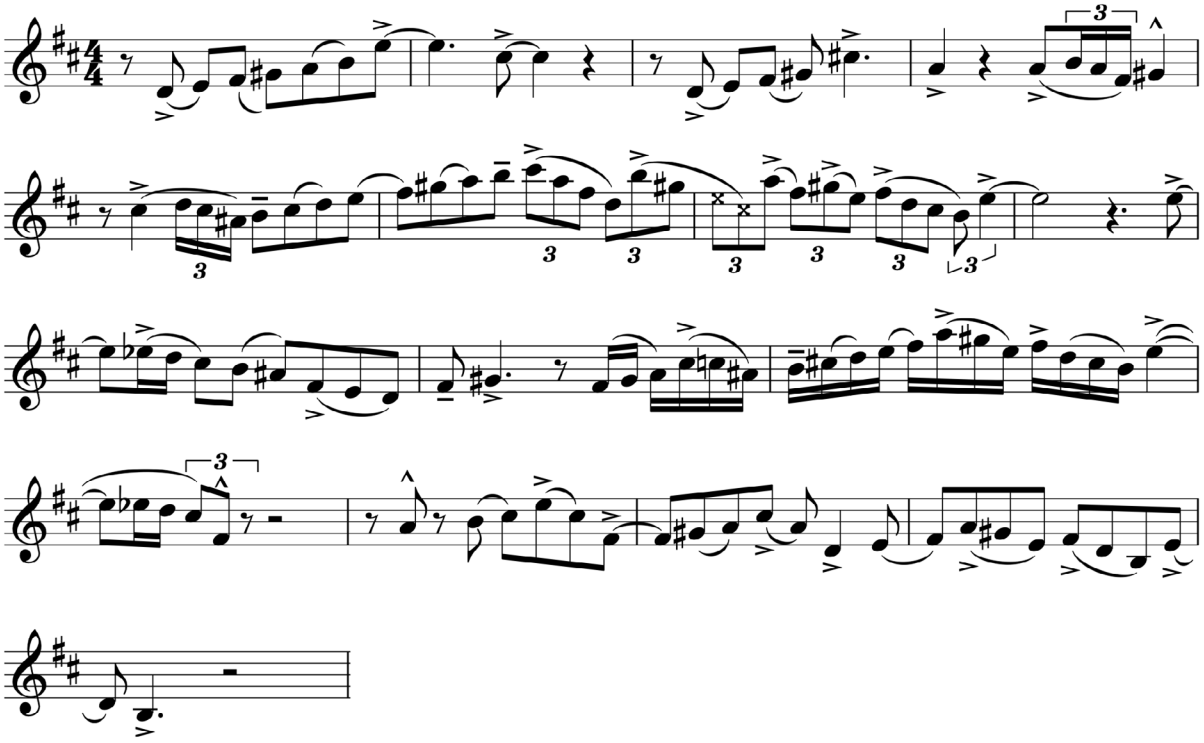
A key characteristic of the first 'melodic' mode of improvising was that of *coupling*. I use this term to refer to the regular alignment of articulated accents, high and low outlying pitches, and longer note durations within a phrase. When aligned, all three parameters are 'coupled' in their contribution to the aural emphasis of certain notes within a phrase. An example of an improvised passage[3] featuring coupling can be heard in Audio 1.5, which is notated in Figure 1.1 (on the following page).

Audio 1.5. Improvised phrase featuring coupling

[2] I am not making this distinction with reference to the work of other musicians; the distinction is made in reference to my own playing at the commencement of this project only.

[3] This improvised passage is not stylistically representative of the musical approach featured within the rest of this thesis. It is presented here for clarity of demonstrating the coupling concept only.

Figure 1.1. Transcription of improvised passage featuring coupling



I first conceptualised coupling by identifying these audible features of the musical surface, but quickly expanded the idea to include the coupling of physical movement patterns on the saxophone that produced those sonic characteristics. These movements include the 'striking' tongue motions that produce articulated accents, and the depressing and lifting motions of the fingers when moving the instrument's keys. I also conceive of my internal timekeeping as a physical, movement-based process that I refer to as an *embodied metrical pulse*, sometimes produced through literal striking movements such as foot-tapping or body-swaying, and other times conceptualised as an abstract, internalised feeling of motion, with pulses conceived of as directional 'striking' motions similar to that of a downbeat and upbeat. The coupling between these three movement patterns refers to the regular alignment of the three striking and depressing motions on the instrument. This description of the link between the musical and movement-based properties of coupling was informed by the theory of embodied music cognition, which foregrounds the interaction of musical instruments, cognitive processes and embodied motor habits in the development of musical ideas (McLean, 2018; De Souza, 2017; Iyer, 1998).

I attribute the emergence of coupling as a creative tendency within my 'melodic' mode of improvising to the accumulated musical and movement-based experience I have gained through my prior jazz-based education and practice. To my ears, the sonic effect of coupling is a characteristic feature of bebop and post-bop phrasing, which I may have internalised through the process of learning transcribed solos by saxophonists such as Charlie Parker, Cannonball Adderley and Joe Henderson. A musicological survey of coupling within these styles of jazz improvisation is beyond the scope of this study; I introduce the idea here solely to highlight my personal association of the sound of coupling with particular stylistic approaches to jazz improvisation. A result of this was that the coupling tendency within my own improvisations often created what I perceived to be a sonic allusion to bebop-based phrasing that I did not always find to be contextually appropriate or desirable for the music that I was playing, despite my phrases being more harmonically and rhythmically angular than those typical of the bebop era. Oscillations into my 'abstract' mode of improvising thus provided not only musical contrast, but also a stylistic shift towards musical

material that was more contextually appropriate and was free of the stylistic allusion to bebop.

With this newly developed understanding of the functional basis of my coupling tendency and its relationship to the 'abstract' mode of improvising, I was able to look for performance solutions that would offer new creative options. I was particularly interested in exploring phrasing possibilities that retained the precision and clarity of the first 'melodic' mode of playing, but with the coupling characteristic removed. This led to my conception of melodic phrasing that exhibited *decoupling* – the distribution of articulated accents, pitch contours and rhythmic patterns within a phrase that did not align with each other, creating a sense of ambiguous, multi-layered patterning. This kind of phrasing would project a clear melodic foundation but with a sense of sonic abstraction that was distinct from that of the gestural phrasing I was already familiar with, offering a third improvisational mode that would enrich my pool of creative options during improvised performance. The concept of decoupling therefore became the initial focal point of the practice-based component of this research, offering a new area of aesthetic interest and corresponding physical movement possibilities on the saxophone.

Moving out of this project's initial self-assessment phase, I was now faced with the task of designing an effective practice methodology that would allow me to explore the concept of decoupling on the saxophone. I conceived of this process as a *practice intervention*. The goal of my practice tasks would be to introduce decoupling as a new organisational tool that would challenge my existing aesthetic and movement-based tendencies. In doing so, my main priority was to ensure that my practice promoted the development of performance-based skills that would affect change upon my improvisational approach, rather than focussing on developing musical vocabulary, in the form of patterns or 'licks', that could be internalised through practice and then reproduced during improvisation. In short, I chose to orient my practice towards skill acquisition rather than vocabulary acquisition.

My decision to adopt this skill-based approach to instrumental learning was informed not only by aesthetic considerations, but also by my academic research into accounts of motor-skill learning described by ecological dynamics and the constraints-led approach. I had initiated my investigation into these areas after identifying the physical movement patterns associated with coupling, hypothesising that motor skill-based learning theories could offer a new perspective on how my practice could proceed. Within the field of ecological dynamics, learners are conceived of as complex adaptive systems with the capacity to self-organise in response to internal and external constraints, spontaneously forming patterns of organisation and action (Chow et al, 2011). Ecological dynamics principles acknowledge the developmental connection between "what people perceive, how they conceive of their activity, and what they physically do" (Borgo, 2022, p. 219), echoing the connections between body, motion and instrument described by embodied accounts of music making.

The constraints-led approach is a pedagogical methodology founded on ecological dynamics principles. The learning strategies promoted by the constraints-led approach aim to affect change upon a learner's self-organising tendencies through the manipulation of environmental and task constraints to guide the learner's attention to new efficient and effective performance actions within their environment. Following the principles of nonlinear pedagogy, practice tasks are designed to encourage learners to explore a variety of different possible solutions to any given performance problem, leading to the emergence of movement patterns and performance behaviours that are both stable yet adaptable within dynamic performance contexts. This has parallels to the concept of *dexterity*, which Bernstein defines as a performer's ability to "[find] a motor solution for any situation in any condition" (Bernstein, 1967, p. 21). The constraints-led

pedagogical approach aligned with the overarching musical aims of my practice: to develop new musical skills that would increase my improvisational dexterity, allowing me to respond to the opportunities within improvised performances with more coordination and control (stability), resourcefulness, and creativity (adaptability).

The constraints-led approach to skill acquisition provides a useful theoretical framework underpinning practice designs that aim to improve the performance of learners already experienced in their given performance environment. For these performers, learning can be understood as "the development and adaptation of previously acquired skills, biases, or preferences" (Slater, 2020, p. 48), as opposed to the acquisition of new skills. Renshaw and Chow refer to this as the 'adaptation phase' – the second stage within their two-stage model of learning (2018). I situate this practice project within the adaptation phase, as the learning approach I took aimed to enrich my existing musical practice, rather than engaging with a completely new skillset. The term *skill adaptation* is promoted by Renshaw et al (2019) as an appropriate descriptor of learning within this phase, as it "refers to the process of acquiring an increasingly functional (more efficiently coordinated and effective) relationship with a particular performance environment" (p. 30). Therefore, I will use the term *skill adaptation* rather than *skill acquisition* to describe this form of learning for the remainder of this thesis.

My engagement with ecological dynamics theory and the constraints-led approach uncovered useful frameworks through which I could conceptualise the goals and methodologies of my improvisational saxophone practice. The constraints-led approach offered a pedagogical framework through which I could conceive of new practice designs in a way that was not conditioned by my previous musical studies. It offered an approach that was highly compatible with the dynamic performance environment of musical improvisation, promoting the development of skilful patterns of behaviour that were stable and could sustain a high level of performance, yet were also adaptable and could effectively engage with creative opportunities that emerged during the unfolding improvisation.

1.2 Research methodology

This project follows a practice-led methodology, presenting a case study of my self-regulated learning as an improvising saxophonist. My research approach incorporates insights from both my instrumental creative practice and theory-based academic research practices, with these two modes of inquiry being undertaken concurrently in a process that facilitated the cyclical, iterative production of knowledge. This reflects Smith and Dean's (2009) conception of practice-led research as a method in which "practice can result in research insights… [and] academic research can lead to creative practice" (p. 2). Within this project, there was an iterative transfer of knowledge generated through my research into theories of learning and skill adaptation, and the practical application of those theories within my own saxophone-based practice regime.

My practice project was oriented towards the generation of new stable patterns of coordination and control within my improvisational saxophone playing. Three phases of practice were undertaken over a developmental period of thirteen months, with each phase focussing on its own set of variable task constraints to promote skill adaptation. I use principles derived from theories of self-regulated learning to create effective forms of self-assessment to determine the efficacy of each phase's learning design. Together, the three phases aimed to develop dexterity and stable patterns of motor organisation that would promote stability, coordination and control for myself during improvised performance.

The knowledge produced by this project is procedural in nature, offering a conceptual framework for the creation of instrumental practice designs and corresponding modes of self-assessment. This harnesses the potential for practice-led research to "[transmit] technical possibilities through increased understanding of method and practice" (Smith & Dean, 2009, p. 24). The framework I present is free of stylistic conventions or implications, with my practice project documenting one of many possible self-regulated applications of constraints-led pedagogical principles.

The project also includes creative output in the form of a number of new original works, recorded at three points within the research period. These original works were performed by three different ensembles, whose varying instrumentations and corresponding sonic environments demonstrate the transfer of the developed musical skills into different creative contexts. The recorded performances are not the subject of analysis, and are instead offered as their own complete forms of knowledge production presented as sound information.

1.3 The practice project

My practice project featured three distinct practice designs that were introduced at different stages between October 2020 and October 2021. When a new practice design was introduced, it was incorporated alongside the other design(s) that I was already utilising within my practice routine. In other words, the three designs accumulated into three overlapping phases of practice by the project's conclusion. The concept of decoupling provided the initial focus for Phase One of practice. Phases Two and Three grew out of insights about my own playing tendencies that emerged out of the first phase, pursuing creative ideas that were not directly related to the initial focus on decoupling, but had been discovered through my decoupling-based practice procedures. There were 111 practice sessions completed: 51 Phase One sessions, 35 Phase Two sessions, and 25 Phase Three sessions. The activities undertaken during these sessions constituted the research-oriented elements within my saxophone practice, occurring alongside other ongoing technical and repertoire-based practice.

The overarching goal of the three practice phases was the development of my instrumental dexterity on the saxophone, with a particular focus on improving my stability, coordination and control during improvisation. The three practice designs featured applications of principles derived from the constraints-led approach, presenting me with physically and cognitively-challenging musical material as a way of introducing functional perturbations into my playing within a controlled practice context. Each practice task featured a unique set of task constraints that facilitated the exploration of possible performance solutions to those perturbations, leading to *skill adaptation*: an accumulative increase in my instrumental dexterity and stability that was transferable to actual performance contexts. The performance solutions explored during practice often involved adjustments of movement-based tendencies within my playing on a granular scale of resolution, with the resultant outcomes enriching and fine-tuning my existing improvisational skillset, rather than generating a radically different performance approach.

While each phase's practice design was distinct, there were some common procedural features that they shared. All of my practice tasks presented me with a small set of pre-determined musical inputs, with each session dedicated to learning to play one set of material accurately. These inputs were conceived of as *task constraints* that functioned to exercise my instrumental dexterity, utilising movement patterns on the saxophone that I had not previously explored in depth. Each of the three practice designs featured a consistent and systematic method of organising musical inputs and ways of practicing them, but the

inputs themselves – the pitches, rhythms and articulation sequences – were changed from one session to the next (within delimiting parameters that will be introduced in the following paragraphs). This was an application of the concept of *task variability*, a feature of the constraints-led approach that encourages learners to repeat the process of organising movement patterns into performance actions, rather than repeating specific forms of movement patterns (Bernstein, 1967). My priority when choosing each task's inputs was to generate task constraints that would allow me to explore new finger motions, tongue motions and rhythmic materials. Insights generated through the practice process would be used to inform the choice of inputs for future sessions, but without reusing any specific musical material. By applying this concept over a developmental period, I was able to target improvisational skills rather than internalising specific musical vocabulary to be reproduced during improvisation.

There were also several specific task constraints that were shared by all three practice phases. One of these constraints was to avoid the use of musical notation during practice[4], forcing me to internally keep track of the complex interactions of musical inputs within each practice task. This ensured that my practice targeted the cognitive and movement-based processes that would be relevant to improvisational performance contexts, as opposed to the notation-reading skills that would otherwise be targeted. A second shared task constraint was a focus on rhythmic accuracy measured against a metronome-generated metrical pulse. During practice, I would consciously use exaggerated physical motions – foot tapping and/or sidewards swaying motions – in time with the metronome to maintain an embodied sense of the metrical pulse. While these movements would not be appropriate in actual performance contexts, they were effective learning tools that promoted skill adaptation in the form of greater rhythmic stability.

The constraints that were unique to each individual practice phase included the parameters of the musical materials being practised, which I conceived of as inputs, and also the procedures that those inputs were fed into. Phase One of practice, which I refer to as *Multi-Parameter Patterning*, used a generative procedure that combined three sequences of different lengths that determined pitch contents, articulation patterning and rhythmical content. When combined, these three inputs would generate a lengthy resultant phrase in which the sequences would be repeated, moving out of phase so that the pitch contour, rhythmic contour and articulated emphases would be decoupled and not align with each other. These resultant phrases would be practised in four different pitch transpositions, allowing each practice task to incorporate multiple sets of finger motions that exercised my technical stability in four unique ways. The parameters defining the inputs and procedures within the Phase One practice design are summarised in Practice Design Outline 1.1; notated examples and audio demonstrations will be presented in Chapter Four.

[4] My practice journal did feature notation to keep a record of the musical materials that I used within each session; however, this notation was not utilised during the practice process itself.

Practice Design Outline 1.1.

Phase One: multi-parameter patterning

Inputs:

- A pitch sequence featuring five, six or seven different notes.

- Rhythmic phrasing featuring either:
  (a) A stream of evenly-spaced notes; or
  (b) A rhythmic archetype made up of multiple rhythmic durations.

- An articulation sequence featuring either:
  (a) Even groupings of slurred notes; or
  (b) Uneven groupings of slurred notes, generated by number sequences.

- The above three elements must contain a different number of events (in other words, the rhythm and articulation contents cannot have the same number of units as the pitch sequence, and must be different from each other).

Procedure:

- Play the resultant phrase formed by the combination of the pitch, rhythm and articulation inputs, allowing them to move out of phase until they re-align at a coincidence point.

- Practise the resultant phrase in four different pitch transpositions.

I refer to the second phase of practice as *Subdivision Recontextualisation*, which featured inputs and practice procedures that presented me with a new set of task constraints. Each Phase Two practice task presented me with the input of a short phrase with defined pitch, articulation and rhythmic content. This phrase would be practised in every subdivision from 3 to 9, allowing me to examine if the stability, coordination and control of my physical movements could be maintained across all subdivisions, or if certain metrical contexts would introduce notable perturbations that could be addressed through further practice. The inputs and procedures of the Phase Two practice design are summarised in Practice Design Outline 1.2; notated examples and audio demonstrations will be presented in Chapter Four.

Practice Design Outline 1.2.

Phase Two: subdivision recontextualisation

Input:

- Short musical phrase with defined pitch, articulation and rhythmic content.

Procedure:

- Practise the phrase in all subdivisions between 3-9.
- Within each subdivision, play the phrase as a repeated sequence until its first note re-aligns with the metrical pulse at a coincidence point.
- Maintain the same actual speed of the played phrase across all subdivisions; calculate the tempos of the metrical pulses to accommodate the required number of rhythmic units within each subdivision.

The third phase of practice featured a practice design I refer to as *Metrical Positioning Shifting*. Like Phase Two, this phase's tasks examined the relationship between a played phrase and the metrical pulse, this time focussing on a septuplet subdivision exclusively and altering the phrase's rhythmical placement relative to the metrical pulse, with the seven-part subdivision offering seven distinct rhythmical placements. These practice tasks facilitated the exploration of the changing relationships of my finger and tongue motions relative to the metrical pulse across the seven different metrical placements of the phrase. This process allowed me to examine whether certain placements presented more significant perturbations to my coordination and control, and to then explore relevant performance solutions when required. The inputs and procedures of the Phase Three practice design are summarised in Practice Design Outline 1.3; notated examples and audio demonstrations will be presented in Chapter Four.

Practice Design Outline 1.3.

Phase Three: metrical positioning shifting

Inputs

- Short musical phrase seven rhythmic units long, with predetermined pitch, articulation and rhythmic content.

- Septuplet subdivision.

Procedure

- Practise the phrase starting on each of the seven time points within the septuplet subdivision.

- For each of these seven time points, play the phrase as a repeated sequence until it feels stable.

- Once each metrical positioning has been learned, move through these three stages:

(a) Play the phrase from each of the seven time points, moving it one later each time;
(b) Play the phrase from each of the seven time points, moving it one earlier each time; and
(c) Play improvised phrases over the metrical pulse, spontaneously incorporating the phrase in each of its seven metrical positionings.

1.4 Research contributions

This research project makes an original contribution to knowledge in the following forms:

- A case study of the application of constraints-led pedagogical principles within a self-regulated musical learning project;
- The creation of new saxophone-specific practice approaches that prioritise skill adaptation relevant to improvisational contexts, rather than the internalisation of vocabulary;
- The creation of a self-assessment model that foregrounds the relationship between saxophone-specific physical movement-based processes and musical outputs, and the impact that interaction has on performance tendencies;
- The documentation of recorded performances, which collectively represent an original contribution to improvisational saxophone performance and creative practice.

I situate these contributions within two emerging bodies of research. The first of these is concerned with the application of ecological dynamics principles to the study of improvised musical learning and performance practices. Within this framework, improvised music performance is conceived of as a

complex, dynamic system formed through the interaction of the performer/s, their instruments and their environment (Borgo, 2022; Love, 2017). The performance processes utilised by individual improvisers are described in ecological terms, with procedural knowledge understood as "co- constituted by the knower, the environment in which knowing occurs, and the activity in which the learner is participating" (Borgo, 2022, p. 219). A number of researchers have described improvisational processes within the framework of the 4E model of cognition, which conceives of knowledge as being embodied, embedded, enactive and extended (Schiavio & Kimmel, 2021; van der Schyff, 2019; van der Schyff & Schiavio, 2017, 2022; van der Schyff et al, 2018). Collectively, this body of work offers an ecological alternative to the computational, information-processing models of knowledge that underpin many improvisation-based pedagogical systems and accounts of improvised performance practices. However, this body of work does not present case studies of how this theoretical framework can be utilised by practicing improvisers to inform the creation of their learning designs.

My research project also contributes to the emerging body of case studies featuring self-regulated musical projects undertaken by improvisers that prioritise constraint manipulation as a key practice design feature. Slater (2020) and Rapp (2023) present two such projects, utilising ecological dynamics principles to conceptualise their manipulation of environmental constraints to affect change upon their improvising approaches and skillsets on trumpet and vocals respectively. A related research project drawing on the constraints-led approach is offered by McMahon (2022), who explores the manipulation of task constraints to conceptualise his investigation of new harmonic concepts on the piano. My project makes an original contribution to this body of research, offering a saxophone-specific case study that highlights the interaction between the exploration of musical ideas and physical movement patterns on the instrument, utilising task constraints to develop instrumental dexterity in order to to affect change upon my improvisational approach.

1.5 Scope and Limitations

This practice-led research project presents a case study of musical learning exclusively within the context of my own improvisational saxophone practice. As such, the three phases of practice were generated to promote skill adaptation in response to technical instabilities that are specific to my own instrumental playing, and which I do not claim are universally experienced by other saxophonists and improvisers. This does not, however, preclude the practice designs from being of use to other musicians within their own practice regimes.

The practice tasks I generated for each practice session were designed as abstract musical exercises. They were conceived of as pre-musical inputs – pitch information, rhythmic information, and articulation information – without any stylistic implication or association. While I intended for the improvisational skills promoted by the practice tasks to have utility within actual performance contexts, the tasks themselves were not conceived of with any reference to defined harmonic or metrical contexts.

My application of constraint-led principles within this project is limited to instrumental practice contexts only, and does not extend to descriptions of in-performance improvisational processes. The constraints-led approach is a pedagogical framework concerned with the promotion of effective practice design and motor-skill learning, informing this project's focus on practice and self-assessment as key research activities, rather than generating an ecologically-oriented analytical model of improvisational performance such as those developed by Borgo (2022) and Hannaford (2019). My application of eco-

logical dynamics concepts is limited to the development of practice designs and corresponding self-assessment models, and is not utilised to interpret or analyse the improvised performances included in Chapter 6 as creative outputs of this project.

1.6 Chapter summaries

Chapter Two presents a musical glossary featuring definitions and notated examples of analytical terminology that will be used throughout this thesis.

Chapter Three introduces key concepts from the research fields of ecological dynamics and the constraints-led approach. Definitions of ecological dynamics principles are provided, followed by a section outlining the pedagogical methodologies promoted by the constraints-led approach. The chapter closes with a discussion of self-regulated learning theory, highlighting the paucity of studies investigating the application of constraints-led methods within self-regulated learning contexts. Alongside the definitions presented within this chapter, I include initial examples of how these fields of research informed the design of my practice project, with additional connections to be highlighted in subsequent chapters.

Chapter Four presents my practice project, offering a detailed account of each of the three phases of practice. The design features of each practice approach are introduced in a multi-modal form of communication that includes text, musical notation and audio examples. I provide annotated descriptions of the musical notation conventions that I had developed to most efficiently and effectively communicate the musical components of each practice task. A number of individual sessions from each phase are discussed in detail, providing examples of the practice processes in action and demonstrating how task constraints were utilised to explore new creative ideas and corresponding movement possibilities on the saxophone.

In Chapter Five, I catalogue five key outcomes of the practice project. Two of these outcomes are performance-based procedures that I developed through my practice that could be applied within performance contexts as well as other learning contexts. The other three outcomes represent newly developed understandings of my movement tendencies on the saxophone and their connection to the musical ideas I explore during improvisation. The identification and theorisation of these tendencies demonstrate my self-assessment processes in action, with insights gained during early sessions influencing the direction of future sessions to explore new creative and movement-based possibilities.

Chapter Six presents the creative outputs that were generated through this project. These recorded performances are presented in complete form, functioning as demonstrations of the developed skills in action. Each recording is accompanied by a brief text component that draws the reader's attention to key musical features indicative of the musical skills that were targeted by my practice. The textual component of this chapter does not present musical analysis, but offers critical listening points to the reader.

1.7 How to Navigate this Document

This thesis is presented as an interactive multimedia eBook. It can be accessed by all programs and devices capable of opening the *.epub* file format. Audio and video examples are embedded alongside the text, and can be played directly within the eBook file. These multimedia examples represent what Gander terms "process in action", rather than creative works that can be viewed as "artistic results" (Gander, 2017, p. 12). In this capacity, they function equally alongside the text-based communication of my research. Excerpts

of recorded practice sessions are included as audio examples, providing a key communicative source that documents the procedural and embodied knowledge generated through this project. Similarly, the audio and video documentation of complete recorded performances serves as the primary communicative source of the creative application of the embodied knowledge and skill adaptation developed through this project, with each performance presenting one of many possible creative realisation of those skills.

Chapter Two

Musical Glossary

The musical terminology defined in this chapter will be used extensively within Chapters Four, Five and Six. A number of widely-used musical terms are included, which I will be given precise definitions to indicate the intended meanings when those terms are used within the thesis. This research project has grown out of some elements of my earlier research work (Gill, 2018), and I will utilise, and expand upon, some definitions first articulated in my earlier work.

2.1 Subdivisions and pulse streams

2.1.1 Subdivision

Subdivision refers to "any division of the metrical pulse into evenly-spaced rhythmic units" (Gill, 2018, p. 6). This thesis will primarily feature subdivisions of 3 through to 9, expressed as tuplets (eg. "triplet" = subdivision of 3, "septuplet" = subdivision of 7, etc). All references to a three-part subdivision of the metrical pulse in this thesis will be expressed using triplets rather than a compound time signature, with the exception of the composition *Abundance* discussed in Chapter Five, which is notated in 9/8 meter.

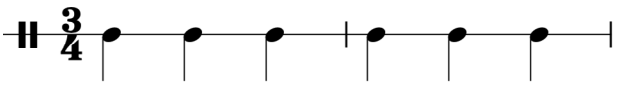
2.1.2 Pulse stream

A pulse is defined by Roeder (1994) as an "accented timepoint" (p. 234). When pulses are arranged in an evenly spaced series, this is referred to as a *pulse stream*.

2.1.3 Metrical pulse stream

A metrical pulse stream (or metrical pulse) is an evenly-spaced series of pulses occurring proportionally to the meter in a ratio of 1:x or x:1. Within this thesis, my discussions of metrical pulses will refer solely to pulse streams that have a 1:1 relationship to the meter. Figure 2.1 features an example of a metrical pulse stream, expressed as crotchet pulses in 3/4 meter.

Figure 2.1. Metrical pulse stream expressed as crotchets



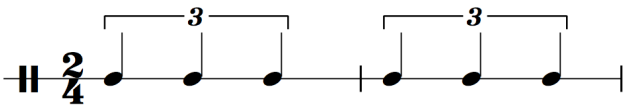
The metrical pulse streams featured within each of my practice tasks were conceived of as even series of individual pulses without a contextualising time signature grouping them into measures. They were not organised into implied bar-lengths such as the 3-beat bars shown in Figure 2.1; as such, the metrical pulses within my practice tasks could be understood to imply a 1/4 meter.

An audible metrical pulse stream was an essential learning tool within the practice tasks featured in this research project. In performance contexts that feature my music, however, the metrical pulse is rarely played or heard as an audible feature of the musical surface, more frequently being used as "an organisational tool that facilitates the accurate placement of sounded rhythmic events" (Gill, 2018, p. 6).

2.1.4 Countermetrical pulse stream

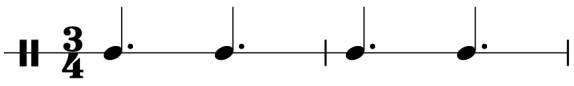
A countermetrical pulse stream is a series of evenly spaced pulses moving "at a speed different to the metrical pulsation stream, and not in a simple whole-number ratio with it" (Hannaford, 2012, p. 10). This definition refers to any ratio between speeds that cannot be reduced with whole-numbers to 1:x or x:1. Hannaford identifies the ratio 3:2 as producing the simplest possible countermetrical pulse stream, shown in Figure 2.2 notated as crotchet-triplets in 2/4 meter.

Figure 2.2. Countermetrical pulse stream expressed as crotchet triplets



Countermetrical pulse streams can move at speeds that are either faster or slower than the metrical pulse. The pulse stream produced by a 3:2 ratio, shown in Figure 2.2, moves at a faster rate than the metrical pulse; inverting the ratio to 2:3 produces a different countermetrical pulse stream that moves at a slower rate than the metrical pulse. This is shown in Figure 2.3, notated as dotted crotchets in 3/4 meter. These ratios express organisational speed relationships only, and do not indicate an audiated rhythmic relationship between two rhythmic voices.

Figure 2.3. Countermetrical pulse stream expressed as dotted crotchets



The countermetrical pulse streams utilised in this research project often feature more complex speed relationships, moving at ratios such as 7:5, 8:3 and 9:7. My practice approach did not incorporate countermetrical pulse streams in isolation, but conceived of the interaction between the metrical and countermetrical pulse streams within these ratios as polyrhythms (this will be discussed further in Section 2.1.5).

Unlike metrical pulse streams, which do not need to be aurally perceived to maintain their function as organisational tools, countermetrical pulse streams are always intended to be aurally perceived in the musical surface. As explained by Roeder (1994), countermetrical pulses are "activated" only when they are sounded, and "dissipate" when not sounded (p. 234).

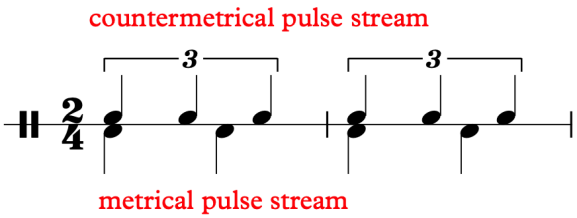
2.1.5 Polyrhythm

A polyrhythm is generated when two or more pulse streams occur concurrently, at speed relationships that cannot be reduced to whole-number ratios of 1:x or x:1. All of the polyrhythms featured within this thesis will be produced by the juxtaposition of two pulse streams exclusively: a metrical pulse stream and one countermetrical pulse stream[1]. When naming polyrhythms in this thesis, I follow the convention defined by Hannaford (2012): "for one cyclic duration, the number of metrical pulsations follows the

[1] Polyrhythms can also be produced by two or more counter-metrical pulse streams, although I do not use this technique within this practice project.

number of countermetrical pulsations" (p. 13). For instance, a 3:2 polyrhythm refers to a countermetrical pulse stream of three evenly-spaced notes being sounded in the space of two metrical pulses. This is shown in Figure 2.4, which features the countermetrical pulse stream in the upper voice and the metrical pulse stream in the lower voice.

Figure 2.4. Notation of 3:2 polyrhythm, with each pulse stream annotated



The polyrhythmic relationship of a countermetrical pulse stream to the metrical pulse can be perceived even when additional rhythmic events occur between each countermetrical pulse. Hannaford (2012) refers to this as "countermetrical pulsation embellishment" (p. 14). Figure 2.5 presents an embellished 3:2 polyrhythm in the upper stave, with the unembellished polyrhythm in the lower stave. The 3 pulses forming the countermetrical pulse stream are emphasised with accents, with the non-accented notes between them forming the embellishments.

Figure 2.5. Embellished 3:2 polyrhythm with even stream of notes

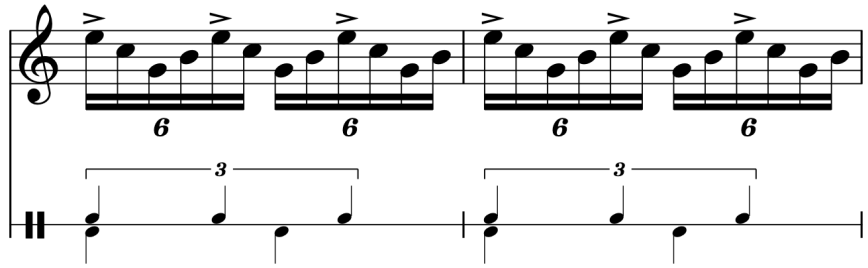
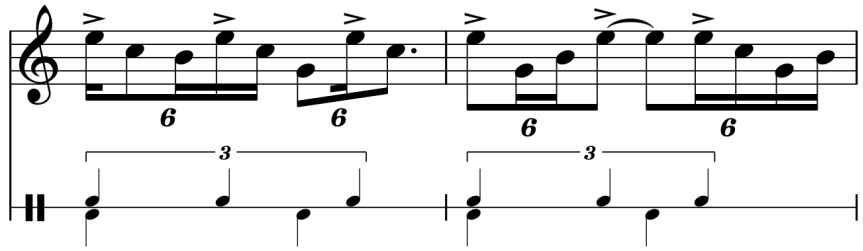


Figure 2.6 features another example of countermetrical pulsation embellishment within a 3:2 polyrhythm. The countermetrical pulses are again emphasised with accents, but the embellishment now includes notes of multiple durations, producing a more varied surface rhythm. Nonetheless, the foundational 3:2 polyrhythm is retained.

Figure 2.6. Embellished 3:2 polyrhythm with multiple rhythmic durations

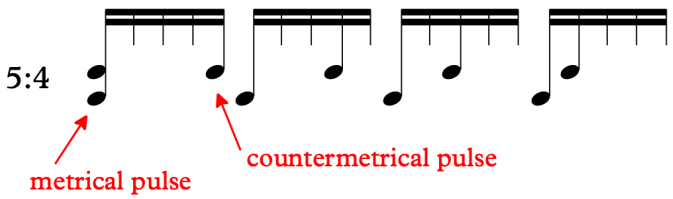


Polyrhythms were an essential rhythmic component of the task designs within my practice project. A number of early tasks in Phase One utilised polyrhythms and countermetrical pulsation embellishment to conceptualise accent placement within phrases featuring even streams of notes, like the example shown in Figure 2.5. The practice tasks within Phase Two utilised polyrhythms and countermetrical pulsation

embellishment to guide the placement of accents within phrases featuring multiple rhythmic durations, like the example shown in Figure 2.6.

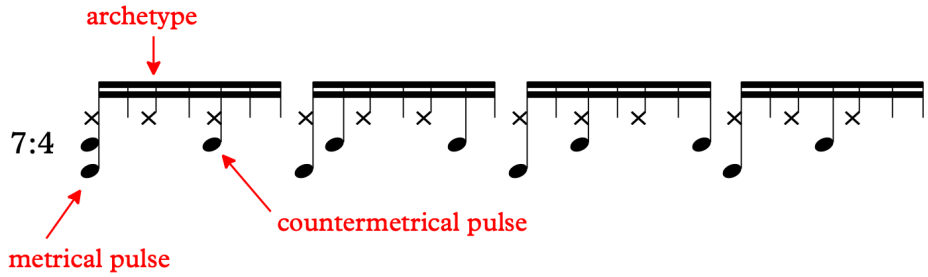
In Chapter Five of this thesis, I will utilise a method of visualising polyrhythms that I presented in my Master's thesis (Gill, 2018). These visual tools can be used to conceptualise the relative placements of a polyrhythm's metrical and countermetrical pulse streams within the subdivision. The notational approach "represents the metrical pulse as a low sound and the countermetrical pulse stream as a high sound" (Gill, 2018, p. 31). Figure 2.7 presents an example featuring a 5:4 polyrhythm, with annotations identifying the metrical and countermetrical pulses.

Figure 2.7. Annotated visualisation of 5:4 polyrhythm



For polyrhythms with subdivisions of 7, 8 and 9, each visualisation also incorporates a rhythmic archetype represented by cross-head notation. These archetypes acted as organisational tools helping me to accurately subdivide the metrical pulse into the required number of rhythmic units. These archetypes are "heard internally while the polyrhythm is sounded" (Gill, 2018, p. 31), and are not themselves a feature of the played rhythm. Figure 2.8 presents an example with a 7:4 polyrhythm, with annotations identifying the archetype.

Figure 2.8. Annotated visualisation of 7:4 polyrhythm with rhythmic archetype

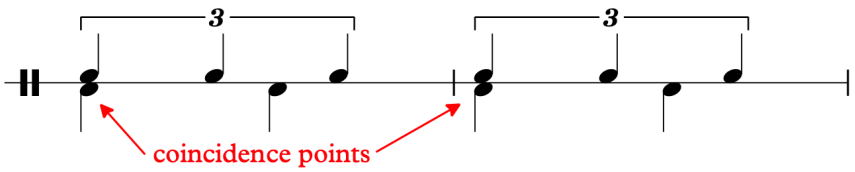


When playing the countermetrical pulse streams in each practice task, the metrical pulse stream itself was sounded by a metronome and was not a feature of the musical surface itself. It did however form a critical organisational tool that allowed me to accurately play the countermetrical pulse stream and its embellishments on the saxophone. In other words, the material I was playing was conceived of as one pulse stream within a polyrhythm whose metrical pulse stream was inaudible yet 'felt' internally to maintain rhythmic stability. The function of this polyrhythmic relationship in maintaining my stability during performance will be further addressed in Section 2.2.1.

2.1.6 Coincidence point

The point at which all pulsation streams within a polyrhythm coincide is referred to as a coincidence point (Link, 1994, p. 8). Figure 2.9 features two consecutive 3:2 polyrhythms, with the coincidence points indicated with red arrows. Link describes the space between coincidence points as a *cycle*; the phrase shown in Figure 2.9 thus contains two cycles of a 3:2 polyrhythm.

Figure 2.9. 3:2 polyrhythm with annotated coincidence points

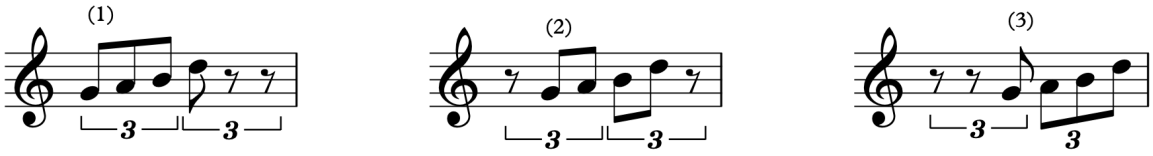


Of the practice tasks that utilised polyrhythms in Phases One and Two of practice, nearly all required me to play a single cycle of the polyrhythm, with the phrases starting at one coincidence point and finishing at the next. The few exceptions that featured multiple successive cycles were chosen to elongate phrases that would otherwise have been too short to be effective for my learning goals.

2.1.7 Metrical positioning

I use the term metrical positioning to refer to the rhythmic placement of a musical phrase relative to the metrical pulse. The number of possible metrical positionings of a phrase corresponds to the number of rhythmic units within the subdivision that the phrase is being played in. For example, a phrase played in a triplet subdivision has three potential metrical positionings, as shown in Figure 2.10.

Figure 2.10. Three metrical positionings of two-note phrase in triplets



2.2 Rhythm-based organisational principles

2.2.1 Embodied metrical pulse

I use the term embodied metrical pulse to refer to a motion-based conception of musical timekeeping. My embodied sense of the metrical pulse is expressed during performance in two ways. The first expression involves literal physical movements such as foot-tapping or body-swaying. Within these two motions, the metrical pulse is enacted through the striking of the foot on the ground and the outermost points of the body swaying motion respectively. At other times, my embodied metrical pulse is expressed as an abstract motion-based process with no actual physical movements occurring. This abstract pulse is not visualised but is experienced as an internalised feeling of motion, with the metrical pulses felt as downwards 'striking' motions, and other rhythmic time points between the metrical pulses felt a upwards

motions. My internalised conception of these upwards and downwards motions is similar to that of the motions associated with downbeats and upbeats.

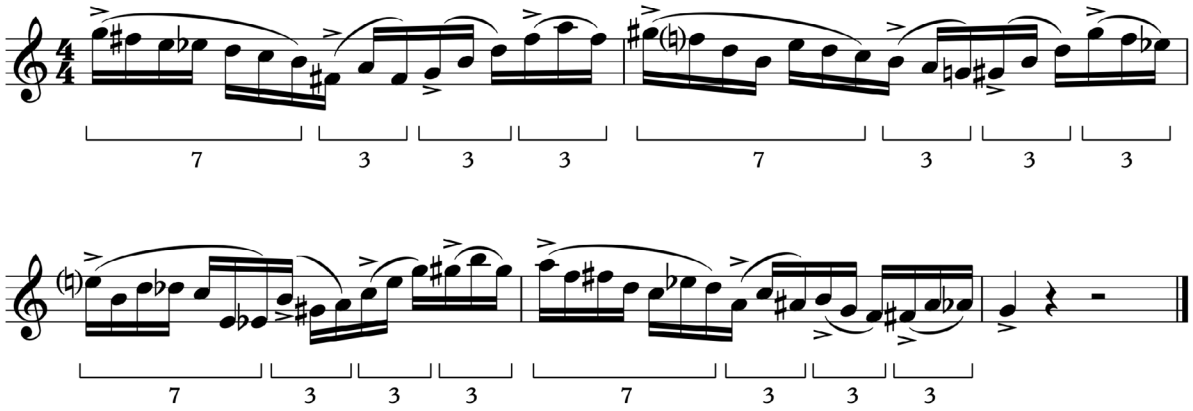
2.2.2 Number sequence

A number sequence is a non-notational method of arranging and communicating a rhythmic sequence, presented as "a series of numbers in which each numeral represents a group of notes that function together as a rhythmic cell" (Gill, 2018, p. 8). These rhythmic cells are referred to as *groupings*. Number sequences can be used to arrange groupings of notes within metrical or countermetrical pulse streams, and do not indicate changes in time signature or subdivision.

Each numeral within a number sequence indicates the total length of that rhythmic cell. The rhythmic content of each cell, however, is not predetermined, and can vary depending on the intentions of the composer and/or performer. Within the context of this research project, number sequences will be utilised exclusively to organise the placement of accents within streams of evenly-spaced notes, with the start of each grouping corresponding to the placement of one accent. For example, the number sequence 7, 3, 3, 3 can generate groupings of semiquavers within a single bar of 4/4 meter, with the first note of each grouping accented and the subsequent notes within each grouping being slurred. Audio 2.1 features four consecutive bars of 4/4 played with this grouping structure. Figure 2.11 features a notated transcription of this passage, with bracketed numbers indicating the groupings.

Audio 2.1. Four bars of quavers grouped into 7, 3, 3, 3 number sequence

Figure 2.11. Transcription of four bar passage with 7, 3, 3, 3 grouping structure annotated



The work of Barker (2015) explains how the numerals within number sequences can also refer to *rhythmic archetypes* (defined in Section 2.2.4). While this is an approach to interpreting number sequences that I have utilised within my music more broadly, it is not a feature of my practice approach within this project.

The use of number sequences to generate rhythmic phrasing has been developed extensively in the music of Australian percussionist Greg Sheehan, as documented in his teaching methodologies (2021) and the liner notes of his recorded music (2009). The use of number sequences has also been discussed through analytical work by O'Neill (2013), Barker (2015), McLean (2018) and Hale (2021). In all of these works,

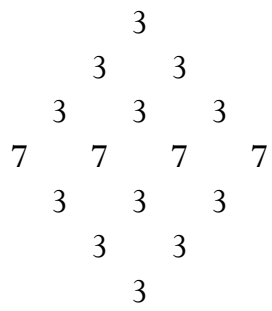
number sequences are applied as either rhythmic frameworks that are utilised in composed works, or as rhythmic structures that can generate improvisation.

Sheehan, Barker, McLean and Hale are all players of instruments that traditionally function within an improvising rhythm section and which are all polyphonic. As such, their applications of number sequences within their academic work is largely informed by the timbral and orchestrational possibilities their instruments afford them. My research project presents a new perspective by focussing on a monophonic saxophone-based application of number sequences. Additionally, the actions involved in rhythmic articulation on their instruments all feature striking, scraping or plucking motions against a sound-producing string or membrane. My research project presents a new perspective by focussing on a monophonic saxophone-based application of number sequences, with rhythmic articulation produced primarily by tongue motions 'striking' a sound-producing vibrating reed in synchronicity with finger motions on the instrument's keys.

2.2.3 Number diamond

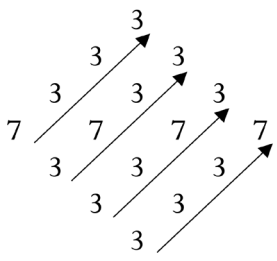
Number diamonds are a method of rhythmic organisation first developed by Australian percussionist Greg Sheehan. They are used to arrange permutations of number sequences into larger phrasing structures that are visually represented in the shape of a diamond. Arranging the number sequence 7, 3, 3, 3 into a number diamond would produce the diamond shown in Figure 2.12.

Figure 2.12. 7, 3, 3, 3 number diamond



Sheehan identifies the procedural utility of presenting number sequences in this configuration, stating that it opens up multiple possible rhythmic interpretations that can be "read in diagonal, horizontal and vertical directions" (Sheehan, 2021, p. 23). My utilisation of diamonds within the research project utilises diagonal readings only, progressing upwards from the left. This reading orientation is shown in Figure 2.13. Each line within this structure is conceived of as a musical phrase, with the diamond featuring four phrases in total.

Figure 2.13. Reading orientation of number diamond



Number diamonds were one of the most common forms of number sequences utilised in Phase One

practice tasks to generate my articulation patterns, organising the placement of accents and slurs within a stream of evenly-spaced notes. Some practice tasks also utilised different number sequence structures that emerged out of my own organisational methodologies.

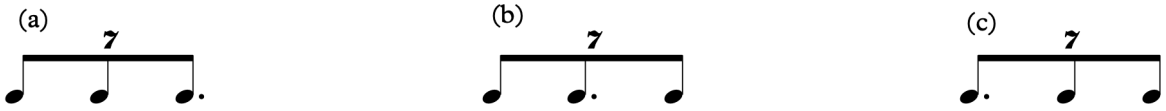
2.2.4 Rhythmic archetype

Barker defines rhythmic archetypes as short rhythmic cells "reduced to their simplest form, whilst retaining enough essential information to convey the organization of internal subdivision" (Barker, 2015, p. 26). The rhythmic contents of archetypes are generated by combinations of notes with lengths of 1 and 2 rhythmic units. Figure 2.14 presents three examples of rhythmic archetypes, each of which features a distinct arrangement of three notes within a phrase seven rhythmic units in length.

Figure 2.14. Three rhythmic archetypes

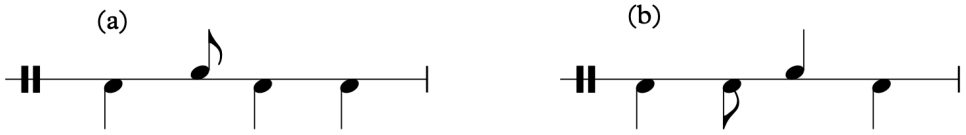
Rhythmic archetypes define the contents of rhythmic cells only, and do not contain any references to time signatures or metrical subdivisions. As such, any given archetype can be realised within any meter or subdivision and still be perceived as a discreet rhythmic unit (Barker, 2015). Within this research project, my realisation of archetypes sees them contextualised within a single metrical pulse. For instance, the three archetypes presented in Figure 2.14 would all constitute a single metrical pulse with a septuplet subdivision, as seen in Figure 2.15.

Figure 2.15. Three rhythmic archetypes expressed as septuplets



A small number of archetypes utilised within my practice project featured rhythmic cells with two distinct 'voices', conceived of as a high voice and a low voice. The high and low voices do not refer to pitch relationships, but rather describe the feelings of rising and falling motions inherent to the archetype's rhythmic content, similar to the feeling generated through the interaction of on- and off-beats in a meter. Figure 2.16 presents two different versions of a septuple rhythmic archetype, each featuring its own arrangement of high and low rhythmic attacks. Archetype (a) can be heard in Audio 2.2 and archetype (b) can be heard in Audio 2.3, both realised with high and low sounds. As can be heard, each of these archetypes has a distinct rhythmic feeling that emerges from the interaction of their high and low voices, despite the underlying rhythmic durations of the two archetypes being the same. The function of two-voiced archetypes within my practice tasks will be discussed in Section 5.4.

Figure 2.16. Two archetypes with high and low voices



Audio 2.2. Archetype (a) played with high and low sounds

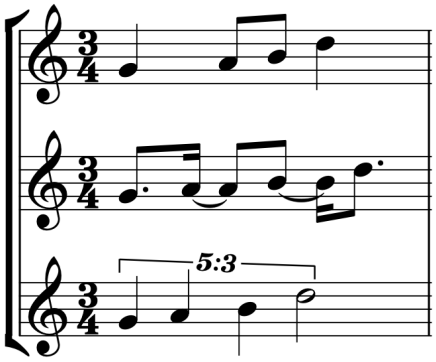
Audio 2.3. Archetype (b) played with high and low sounds

The rhythmic archetypes within my practice tasks were used in two ways. Archetypes were sometimes used as silent rhythmical organisational tools guiding the placement of notes played on the saxophone without the archetype being projected in the musical surface. In some Phase One sessions, archetypes were also utilised as played phrases that were audible features of the musical surface.

2.2.5 Microtiming redistribution

The term microtiming redistribution describes multiple rhythmic arrangements of the same sequence of pitches within a uniform metrical space (Gill, 2018). Figure 2.17 presents an example of this, featuring the microtiming redistribution of a four-note phrase into three distinct rhythmic permutations within a 3/4 bar-length.

Figure 2.17. Three micro-timing redistributions of four-note phrase



My prior research (2018) has explored creative applications of microtiming redistribution, discussing its utility as a method for generating permutations of rhythmic material that could be used either as a compositional device or during improvisation.

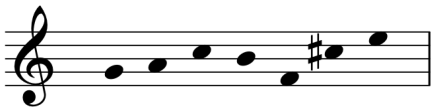
Within Chapter Five of this thesis, I present a new application of the concept by introducing the term *microtiming redistribution errors* (MRE). In contrast to the deliberate utilisations of microtiming redistribution, MRE describes the erroneous displacement of rhythm events from their intended onset point on a microtiming scale. These rhythmic displacements result in a played phrase that is similar to, but not identical to, the intended rhythmic phrasing.

2.3 Sequences

2.3.1 Pitch sequence

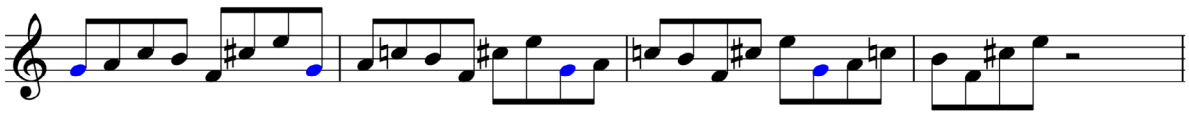
I use the term pitch sequence to refer to a pitch set that is played in a fixed order. Many of the pitch sequences featured within this thesis will be notated without rhythmic content, as demonstrated by the seven-note pitch sequence seen in Figure 2.18.

Figure 2.18. Seven-note pitch sequence



In the context of my practice tasks, pitch sequences were repeated without pitch variation or transformation, played sequentially and without pause. For example, the pitch sequence shown in Figure 1 could be played sequentially four times as a stream of even quavers to generate the phrase shown in Figure 2.19, where blue noteheads are used to indicate the first pitch of the cycle whenever it recurs. This notational convention will be featured throughout this thesis.

Figure 2.19. Seven-note pitch sequence played as quavers



2.3.2 Articulation sequence

Within this project, I define an articulation sequence as an ordered series of slurs, staccatos, tenutos and accents. As was the case with pitch sequences, articulation sequences within my practice tasks were repeated as recurring loops without pause.

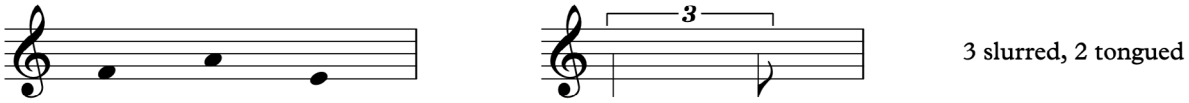
Articulation sequences within my tasks were generated in two ways. In Phase One, articulation sequences were conceptualised as musical inputs that were independent of other musical elements such as pitch or rhythm. All articulation sequences within this phase featured series of slurs exclusively, with the first note of each slur being accented. These series of slurs were conceived of as verbalised grouping structures without the use of musical notation; early practice sessions utilised regularly recurring slur lengths communicated as groupings such as “slur in groups of 7”, while later practice sessions used number sequences to organise irregularly-grouped series of slur lengths.
In Phase Two tasks, the articulation sequences incorporated staccatos and tenutos alongside slurs. These sequences were conceived of as part of a musical phrase that also included notated pitch and rhythmic content. The articulation sequences in these phases of practice were thus expressed through standard musical notation. The articulation within Phase Three tasks was not predetermined and was instead improvised during practice.

2.3.3 Resultant phrase

In Phase One of practice, a resultant phrase was formed through the combination of three inputs: a pitch sequence, an articulation sequence, and a rhythmic phrase. Combining these inputs saw the rhythmic phrasing being used to define the durations of each note within the pitch sequence, while the articulation sequence determined how each note was struck. Each of these three parameters featured a different number of events; resultant phrases, therefore featured the three concurrent sequences commencing in unison, then drifting out of phase, and then re-aligning at a coincidence point.

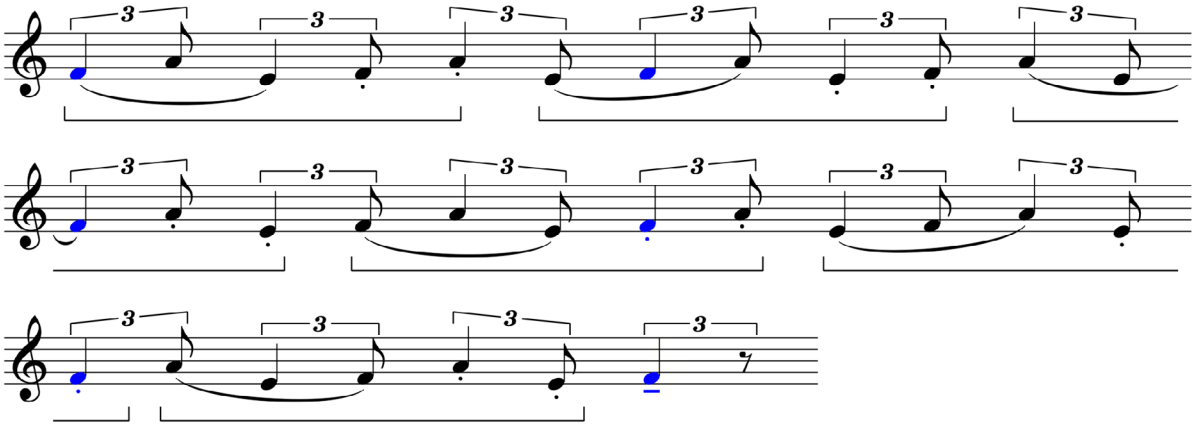
An example of how the inputs of resultant phrases were conceptualised is shown in Figure 2.20. From left to right, the figure presents a pitch sequence with three notes, a rhythm sequence with two rhythmic events, and an articulation sequence with five distinct note attacks.

Figure 2.20. Pitch, rhythm and articulation sequences



When combined, these three individual musical inputs generate the resultant phrase featured in Figure 2.21. Within this notated example, blue noteheads indicate the recurrence of the first note of the pitch sequence, the beams indicate the recurring rhythmic phrase, and square brackets indicate the recurring articulation sequence. As can be seen, these three parameters align at the beginning and ending of the resultant phrase, with the sequences moving out of phase in-between the two coincidence points. The resultant phrase can be heard in Audio 2.4.

Figure 2.21. Resultant phrase



Audio 2.4. Resultant phrase played on saxophone.

Chapter Three

The Constraints-Led Approach

The practical component of my research project is informed by the principles of the constraints-led approach, a pedagogical methodology that is in turn informed by insights offered by the broader field of ecological dynamics. As will be demonstrated in this chapter, a large majority of research into the practical applications of CLA has focussed on skill adaptation within sports contexts, with only a handful of musical applications being published to date. Additionally, sports-based applications of CLA have predominantly been studied within learning contexts featuring a clear division between the learner and the practitioner who devises and administers the practice tasks; the music-based existing studies are, to my knowledge, the only case studies of applications of CLA within a self-directed learning context.

This chapter will feature three sections. First, I will introduce key concepts from the ecological dynamics field that form the theoretical framework on which the constraints-led approach is based. The second section will then discuss the pedagogical principles of the constraints-led approach, introducing some broad examples of their application within my practice project that will be expanded upon in Chapter Four. The final section of this chapter will introduce the concept of self-directed learning, highlighting its unique attributes as a pedagogical context that is distinct from the learning contexts presented in much of the constraints-led literature.

3.1 Ecological dynamics terminology

The terms and concepts introduced in this section will establish the theoretical foundation for the constraints-led approach. Renshaw et al (2019) describe the connections between these fields of knowledge as follows:

> "Ecological dynamics describes the theory that supports the [nonlinear pedagogy] framework. Nonlinear pedagogy refers to the pedagogical principles that underpin the constraints-led approach, which is the methodology of manipulating constraints during practice task designs" (p. 2).

Ecological dynamics theory builds on ideas originating in dynamical systems theory and ecological psychology. Dynamical systems theory is a field of mathematics used to describe the behaviour of complex systems over time. It can be applied to the study of natural movement systems such as meteorological events, flocks of birds, a sports team, and the human body, as well as non-biological systems such as financial markets and road traffic flow. These complex systems are formed by a highly integrated network of interacting parts, each of which has the capacity to interact with other parts in non-linear and recursive ways, as well as to contribute to the functionality of the system as a whole (Clark & Crossland, 1985; Davids, Button & Bennett, 2007). The patterns of behaviour exhibited by these complex systems are emergent properties produced by the self-organisation of system components on a local and macro level, oscillating between phases of functional stability and instability (Thelen, 1992; Riley & Turvey, 2001; Munakata & McClelland, 2003).

Dynamical systems theory has also been applied to studies of the developmental stages of human motor-

skill learning. Within this framework, the human body is conceptualised as a complex integrated system, with motor-skill development being promoted by embodied learning processes. These processes involve the exploration of novel movement patterns that initially cause instability within the system, but as the learning process progresses, new stable patterns of self-organisation emerge amongst the system's constituent parts. This process has been demonstrated through studies of the development of a number of motor-skill behaviours such as learning to walk, which involves system parts including the "spinal cord, brain, sensory input, muscles and limbs" (Smith & Thelen, 1994).

Ecological psychology describes the functional interaction and reciprocity between human perception and action, and surrounding environmental factors. The ecological approach challenges the notion that the information perceived within the environment is passively and indiscriminately received by the sense organs that is then cognitively processed or enriched. Instead, the approach proposes a direct model of perception without cognitive interpretation, with the main objects of perception being affordances: possibilities for action within the environment for the perceiving organism (Gibson, 1979; Chemero, 2003; Lobo, Heras-Escribano & Travieso, 2018). Ecological psychology therefore offers an alternative to the traditional psychological models that feature dualities of perception-action and organism-environment. Perception-action coupling and affordances will be described further in Sections 3.1.1. and 3.2.2. respectively.

Drawing on dynamic systems theory and ecological psychology, ecological dynamics is a motor-skill learning theory that conceives of learners as complex dynamic systems functioning in reciprocal relationships with information-rich performance environments. Self-organisation of stable patterns of behaviour is now understood to emerge from interacting organismic components that are guided by affordances perceived within the environment. This can be understood through the example of learning to walk, which involves not only the organismic system parts listed earlier, but would also be influenced by environmental factors directly perceived through the sense organs such as the walking surface grade and material, the reachability of steadying features such as railings, as well as ambient factors such as wind and light levels. Ecological dynamics theories have also been applied in musical learning contexts to understand how musicians develop new embodied and sonic relationships with their instruments, informed by "the dynamic interactivity (feedback loops) that occurs between instrument, body, brain, and the environment" (van Der Schyff et al, 2018).

3.1.1 Perception-action coupling

The concept of perception-action coupling is one of the key principles of ecological dynamics, describing the functional grouping of perceptual and movement-based systems within organisms. The coupling of these two systems allows the organism to identify and act upon useful resources within its surrounding environment, in what Gibson (1979) describes as a reciprocal loop between actions that serve to detect information, and information that acts as an impetus and/or constraint upon action. In other words, perception does not function as a neutral form of information gathering, but rather is an active process that informs decisions made by the organism and guides the actions they take. This has significant implications for the understanding of human behaviour, highlighting the "mutuality and reciprocity of neurobiological systems and their environments" (Chow et al, 2011, p. 190) in determining the actions taken by individuals within a given context.

The theory of perception-action coupling offers an account of human behaviour that contrasts with

a number of more dominant analytical models that prioritise the role of organism-centred cognitive mechanisms. These other models demonstrate an analytical bias that Davids and Araújo (2010) describe as *organismic asymmetry* – the foregrounding of cognitive processing of sensory information and internal representations of the desired action(s) in descriptions of behaviour. By contrast, the model promoted by perception-action coupling is summarised by Slater (2020) as:

> "…[providing] a connection between the self-organisational capacities of systems to form and maintain patterns of coordination without the need for an executive controller, to the information sources present in the environment that are acted upon directly without the need for modelling or interpretation" (p. 69).

This model of human behaviour has significant implications for approaches to learning, and is foundational to the constraints-led approach that will be detailed in Section 2 of this chapter. Within a constraints-led approach to learning design, the coupling of action and perception is harnessed to direct the learner's perception "to uncover otherwise unrecognised affordances within a performance situation" (Slater, 2020, p. 94), promoting the emergence of previously unexplored action possibilities. Internal representations of those actions are not a feature of this approach; rather, perception is direct, and "meaningful information for regulating action emerges as the joint product of a coordinated system of parts and processes that spans an organism and environment" (Davids & Araújo, 2010, p. 634).

The concept of perception-action coupling also has significant implications regarding skill development for improvising musicians. Traditional jazz-based pedagogical methods often feature the internalisation of modelled actions as a central tenet of their philosophy: the accumulation of harmonic, melodic and rhythmic vocabulary that becomes embodied through instrumental practice and can then be reproduced spontaneously during performance. These approaches, however, often fail to adequately address the performer-environment relationship in their practice designs. Improvised musical performance is a highly dynamic performance environment, and the collective musical output of an ensemble during an improvisation can be understood as a *sonic environment* (see Section 3.2.1) that each individual performer has a reciprocal relationship with. In preparation for this performance context, effective learning approaches should not only promote the development of musical vocabulary, but also encourage learners to explore different ways of spontaneously responding to the performance demands of diverse sonic environments.

There is a growing body of research examining practice designs that acknowledge the performer-environment relationship through the application of ecological-dynamics approaches to learning within the context of jazz and improvised music. This includes work produced by professional musicians analysing the application of ecological dynamics-based practice interventions within their own improvisational approaches, including the work of Slater (2020), McMahon (2022) and Rapp (2023). Each of these research projects addresses the performer-environment relationship in a distinct way, demonstrating the diverse range of practice designs that could be derived from an ecological-dynamics perspective. My research makes an original contribution to this growing body of knowledge through the evaluation of my own saxophone-based practice intervention.

3.1.2 Affordances

One of the key implications of perception-action coupling is that organisms have the capacity to identify opportunities for action within their surrounding environment. Gibson (1979) refers to these information

sources as *affordances*. Chemero (2003) expands on this concept, describing an affordance as "a resource that the environment offers any animal that has the capabilities to perceive and use it. As such, affordances are meaningful to animals: they provide opportunity for particular kinds of behaviour. Thus, affordances are properties of the environment but taken relative to an animal" (p. 182).

A number of researchers within the creative disciplines have explored theories with clear parallels to the concept of affordances. Bolt (2010) argues that practice-led research can generate "a very specific sort of knowing, a knowing that arises through *handling* materials in practice" (p. 29, emphasis added). Bolt's concept of handling is a clear allusion to the physical affordances offered to practitioners by the tools they interact with in their creative processes. In the case of musical skill adaptation, this could refer to the affordances offered by musical instruments, and the particular musical possibilities that are unique to each instrument. Saxophonist Evan Parker offers an insightful practice-based reflection on this concept, identifying his instrument as a "channel for the imagination but at the same time as a *shaper and perhaps limiter* of the imagination" (Parker, 2018, emphasis added).

Another source of affordances that can be identified within the dynamic performance context of improvised music is the musical output produced by the performers themselves. According to Gibson, "the richest and most elaborate affordances of the environment are provided by other animals and, for us, other people" (Gibson 1979, p. 126). Hannaford (2019) highlights the significance of this idea to our understanding of improvised music, with his research employing the concept of affordances "to describe relational qualities between improvisers' *sonic gestures* and… their *sonic environment*" (p. 40, emphasis in original). He conceives of the sonic environment as "the conceptual frame that facilitates musical performance", with sonic gestures being "sounds that improvisers regard as meaningful parts of their sonic environment" (p. 40). In other words, the sonic contributions of each performer can be conceived of as a series of affordances that offer opportunities for interaction with the other performers co-creating the music.

Within this project, I use the concept of affordances to describe information sources presented by the physical features of the saxophone, and also within the sonic environments generated during improvised performance. My practice project was conceived of as a way to affect change upon how I interact with these two sources of affordances. The learning methodologies implemented within my practice intervention were heavily informed by the affordances of the saxophone, particularly two of the idiosyncratic physical movements involved in sound production on the instrument: tongue movements against the reed and finger motions on the keys. How these considerations informed my practice approach will be detailed in Chapter Four.

3.1.3 Stability

According to ecological dynamics theory, an organismic system demonstrates stability when it is able to maintain functional movement patterns while adapting to changing opportunities for action presented by the affordances within its performance environment. Through the development of stable patterns of coordination and control, performers are able to respond to perturbations during performance with flexibility and adaptability (Newell, 1996; Davids et al, 2007). This contrasts to system instability, which is characterised by a reliance on fixed movement patterns and performance solutions that are not adaptable to dynamic features within the performance environment.

Systems have a tendency to self-organise into stable and functional patterns of organisation, which are referred to as *attractors*. These attractors "represent coordination tendencies among system components and are roughly synonymous with functional coordination patterns in the repertoire of a movement system" (Davids et al, 2007, p. 32). When perturbations are introduced during performance, systems have a self-organising tendency to move towards the functional stability of attractors in order to generate an effective and efficient performance solution.

The musical and movement-based tendencies identified within my own playing at the commencement of this research project can be described as attractor states. The goal of this practice project can thus be understood as the exploration and development of new functional attractor states that would be integrated alongside my existing movement-based tendencies, rather than replacing or eliminating them. This would have the effect of allowing me to respond with more creativity and spontaneity during improvised performance.

3.1.4 Constraints

The information derived from internal and external sources that inform the decision-making and actions taken by organisms can be referred to as *constraints*. According to Glazier and Davids (2009), constraints are "internal or external features that limit the number of possible configurations that complex systems, [such as] neurobiological systems, can adopt" (p. 20). Constraints can belong to three distinct categories that define their sources: organismic constraints, environmental constraints and task constraints (Newell 1986; Glazier & Davids, 2009). The interaction of these three categories of constraints "define the boundaries within which human neuromusculoskeletal systems must operate and, therefore, shape the emergence of patterns of coordination and control" (Glazier & Davids, 2009, p. 20).

Organismic constraints, sometimes referred to as personal or individual constraints, are those that describe defining characteristics of individuals. According to Renshaw et al (2019), they can include both physical and cognitive characteristics including "genes, height, weight, muscle-fat ratio, cognitions and patterns of thinking, amount of previous experience and learning, motivation, emotions, feelings and desires" (p. 42). Their work notes that due to the individual nature of these characteristics, organismic constraints are inherently variable across a population, but can also vary within individuals over both short and long time-scales.

Environmental constraints are anything external to the performer's body. They can include elements of the physical environment within which a performer is situated such as surrounding landscape features, weather conditions, altitude and air pressure, and ambient lighting (Glazier & Davids, 2009). They can also include design features of performance environments such as architecture, furniture, artificial lighting and other infrastructure (Newell & Jordan, 2007). In his summary of work by Davids and colleagues, Slater highlights a number of additional, non-physical environmental constraints including "community and cultural expectations and attributes, economic pressures and opportunities, historical resources and documents, recordings and artefacts, and institutional support mechanisms" (Slater, 2020, p. 64).

Task constraints are directly related to performance activities. According to Newell (1986), they refer to "the goal of the activity and the specific constraints imposed" (p. 352). Elaborating on this idea, Davids et al (2007) define task constraints as including "task goals, specific rules associated with an activity, [and] activity-related implements or tools" (p. 41), as well as the task-specific physical features of

the performance location, such as goals and pitch boundaries in football. Task constraints are usually temporally and geographically specific to periods in which performance activities occur, making them more contextually defined than most environmental and organismic constraints.

When performers are involved in a goal-directed activity, their performance behaviours emerges out of the interaction of organismic, environmental and task constraints acting upon them. The constraints-led approach is based on the manipulation of key constraints to encourage new movement possibilities to be explored by learners, leading to what Davids et al (2007) identify as "the emergence of different states of coordination that become optimized with practice and experience" (p. 42). They go on to highlight the importance of exploring movement variability during the process of skill acquisition as a way to promote system stability in actual performance contexts: "adaptive learning allows people to cope with novel task constraints as performance conditions change" (p. 42). The manipulation of constraints formed a key component of my research project, and offers a useful learning approach to prepare for the dynamic performance context of improvised musical performance. Details of constraint manipulation within my practice project will be addressed in Section 2 of this chapter and also in Chapter Four.

3.1.5 Self-organisation

Within the theory of ecological dynamics, learners are understood as complex, adaptive systems that spontaneously form patterns of organisation and action in response to constraints (Chow et al, 2011; Davids et al, 2003). This process of pattern formation, which occurs "without the need for executive micro-management of each component" (Renshaw et al, 2019, p. 13), is referred to as *self-organisation*, a term adapted from dynamical systems theory. Self-organisation has been demonstrated through experiments involving learning a bimanual coordination pattern produced by repetitive index finger motions, in which the finger motions transitioned between out-of-phase and in-phase patterns of coordination without any cognitive initiation of the change (Kelso, 1984; Haken, Kelso & Bunz, 1985). Slater (2020) identifies the capacity to self-organise as "the primary source of skill development within ecological dynamics theory and methodology" (p. 47), with a nonlinear approach to learning being one that promotes "the self-organisation of skills" (p. 88). The practice tasks utilised within my practice project aimed to exercise this self-organising tendency to develop new patterns of coordination and control within my improvisational saxophone approach.

3.1.6 Synergy

A related concept to self-organisation is that of synergy formation. Kelso defines synergies as "context-sensitive *functional* groupings of elements that are temporarily assembled to act as a single coherent unit" (Kelso, 2012, p. 907). These temporary formations self-organise in response to constraints imposed upon an organism, always within the context of that organism attempting to accomplish a task or goal (Latash, 2008).

Effective synergies are able to maintain flexibility and adaptability to changing constraint pressures during performance. Kelso (2012) explains that "during the course of ordinary function a perturbation to any part of the synergy is immediately compensated for by remotely linked parts in such a way as to preserve functional integrity" (p. 908). This characteristic of synergies is referred to as system *multistability*. The constraints-led approach that will be discussed further in Section 2 of this chapter promotes skill adaptation through the development of multistability for the performer through carefully designed and

applied perturbations during practice that encourage the exploration of multiple movement solutions to any given performance problem.

A number of synergies are evident in the act of playing saxophone. One such synergy is formed in order to produce an instrumental tone, involving the cooperation of separate physical processes including embouchure pressure, tongue position, air pressure, and oral cavity shape. When playing a passage of tongued notes on the instrument, another synergy is formed drawing on separate physical processes including tongue motion against the reed and the depression and lifting motions of fingers, in addition to those involved in the production of the sound itself. This second synergy was one that was interrogated through my practice intervention, and as will be discussed in Chapters Four and Five, the promotion of greater multistability for that synergy was one of the main outcomes of the practice.

3.1.7 Degrees of freedom

Nikolai Bernstein's research into the coordination of complex movement systems (1967) addresses what he refers to as the *degrees of freedom problem*. Bernstein's work was formed in response to the question of how the large number of individual components within a movement system, referred to as degrees of freedom (DFS), could functionally group together with enough stability to achieve movement goals, yet with enough adaptability to effectively respond to changing performance conditions.

To address the question of functional stability, Bernstein proposed that when multiple degrees of freedom join to form a synergy, the range of possible movements for each component is temporarily reduced, oriented towards only the possibilities relevant to the performer's movement goal. Additionally, the control exerted by the performer dictates the movement of the synergy as a whole, rather than the movements of each individual component. This results in greater coordination and control for the performer over their movement, with the most efficient level of cognitive intervention.

To address adaptability, Bernstein investigates how degrees of freedom are *frozen* into larger units and then *freed* when that particular synergy is no longer required. A movement system demonstrates high levels of adaptability when each degree of freedom contributing to a synergy is able to respond to perturbations or changing constraint pressures without any detriment to the overall level of performance, and is able to be efficiently and quickly be frozen or freed depending on the performance demands. Another concept related to the adaptability of DFS's and synergies is that of component *degeneracy*, which Edelman and Gally (2001) describe as "the ability of elements that are structurally different to perform the same function or yield the same output" (p. 13763).

The physical movements required for musical performance are supported by degrees of freedom being frozen into synergies. Returning to the synergy described in Section 3.1.5. that forms to produce instrumental tone on the saxophone, each contributing component – embouchure pressure, tongue position, air pressure, and oral cavity shape – is an individual degree of freedom. These four DFS are frozen to form a synergy during the act of tone production, and are freed when the tone is ceased.

3.1.8 Repetition-without-repetition

Bernstein (1967) coined the term repetition-without-repetition to refer to the inherent and observable variability in human movement patterns. As Slater (2020) explains, the concept "describes how similar

problems are solved in similar ways when under similar constraints... but with variation as the fundamental performance feature" (p. 52). This concept acknowledges that performance problems have multiple possible movement solutions, and that similar movements can produce variable results. In practice, this means that individuals repeating the same task will not reproduce the exact same movement pattern upon each reiteration of the task. Inherent movement variability is reflective of system stability, in that it demonstrates the system's ability to adapt to changing performance contexts and constraint pressures without any detrimental effects to performance outcomes.

Repetition-without-repetition can be demonstrated on a number of levels within musical performance. The precise physical processes involved in instrumental or vocal sound production feature a wide range of movement variables that subtly interact with environmental and task constraints, which for the experienced performer will occur without conscious intervention. The synergy of physical processes described in the previous section required for sound production on the saxophone (embouchure pressure, tongue position, air pressure, and oral cavity shape) demonstrates repetition-without-repetition when those separate DFS produce a consistent instrumental tone while responding to changing influences from the performance environment including (but not limited to) the strength and grain structure of the reed, ambient temperature, the temperature of the instrument's metallic body, and the desired volume.

Repetition-without-repetition was a core feature of the practice designs I developed within this project, implemented through the learning principle of task variability that will be introduced in Section 3.2.4.

3.2 The constraints-led approach

The constraints-led approach (CLA) offers a pedagogical application of the ecological dynamics principles presented in section 3.1. CLA harnesses the self-organising tendencies of learners through the implementation of practice tasks that encourage the discovery of performance solutions in response to the demands of interacting constraints. Learners are encouraged to explore multiple solutions to any given performance task, with manipulations of task and environmental constraints guiding learners to perceive and act upon different information sources within the performance environment upon each repetition of the task. Put another way, the manipulation of constraints encourages the emergence of new action-perception couplings, allowing performers to develop individualised and adaptable patterns of coordination and control that have transfer to performance contexts (Komar et al, 2019).

A core philosophical feature of the constraints-led approach is its acknowledgement that each individual learner performs under a unique sets of constraints, including the inherently individual-specific organismic constraints. It follows that the most effective performance solution (or solutions) for any given performance task will also be unique to each learner. This concept is a point of contrast between CLA and more traditional pedagogical methods that promote single, idealised forms of performance actions. Constraints-led practice designs thus utilise tasks that "constrain the range of response dynamics that can be produced in pursuit of the task goal *without* dictating a specific pattern of response dynamics" (Newell, 1986, p. 352), allowing each individual learner to find the performance solution(s) that best work for them.

The definitions included in this section will provide theoretical context to the constraints-led learning approach that I implemented within my practice project. Further details of how each concept informed my learning designs will be discussed in Chapter Four. The concepts of *dexterity* and *task variability* in

particular will be revisited at length in the introduction to Chapter Four, highlighting their critical function within my project. This section will present more general definitions, drawing on relevant sources from the CLA literature.

3.2.1 Constrain-to-afford

The constrain-to-afford principle is a key practice design feature within the constraints-led approach. It describes the manipulation of constraints within practice tasks to guide the attentional focus of the learner towards useful affordances within the performance environment, as well as to introduce perturbations that "create instability and promote transitions to new… action solutions" (Renshaw & Chow, 2018)". In doing so, constraint manipulation can "encourage performers to engage with available affordances in a more effective and efficient manner as they self-organise to solve the problem presented" by the practice task (Renshaw et al, 2019, p. 77). Constraints can also guide learners to identify previously unrecognised affordances within their performance environment, leading to greater contextual attunement. Within my project, the principle of constraint to afford was a useful way to conceptualise the function of constraints within my practice tasks: to guide my attention to new movement possibilities on the instrument that offered pathways to more effective and efficient responses to affordances within the sonic environments of improvised performance.

3.2.2 Dexterity

Dexterity describes the ability of performers to adapt to dynamic performance contexts, and their resourcefulness in spontaneously finding effective performance solutions in the face of unpredictable environments. The term was first introduced into the field of ecological psychology by Bernstein (1967), who stated that "dexterity is in *finding a motor solution for any situation and in any condition*." (p. 21, emphasis in original). Dexterity is characterised by a balance between stability and flexibility of patterns of behaviour, with movement variations introduced when required by the constraint pressures of dynamic performance environments (Renshaw et al, 2019).

Dexterity is an exercisable capacity that can be promoted through practice, with its development being one of the key goals of a constraints-led approach. Dexterity is not a property of movements themselves, but refers to a performer's capacity to exhibit efficient perception-action coupling, allowing them to respond to emerging performance demands correctly, quickly, rationally and resourcefully (Bernstein, 1967; Renshaw et al, 2019). Constraints-led practice designs can promote dexterity by encouraging learners to solve task problems multiple times while navigating a variety of task and environmental constraints, and in doing so developing flexibility in response to the changing performance demands.

The development of dexterity on the saxophone was one of the core goals of my practice project. Dexterity within this project refers to both the technical ability to execute performance solutions, and the creative decision making that facilitates the identification of those solutions during performance. My practice designs focussed primarily on variability of task constraints (as opposed to environmental constraints), encouraging the exploration of new movement patterns on the saxophone and their resultant sonic outputs. In doing so, I hoped to further develop my instrumental dexterity and increase my range of possible responses to performance demands encountered within improvised musical contexts.

3.2.3 Task variability

Task variability is a core principle underlying practice design within a constraints-led approach. It refers to the manipulation and modification of constraints within a practice task, encouraging learners to "seek different solutions to the same performance problem" during practice (Renshaw et al, 2019, p. 33). In doing so, the learner is encouraged to repeat "*not the means for solving* a given motor problem, but *the process of its solution*, the changing and improving of the means" (Bernstein, 1967, p. 205, emphasis in original). As such, task variability can be understood as a pedagogical application of the repetition-without-repetition concept.

Task variability was a key consideration informing the design of my practice tasks. Each of the three practice phases featured a defined and consistent method of practicing pitch, rhythm and articulation materials, but the specific musical inputs of each practice session were unique to that session alone. In other words, I was practicing the *process* of manipulating the materials, with the limited time spent with each set of inputs ensuring I wouldn't internalise the material itself.

3.2.4 Representative practice design

Another key feature of the constraints-led approach is that practice tasks are designed to feature information sources and performance demands similar to those of actual performance contexts. This information-rich form of practice design encourages learners to "discover and exploit information–action relationships" (Renshaw et al, 2019, p. 22) within the performance environment, promoting the development of perception-action couplings that are transferable from practice contexts to performance contexts. Ecologically-relevant task designs thus avoid the tendency of more traditional learning approaches to feature "simplistic and highly controlled evaluation or practice tasks" that are isolated from their performance context (Davids et al, 2013, p. 26).

A growing body of research within the improvised music field has featured free improvisation as a key component of constraints-based learning tasks[1] (Slater, 2020; McMahon, 2022; Rapp, 2023). Although the tasks undertaken by each of these researchers are otherwise distinct, the shared incorporation of improvisation gives their tasks a high degree of representativeness for the demands of actual improvised performance, particularly the time pressure of spontaneous and simultaneous generation and execution of musical ideas.

While my research features very little improvisation in its practice designs, my tasks incorporate another performance demand that was representative of improvised performance. Each of my three learning designs feature the constraint that all musical material being practised should be internalised and executed without the use of notated visual references, other than the record-keeping of the material in my practice journal. As will be further discussed in Section 4.1.4, the use of musical notation would have changed the nature of the learning tasks, with the primary focus becoming the accuracy of my score-reading skills. This, however, would not have allowed me to exercise the motor skills and cognitive processes most relevant to improvisational dexterity that I was aiming to strengthen, which were more effectively targeted by tasks that did not utilise notation.

[1] Outside of constraints-led research projects, there would be a considerable volume of projects featuring improvisation as a key learning approach.

3.2.5 Nonlinear learning

There are several characteristics unique to theories of nonlinear learning that are distinct from other approaches to learning and skill acquisition. One of these features is that unlike traditional theories of deliberate practice, a nonlinear learning process does not exhibit a direct monotonical relationship between practice time and performance outcomes. The process of skill development can feature periods of either apparent stasis or rapid growth at different times, with Renshaw et al (2019) pointing out that "just because instant qualitative or quantitative changes cannot be observed, it does not mean that some learning has not taken place." (p. 96). Slater elaborates on this within his own improvisation-based musical research project, stating that "the learning process is cumulative over the practice period, and changes to technical abilities and aesthetic preferences are iterative and nonlinear" (Slater, 2020, p. 32). The thirteen-month period allocated to the practice component of my own research project allowed for potential changes to my improvising approach to emerge over a lengthy developmental time frame.

In addition to a disparity between practice time and learning outcomes, nonlinear learning approaches also feature disproportionality between practice effort and outcomes. As Chow et al (2011) explain, practice tasks that target specific areas can lead to other, wider performance outcomes: "small changes to practice task constraints, such as information present or technical changes to equipment, may result in significant changes in learners' behaviors" (p. 190). While each practice task is designed to target specific goals, the nonlinear approach also promotes the emergence of skills that may not have been explicitly planned for, often demonstrating high levels of *transfer* in which "the practice on one task can influence the performance on another" (Newell, 1996, p. 407). Conversely, effort-to-outcome disproportionality can also be demonstrated when multiple practice tasks (or variations of a single task) are used to target a single performance outcome.

Disproportionality between practice effort and performance outcomes was a notable feature of my own research project. During the thirteen-month practice period, I observed spans of time in which my progress had seemingly plateaued, as well as periods of rapid break-throughs. Additionally, none of the specific musical materials practised were intended to be mastered and then reproduced during improvised performance, which would represent a more proportional effort-to-outcome balance.

A third defining feature of nonlinear learning is that learners are not guided towards pre-defined 'exemplar' outcomes that practice is designed to progress towards (Newell, 1986; Ericsson et al , 1993). This principle acknowledges that the most suitable movement patterns for effective performance will differ between individuals, with nonlinear learning prioritising tasks that allow for "flexibility and adaptability so that learners can generate a movement solution that is unique to his or her personal, task and environmental constraints" (Renshaw et al, 2010, p. 124).

Due to the individual-specific nature of effective movement solutions, nonlinear practice designs prioritise exploration and experimentation. This approach allows for flexibility in response to the learning needs and desires of the learner, which may change over time as the learner's understanding and skills develop, and also allows for the emergence of skills that may not be anticipated outcomes of the learning design (Chow et al, 2007; Renshaw et al, 2010). As will be discussed in Chapters Four and Five, both of these characteristics are observable within my own project. The practice designs of Phases Two and Three both emerged out of insights I gained during earlier phases, allowing me to isolate certain ideas and promote further skill adaptations through new practice tasks. Additionally, self-reflexive evaluation of

recorded practice sessions and improvised performances identified outcomes that could be attributed to the practice designs, but that were not determined as goals at the commencement of the practice period.

3.3 Self-regulated learning

As noted by Slater (2020), the constraints-led approach has primarily been developed within sporting contexts that feature a clear divide between learner/s and practitioners such as teachers, coaches or assessors. These practitioners are responsible for the design and implementation of learning tasks, as well as making evaluations of the learner's performance to provide feedback and to make adjustments to future practice tasks as the learner's skill adaptation progresses (Davids et al, 2007; Renshaw et al, 2019). A contrasting learning context is that of *self-regulated learning*, which allows the learner to exercise individual responsibility over "goal identification, task specification, practice scheduling, task duration, and performance evaluation" (Slater, 2020, p. 33).

Effective self-regulated learning is predicated on the development and implementation of self-assessment strategies to allow learners to make insightful evaluations of their own performance without the need for an external practitioner. Self-assessment can provide the evaluative and experiential insights that would allow learners to identify their performance goals, and to design their own learning tasks (McPherson & Zimmerman, 2011; Zimmerman et al, 1996). Within a creative arts context, goal identification for self-regulating learners can feature a broad range of selection criteria, drawing on considerations that are "aesthetic, technical or ideological, or somewhat random" (Smith & Dean, 2009).

There is a growing body of research investigating effective methods of self-regulated learning within musical contexts. Self-regulated learning theory features an iterative process of self-assessment encompassing three steps: forethought, performance and self-reflection (McPherson & Zimmerman, 2011). Each of these steps can involve a range of activities. The forethought phase involves the identification of relevant performance goals, and the design of corresponding learning tasks. The performance phase sees learners implement the learning tasks within their own practice routine, while creating documentation in the form of self-recording or journaling that can assist in the self-observation process[2]. Finally, the reflection phase allows learners to self-evaluate, assessing the effectiveness of practice tasks in moving towards the identified performance goals, with modifications likely being made as practice progresses.

The methods of self-assessment utilised in my practice project featured cyclical feedback procedures on both a session-to-session scale and also in the longer-term progression of practice phases. Each session was documented with audio recordings and journaling, with evaluation of my performance based on that documentation occurring at the completion of each session. This process of evaluation and self-reflection would then lead to the alteration of task constraints to be utilised in subsequent sessions, and on two occasions it also lead to the creation of entirely new practice designs, as was the case with the development of Phases Two and Three. Details of this iterative process of constraint manipulation, practice, documentation and evaluation will be discussed in Chapters Four and Five.

Research into the constraints-led approach has raise some questions surrounding the ability of performers to effectively self-direct their learning. Newell (1996) cautions that performers' existing knowledge and

[2] Intriguingly, a number of researchers have suggested that self-recording is an infrequent strategy for musicians (Lehman & Jørgensen, 2012; McPherson & Zimmerman, 2011; Daniel, 2001). While a full interrogation of this claim is beyond the scope of this discussion, it should be acknowledged that self-recording is a near-ubiquitous feature of self-regulated learning for professional improvising musicians.

skill levels may limit their capacity to objectively identify relevant information sources and affordances within their performance environment without the guidance of a practitioner, suggesting that this can lead to "inefficient and ineffective searches, and, in some situations, the appropriate coordination solution or task goal may never be realized" (p. 421). In contrast, McPherson and Zimmerman (2011) highlight the potential for well-designed self-assessment to guide self-regulating learners to the appropriate performance solutions:

> "Self-regulation is cyclical because feedback obtained from prior performance helps learners to adjust their current performance and future efforts. Adjustments of this type are necessary because personal, behavioral, and environmental factors are constantly changing during learning and performance" (p. 131).

The tendency for sports-based representative practice designs to simulate the time pressures of actual competitive performance (Renshaw et al, 2010; Renshaw et al, 2019; Araújo et al, 2006) is a likely contributor to the potential for self-assessing learners to overlook effective performance solutions during practice. It is my assertion that this constraint may not allow adequate opportunity for performers to effectively identify and act upon new movement possibilities, requiring the input of an external practitioner who has been afforded ample preparation time outside of the practice session itself to identify new information sources and opportunities for action within the performance environment that the learner's attention can be directed to through constraint manipulation during practice.

My practice project provides a case study of a self-regulated learning approach that incorporates representative practice design without replicating the time pressures of actual performance environments. As was discussed in Section 3.2.5, my practice designs did not feature improvisation as a constraint, meaning that I was able to identify new movement patterns and design corresponding task constraints outside of the practice sessions themselves. It is my assertion that this lack of time pressure allowed me to avoid the potential for ineffective and inefficient searches for performance solutions within my self-directed learning process. The identification of relevant affordances prior to the commencement of practice could be a valuable process for other self-regulating learners wishing to utilise constraints-led principles in their practice.

The use of self-recording as a self-assessment tool also contributed to the lack of time pressure within my practice procedures. While journaling did provide a way to instantly record reflections during practice, the session recordings provided a second form of documentation that allowed me to critically reflect on my performance as a separate activity at a different time. This offered the potential to listen to passages multiple times and, if necessary, to utilised altered playback speeds. By allocating time for this process of self-assessment to occur separately to the practice sessions, I was able to listen back to my playing with more objectivity and to identify musical features that hadn't been apparent to me while I was practicing.

Examples of self-regulated, music-based learning projects that also utilise constraints-led principles can be found in the research of Slater (2020), McMahon (2022) and Rapp (2023). Each of their projects presents a unique application of CLA principles to their improvisational approaches on trumpet, piano and voice respectively. Significantly, each of their projects situates the application of ecological dynamics principles within the context of a self-regulated practice intervention, reflective of the solitary nature of much professional music practice. As such, each researcher was responsible for the learning design, the development of a model of self-assessment, and the implementation of practice tasks within their own

practice regime across a developmental period of twelve months (Slater), fifteen months (Rapp) and five years (McMahon).

My research project contributes a further case study within the context of my own improvisational approach on the saxophone, applied across a thirteen-month developmental period. My project does not seek to critically examine the pedagogical efficacy of the constraints-led approach. Rather, I present a case-study of the application of CLA within my self-regulated creative practice, outlining the function of constraint manipulation in promoting skill adaptation and increased dexterity for myself as an improvising saxophonist.

Chapter Four

The Practice Project

4.1 Overview

This practice project unfolded in three phases, taking place across a thirteen-month developmental period from October 2020 to October 2021. Although each of the three phases featured a distinct learning design, they all emerged in response to the same creative goals. The practice designs of Phases Two and Three both grew out of areas of interest from within Phase One that I wished to amplify in an isolated way; as such, each subsequent phase could be considered an output of the earlier phases.

The three phases of practice were introduced at different points during the practice period. When a new learning design was established, it was incorporated into my practice alongside the other design(s) that were already being used. In other words, the different phases did not occur sequentially, and were instead undertaken as concurrent streams of practice. Phase One commenced in October 2020, Phase Two commenced in January 2021, and Phase Three commenced in August 2021, with each phase carrying through from its introduction to the project's conclusion in October 2021.

To my knowledge, these three practice designs are distinct from any existing pedagogical approaches to improvisation on the saxophone, and as such present new knowledge in the form of novel learning approaches. Every practice session was 20-40 minutes long, focussing on the process of learning to play a single complex musical phrase on the saxophone, and also the process of adapting to any instabilities caused by the phrase's corresponding finger and tongue movement patterns. Each of the three practice designs featured a different approach to generating and practising these musical phrases, which this chapter will detail with reference to notated examples, practice recordings and analytical notes.

Some common features of all three practice designs will be introduced in this overview. Firstly, I will revisit two concepts drawn from the constraints-led approach that were first introduced in Chapter Three: *dexterity* and *task variability*. Here, I will give further details of how these principles are implemented within my practice designs, conceiving of the development of dexterity as a goal and task variability as the procedural means to work towards that goal. Following this, I will introduce two musical characteristics that were common features of all three practice designs: my focus on an embodied metrical pulse within each practice task, and the use of memorisation as a task constraint.

When pitch material is discussed within this thesis, pitch names will refer to the transposed notes played on the saxophone rather than notes in concert pitch. For instance, a note notated as a C will refer to the note C played on the alto saxophone, and not the sounded concert pitch E-flat.

4.1.1 Dexterity in my practice designs

Chapter Three described dexterity as a performer's ability to adapt to the performance demands of any situation under any condition. Within this conception, movement patterns that are indicative of dexterity are those that allow performers to solve performance problems correctly, quickly, rationally and resourcefully (Bernstein, 1967). In addition, dexterity facilitates a performer's access to multiple

solutions to any given performance problem – a characteristic with a clear parallel to this project's overarching goal of expanding my creative options in response to the dynamic performance context of musical improvisation.

The four indicators of dexterity have clear applicability for improvising musicians. My interpretation of Bernstein's theory leads me to define a *correct* performance solution in this context as one that allows the musician to accurately execute their creative ideas. The need for a *quick* performance solution in this context is immediately apparent: whether performing unaccompanied or within an ensemble, improvisers must attend to the unfolding musical environment in real time, simultaneously listening to the music being produced while also contributing to its creation. I define *rational* solutions to be those that are economical for the performer – making efficient use of their instrument's affordances in a way that is sustainable on multiple time scales, eg. within a performance, across a career. Finally, *resourceful* solutions are those that recognise affordances within the sonic environment, responding in ways that are contextually appropriate but can also contribute creative and unexpected musical inputs.

A common feature of the three practice designs is their shared focus on developing dexterity within my saxophone playing. The definition of dexterity within this study extends to include the interaction of both physical and cognitive processes, reflecting the conception of performers within ecological dynamics as complex adaptive systems (Chow et al, 2011). It was my hope that over the course of the practice period, new regions of system stability for myself as an improvising saxophonist would emerge through the practice, facilitating interaction with previously unrecognised affordances within the sonic environments of improvised musical performances. Dexterity thus encompasses accurate and efficient instrumental playing technique, the ability to conceive of multiple musical responses to any given performance context, and the interaction of those two qualities working together to allow me to accurately and extemporaneously execute any creative idea that I conceive of during performance.

My focus on dexterity led me to search for ways of practising that would exercise both my instrumental technique and my aural skills concurrently, forging connections between newly-explored movement patterns and the audible musical outputs of those movements. While this is a common underlying feature of many otherwise diverse pedagogical approaches within improvised music, I was interested in exploring practice methodologies that would focus on internalising processes and ways of working rather than prioritising the internalisation of musical vocabulary. This, in effect, promoted the formation of new regions of performance stability, or attractor states, within my improvisational approach on the saxophone across the developmental period of the practice project. My practice designs introduced several mechanisms to ensure this distinction was realised in practice.

4.1.2 Task variability in my practice designs

Task variability was introduced on a session-to-session basis. Each of the three practice phases featured a defined and consistent practice procedure and method of generating musical inputs, but the specific inputs utilised within each practice task was unique to that session alone. In other words, I was practising the process of manipulating the inputs and adapting to the perturbations introduced by their resultant finger and tongue movement patterns, with the limited time spent with each set of inputs ensuring I wouldn't internalise the material itself. By conceptualising each session's inputs as a unique set of task constraints, their application within consistent practice procedures allowed me to "repeat the process of solving the same performance problems under varied practice task constraints" (Renshaw et al, 2019, p.

36). By practising this way over a developmental period of thirteen months, it was my goal to internalise those organisational processes rather than any particular musical material, thus allowing me to exercise my improvisational dexterity on the saxophone.

The selection criteria that I applied when designing the musical inputs of each practice session will be discussed in Sections 2-4 of this chapter. I discuss the decision-making processes involved in my self-regulated learning approach, demonstrating how I ensured each practice task would effectively contribute to my accumulative development of dexterity. In doing so, I will also highlight the musical parameters that were unique to each practice phase, demonstrating how their consistency in application gave each practice phase unique characteristics that were clearly identifiable despite the changes of musical material between sessions.

4.1.3 Embodied metrical pulses

One musical parameter that was shared by all three practice phases was their emphasis on the accurate execution of precise rhythmic material measured against a metrical pulse. One of the key aims was to maintain a clear, embodied metrical pulse while playing the musical material on the saxophone. Many of the practice tasks was designed to present perturbations that challenged the stability of my embodied metrical pulse, offering varied musical contexts through which to develop greater system stability. I hypothesised that over time, these practice tasks would accumulatively promote skill adaptation and establish greater rhythmic coordination and control.

To maintain my embodied metrical pulse, I introduced a constraint that required me to accurately tap the pulse with my foot while executing the material on the saxophone. This tapping would be measured against the pulse of a metronome, which would also be used throughout the session. This is demonstrated in Audio 4.1, drawn from the Phase One practice session on 23rd October 2020. In this recording, my foot tapping is clearly audible in unison with the metronome while I practise[1].

Audio 4.1. Audible foot tapping of metrical pulse

The foot tapping motions often featured significantly more bodily movement, and produced more sound, than would be desirable or appropriate in performance contexts. Nonetheless, this exaggerated way of 'playing' the metrical pulse with my foot was a useful learning tool that ensured the complex phrases I was learning on the saxophone were grounded in an internalised, embodied metrical sense of pulse rather than solely relying on external time-keeping, which would also be undesirable in a performance context.

The strengthening of my embodied metrical pulse had direct transfer to improvised performance contexts. This could include music where the pulse was audibly projected in the music, with an ensemble playing 'in time' together. It could also be applied to more open improvisational contexts, where a silent but internally maintained metrical pulse could be used to generate rhythmic material.

[1] Foot tapping is not always audible in my practice recordings, due to a number of factors including proximity of recording device to my saxophone, the material of the floor and footwear, and the force with which I tapped my foot. The lack of audible foot tapping in other audio examples does not indicate a corresponding lack of this constraint.

4.1.4 Memorisation of practice materials

Another constraint utilised within all three learning designs was the memorisation of the practice material and a corresponding avoidance of notated visual learning aids. At the commencement of each session, notation was used to keep a record of the practice task's inputs. These inputs were written as a pre-musical information source, and did not amount to musical notation that could be read as a complete phrase. Once the inputs had been memorised, no further notational aids were used, forcing me to maintain an active aural and embodied engagement with the material while practising, which I hypothesised would be a more effective learning approach than using completely notated versions of each phrase.

By practising without notation, my awareness of the 'correct' execution of each practice task emerged as an outcome of the learning process itself. This required me to maintain an embodied understanding of the relationships between each musical input and to be actively listening as I practised, scanning for potential errors or moments of misalignment between the different inputs. Over the thirteen months of the practice project, I found that my ability to recognise errors and to implement effective performance solutions became more acute, suggesting that this constraint had led to my skillset adapting to the performance demands presented by the practice tasks.

Had fully notated versions of the practice material been used, the task constraints would not have been effective in introducing functional instability during the learning process. The skill adaptation being promoted by my tasks was based in the development of new stable methods of generating and manipulating material during improvisation, so the cognitive tracking of the materials required by memorisation during practice was highly representative of improvised performance. Writing each task's inputs in fully notated form would have allowed me to draw on my existing score-reading skills, which would not have been a representative practice design relative to improvised performance. Notation would also have offered a visual method of assessing the accuracy of my playing, which would have diminished the development of my aural skills in making those assessments. It is likely that as a result, many of the subtle playing tendencies that were aurally identified through my practice, presented as practice outputs in Chapter Five, would not have been observed.

4.1.5 Self-assessment model

One of the key research outputs of this project is the development of a self-assessment model that allowed me to evaluate the outcomes of my practice project. Indicators of effective practice within this model did not assess my progression towards the internalisation and mastery of the musical vocabulary within the practice tasks; rather, the indicators assessed the efficacy of my nonlinear constraints-based approach to learning in affecting change upon my improvisational skillset. Three key evaluative indicators, expressed as questions, were developed within my assessment model:

1. Does the practice design facilitate the introduction of functional instability during the learning process?
2. Does my application of task variability and constraint manipulation lead to the exploration of new movement patterns, promoting the formation of new regions of performance stability?
3. Are the inputs and performance processes of aesthetic relevance to my creative practice?

The nonlinear learning approach underpinning my practice also necessitated a fourth guiding principle

that, while not an indicator itself, allowed for the emergence of additional self-assessment indicators in response to insights and creative ideas generated during the practice process itself. This principle can be expressed as the following question:

4. What forms of self-assessment will emerge in response to the insights developed through the practice project?

Evidence of this self-assessment model in action will be introduced in this chapter as well as Chapters Five and Six. The first three indicators will be addressed primarily through this chapter's discussion of the three practice designs, as well as within Chapter Six's discussion of the project's creative outputs. The additional emergent indicators that were developed during the practice period will be presented in Chapter Five.

4.2 Phase One: multi-parameter patterning

The first phase of practice commenced in October 2020, and was sustained throughout the thirteen-month practice period until its conclusion in October 2021. The practice design examined the interactions between my tongue motions, finger movements, my aural perception of pitch contours, and my embodied metrical pulse. Phase One featured a set of constraint-based tasks that decoupled these elements of my playing in an attempt to introduce functional perturbations that would promote skill adaptation, leading to a greater variety of physical movements and resulting sonic musical output that I could spontaneously generate on the saxophone during improvisation.

My approach during this phase was to challenge the musical and movement-based couplings that I had identified within my playing. This guiding principle was formulated into the following question: what changes could I affect upon my playing if I practised new ways of combining articulation patterns, pitch contours and rhythmic phrasings that did not feature coupling? I hypothesised that by seeking out novel physical movement patterns across a developmental practice period, I could develop new regions of performance stability and expand my improvisational dexterity, thus generating new attractor states within performance contexts. To do this, I created a practice procedure that featured articulation, pitch and rhythmic inputs being combined into complex resultant phrases, with each session dedicated to learning how to play one of these phrases. Practice Design Outline 4.1 revisits the summary of the inputs and procedure first presented in Chapter One.

Practice Design Outline 4.1.

Phase One: multi-parameter patterning

Inputs:

- A pitch sequence featuring five, six or seven different notes.

- Rhythmic phrasing featuring either:
  (a) A stream of evenly-spaced notes; or
  (b) A rhythmic archetype made up of multiple rhythmic durations.

- An articulation sequence featuring either:
  (a) Even groupings of slurred notes; or
  (b) Uneven groupings of slurred notes, generated by number sequences.

- The above three elements must contain a different number of events (in other words, the rhythm and articulation contents cannot have the same number of units as the pitch sequence, and must be different from each other).

Procedure:

- Play the resultant phrase formed by the combination of the pitch, rhythm and articulation inputs, allowing them to move out of phase until they re-align at a coincidence point.

- Practise the resultant phrase in four different pitch transpositions.

I have named this practice design 'Multi-Parameter Patterning', referring to the cyclical layering of the pitch, rhythm and articulation inputs. Each parameter's sequence was of a different length, so when combined, they would move out of phase with each other as they recurred at different rates. Examples of this kind of phasing will be discussed in detail in Section 4.2.1, where I will use the terms 'Multi-Parameter Patterning' and 'MPP' interchangeably.

The multi-parameter patterning practice approach was experimental, and did not draw upon existing pedagogical methods of improvisational learning on the saxophone. As such, the specifics of the practice design emerged over time, with a corresponding self-assessment methodology also forming as the project progressed. As will be demonstrated in Sections 4.2.2-4.2.5, some elements of the practice design were amplified over time due to their effectiveness, while others were discarded if they were found to be ineffective. Overall, there was a trend across the thirteen-month period towards more variability within the practice tasks, indicating that the learning design had led to the development of new regions of stability, allowing me to find solutions to increasingly complex performance problems.

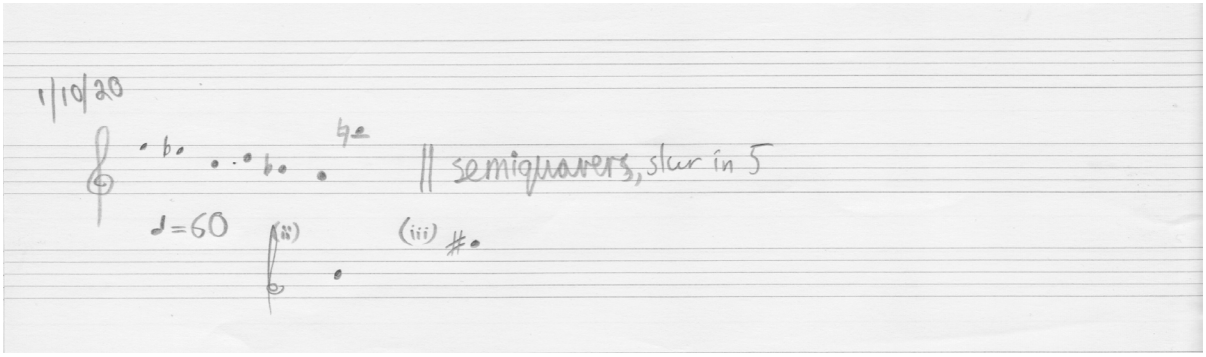
4.2.1 Multi-parameter patterning practice design

To illustrate the practice design of Phase One, this section will draw on the materials utilised in the first multi-parameter patterning session, held on 1st October 2020. Referencing this session, I will demonstrate how the inputs were generated, how the practice procedure was implemented on the saxophone, as well as the notational conventions I developed to communicate the musical ideas to myself. My playing during the session will not be analysed in depth; rather, the purpose of this section is to generate an understanding of the learning design's methodology, as well as establishing the format that will be used to present musical information in subsequent Phase One session analyses.

The inputs will be introduced here in the same order that they were conceived of during the session itself. The pitch, rhythm and articulation inputs were conceived separately at the commencement of each practice session, with the resultant phrase generated through their combination being 'discovered' through playing. For this reason, presentation of the resultant phrases in notated figures and corresponding audio examples will only be offered towards the end of this section, reflecting their emergence within each practice session.

All notated figures included in this section will be digital reproductions of hand-written notes that were made during the practice sessions. These hand-written notes were the only notated elements used, and were written at the commencement of each session to define the pitch, rhythmic and articulation inputs to be practised. Once these areas were defined, each musical parameter was quickly internalised so that the session could proceed without any further visual reference points. The handwritten notes used on 1st October 2020 can be seen in Figure 4.1; each component of these notes will be described below.

Figure 4.1. Example of handwritten practice notes, from 1st October 2020 session



Within each practice session, the first input to be determined was the pitch sequence. The order of notes and registral distribution within each pitch sequence was determined spontaneously at the commencement of each practice session. For the first six months of Phase One, the pitch sequences were all seven-notes in length, drawn from *Elliott Carter's Harmony Book* (Carter et al, 2002) which includes a catalogue of all possible sets of seven pitches[2]. Each of my practice tasks would utilise one of these pitch sets, arranged into a short melodic cell that was registrally distributed across the saxophone's range[3]. One such seven-note pitch sequence was utilised in the 1st October 2020 session, as can be seen in Figure 4.2[4]. Later MPP

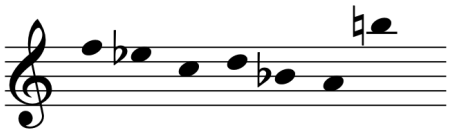
[2] Within a twelve-tone equal temperament system only.

[3] The layout of Elliott Carter's Harmony Book is free of stylistic implications or association with Carter's compositional process, making it a useful resource that presented the harmonic information in a 'pre-musical' format that could be readily applied to the musical direction of my practice tasks.

[4] This pitch sequence is derived from the seven-pitch set labelled as ⑯[7] in the Elliott Carter Harmony Book.

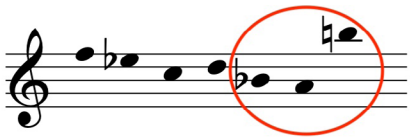
practice tasks after this initial six-month period moved away from this systematic exploration of seven-note pitch sets, instead using more varied pitch sequences that were five, six and seven notes in length.

Figure 4.2. Seven-note pitch sequence from 1st October 2020 session



When choosing the note order and registral distribution within the pitch sequences, I attempted to introduce functional perturbations within each task that would force me to adapt to the system instability I experienced. My primary aim was to target my dexterity on the saxophone by finding melodic contours that I found physically challenging to play, particularly with regards to finger and/or hand motions on the instrument's keys. The final three notes of this phrase, highlighted in Figure 4.3, presented me with one such challenging sequence[5].

Figure 4.3. Three sequential pitches requiring difficult finger movements



The rhythmic inputs featured in Phase One developed into several distinct forms across the thirteen-month practice period. The first type of rhythmic input devised featured an even stream of notes within a single subdivision. The input for this session was a four-part subdivision of the metrical pulse, which was written in shorthand as "semiquavers" in my handwritten notes (see Figure 4.1). For clarity, I will use musical notations of all subdivisions in subsequent discussions of practice sessions. Figure 4.4 features an example of this kind of notation, showing the four-part semiquaver subdivision used during this session. The other forms of rhythmic inputs that were developed in later Phase One sessions will be introduced in Sections 4.2.3-4.2.5.

Figure 4.4. Four-part subdivision utilised in 1st October 2020 session

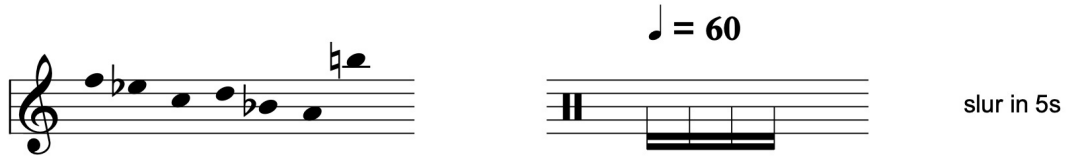
The final input that was incorporated into each session was the articulation sequence. My approach to creating articulation sequences also changed as the practice period progressed, with the initial approach featuring notes being grouped into slurs of a single recurring length. During this session, the notes were slurred in groups of five, as indicated by the shorthand directive 'slur in 5' in my handwritten notes (see Figure 4.1). A second form of articulation patterning that was developed in later sessions will be introduced in Section 4.2.2.

In all subsequent sections of this chapter, I will use digital reproductions of my handwritten notes that combine the pitch, rhythm and articulation inputs into a single figure. An example of this is shown in

[5] The B-flat in this sequence of notes could be played with four different fingerings; for this task, I chose to use the side-key fingering, which is the easiest to use when the B-flat is preceded or followed by a chromatic neighbouring note.

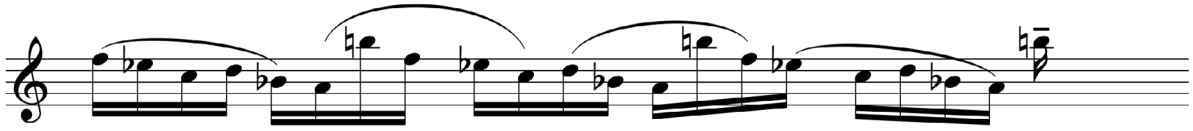
Figure 4.5. The components included are the pitch sequence (left), the rhythmic phrasing (lower middle), the metrical pulse tempo (upper middle) and the articulation sequence (right).

Figure 4.5. Representation of pitch, rhythm and articulation inputs from 1st October 2020 session



When combined, the pitch, rhythm and articulation inputs generated a resultant phrase with the three sequences commencing together and then moving out of alignment. This phasing effect emerged due to the different lengths of each input: the pitch sequence contained seven units, the articulation sequence contained five units, and each metrical pulse was split into four units within the subdivision. In most Phase One sessions, this phasing effect would be allowed to unfold until all three sequences realigned at a coincidence point, marking the end of the resultant phrase. However, taking that approach with these inputs would have generated a phrase 35 metrical pulses in length, which was lengthier than necessary for the purposes of my practice design. To make the resultant phrase more manageable in length, I chose to play the sequences in combination until a coincidence point occurred between the articulation sequence and the metrical pulse only. The notation in Figure 4.6 features this resultant phrase, combining the pitch, rhythm and articulation inputs from Figure 4.5. A recording of me playing the resultant phrase during the practice session is presented in Audio 4.2.

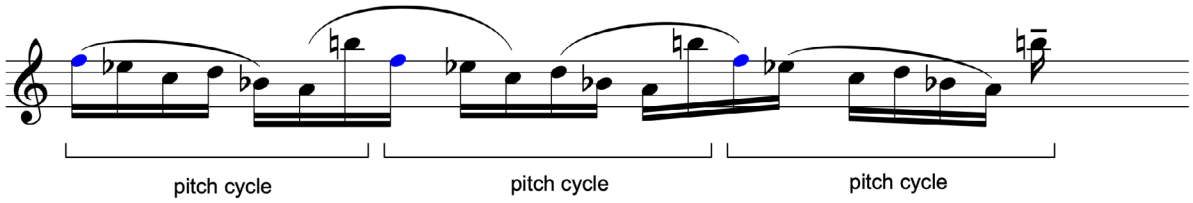
Figure 4.6. Resultant phrase utilising inputs from 1st October 2020 session



Audio 4.2. Resultant phrase played on saxophone

The manner in which the three inputs move out of phase will now be visually demonstrated with annotated notation. The recurrence of the articulation cycle is visible in Figure 4.6, with the start points of the slurs indicating the articulation sequence's recurrence. As can be seen, the placement of these slurs shifts one semiquaver later upon each metrical pulse, realigning with the metrical pulse at a coincidence point after 5 metrical pulses. In effect, this generates an embellished 4:5 polyrhythm. The phasing of the pitch sequence relative to the metrical pulse and the articulation sequence can be similarly visually represented. Figure 4.7 highlights each repetition of the pitch sequence with annotated square brackets, and with the pitch sequence's first note indicated by blue note-heads. As can be seen, the recurrence of the pitch sequence does not align with either of the other two cycles, with the pitch sequence shifting one semiquaver earlier relative to the metrical pulse upon each repeat, generating an embellished 4:7 polyrhythm.

Figure 4.7. Recurring pitch sequence in resultant phrase from 1st October 2020 session



The notated resultant phrase was not used as a learning tool during practice, and was created solely to demonstrate the musical output generated through the combination of the inputs. In subsequent sections of this chapter, audio examples will be presented alongside figures of the task's inputs, but there will be no other notated resultant phrases featured. This is to emphasise that the primary knowledge being discussed is not what the material was within each session, but rather how that material was practised, how I communicated ideas to myself and what I learned about my embodied understanding of the material.

A final element of the Phase One practice design is the use of transpositions. After I had learned the original phrase within each session, I would then transpose the phrase into three new transpositions, with the exception of this initial session which only featured two transpositions. Many of the phrases being practised were atonal and without any clear reference to a tonal centre, so the skills I had previously developed for transposition based on functional harmony were not directly applicable here. However, much of the music I now play features freely improvised, non-tonal harmony, so developing the ability to transpose non-tonal phrases between different starting pitches was a relevant skill to target that would allow me to develop melodic material in performance. This is a key example of representative practice design within Phase One, as it relied on aural skills in a time-sensitive practice environment similar to that of improvised performance.

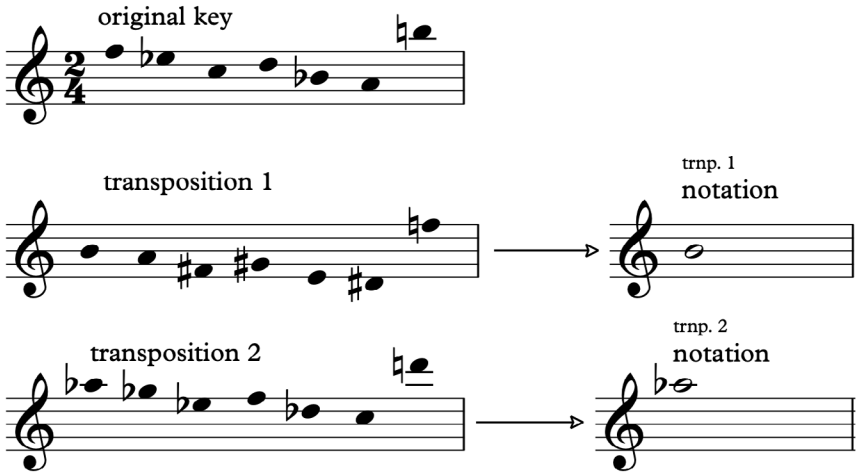
My goal when choosing the transpositions was to explore registral distributions of the pitch sequence that would require different digital movement patterns. In doing so, I introduced further functional instability into each task, exploring the mechanical property of the saxophone that allows the same pitch contour to be produced by substantially different finger motions depending on the key, allowing me to decouple the finger motions producing the phrase from its sounded contour. An example can be seen in the different finger motions producing an ascending minor-sixth interval on the saxophone in two different transpositions: moving from low G to middle E-flat features a depressing motion in both hands, while going up from low F to middle D-flat features a releasing motion in both hands. These two finger motions can be seen in Video 4.1 and 4.2 respectively.

Video 4.1. Depressing finger movements moving from G to E-flat

Video 4.2. Releasing finger motions moving from F to D-flat

Within my practice notes, the transpositions were notated with a single pitch that indicated the first note of each new transposition, rather than being written in their complete form. This helped to ensure that I was engaging my aural understanding of the phrase, forcing me to transpose the material internally without a visual aid. Figure 4.8 features the two transposed pitch patterns practised during the 1st October 2020 session, as well as their single-pitch notational representations. Audios 4.3 and 4.4 feature my performances of transposition 1 and 2 respectively, played with the same rhythm and articulation sequences as the original key. When discussing transpositions in subsequent sections of this chapter, I will use the single-pitch notations only.

Figure 4.8. Transpositions of pitch sequence in 1st October 2020 session

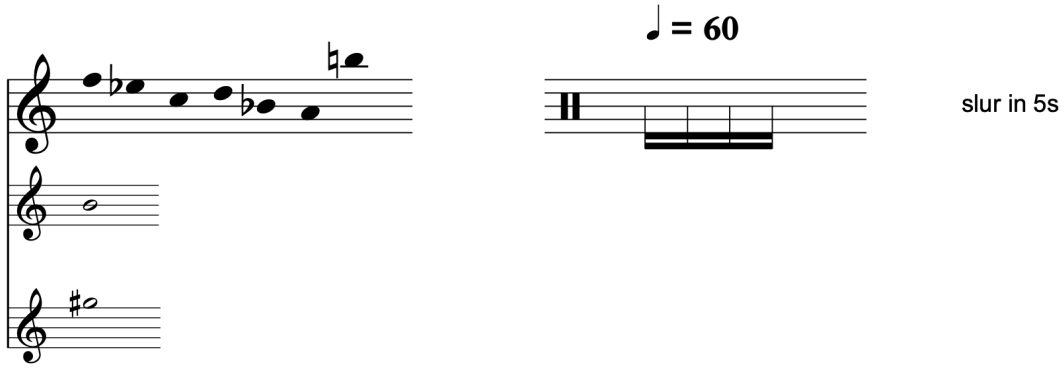


Audio 4.3. Transposition 1 played during 1st October 2020 session

Audio 4.4. Transposition 2 played during 1st October 2020 session

Transpositions will be included in task constraint figures when relevant to the corresponding analysis of that session. An example of this is shown in Figure 4.9, featuring the first note of each transposition included below the fully notated original pitch sequence. When the analysis of a session does not include discussion of its transpositions, they will be omitted for greater simplicity within the figure.

Figure 4.9. Inputs from 1st October 2020 session including transpositions



As the thirteen-month practice project progressed, a number of variations were introduced into the Phase One practice design. The following sections will introduce these variations, presenting examples from specific practice sessions. Some of the variations were found to be effective methods of practising and were retained once introduced; others were used for a short period before being deemed ineffective or irrelevant to the aims of the practice design. Examples of both will be outlined in order to make clear the methods of self-assessment that emerged during the practice period.

Three of the four variations discussed in this section were introduced into the learning design within the

first two months of the practice period. As such, this initial period could be considered as a 'babbling' phase in which I utilised multiple approaches to find the appropriate forms of inputs to maximise the efficiency and effectiveness of the learning design (Rhode et al, 2019). After this initial babbling period, certain musical processes were focussed on and others were discarded.

4.2.2 Articulation sequence variation: number sequences

As has been noted, practice tasks that featured articulation inputs with a single, recurring slur length would generate resultant phrases that were too lengthy for the purposes of the multi-parameter patterning practice design. To address this issue, I introduced an alternative approach to articulation sequencing in the second month of the practice period. Rather than using a single, recurring slur length, I would use number sequences to create more complex patterns of slurring. It quickly became clear that this was the most effective way of organising articulation sequences within the MPP practice design, becoming the predominant method of articulation patterning once introduced.

When using number sequences, I created sequences with lengths that would resolve at the coincidence point formed by the pitch and rhythmic sequences. This process can be demonstrated through an analysis of the 10th November 2020 practice session, which featured a seven-note pitch sequence played in a sextuple subdivision, the combination of which would generate a resultant phrase 42 notes in length. Drawing on Greg Sheehan's number diamond concept, I used the number sequence shown in Figure 4.10 to generate an articulation sequence that was also 42 notes in length. This can be heard in Audio 4.5, which features accents at the start of each slur grouping.

Figure 4.10. Number diamond used as articulation sequence in 10th November 2020 session

```
      4
   5     5
5     4     5
   5     5
      4
```

Audio 4.5. Resultant phrase featuring number diamond from 10th November 2020 session

Using number sequences in this way led to a far greater range of articulation possibilities within the practice design. This in turn led to a wider scope of task variability and thus increased effectiveness in promoting skill adaptation. The variety of possible groupings within number sequences became a useful and creative area to explore from one practice session to the next.

For instance, the 22nd August 2021 session featured another number sequence 42-notes in length as the articulation input. Rather than using a number diamond format, I used the three-phrase grouping structure shown in Figure 4.11. I created this sequence to generate the effect of rhythmic 'compression' through the gradual shortening of groupings from one phrase to the next. As can be seen, each line starts with a group of 5, followed by three repeated values that get shorter within each subsequent phrase. The rhythmic effect of this 'compression' can be heard in Audio 4.6.

Figure 4.11. Number sequence used as articulation sequence in 22nd August 2021 session

5 4 4 4
5 3 3 3
5 2 2 2

Audio 4.6. Resultant phrase featuring number sequence from 22nd August 2021 session

This kind of rhythmic compression became a feature of many of the number sequences used in the latter half of the thirteen-month practice period. The opposite musical effect – that of rhythmic expansion – was also explored, albeit less frequently. An example of this occurred during the 26th September 2021 session, which featured a 35-note number sequence using the groupings shown in Figure 4.12. Each line of the sequence features a short-long-short rhythmic shape, with the second line using longer overall durations than the first. This effect can be heard in Audio 4.7. Note that this practice session uses a different approach to rhythmic organisation that will be discussed in Section 4.2.3; the expanding effect within the number sequence is still aurally evident.

Figure 4.12. Number sequence used as articulation sequence in 26th September 2021 session

5 6 5
6 7 6

Audio 4.7. Resultant phrase featuring number sequence from 26th September 2020 session

The move towards number sequences as the primary method of articulation sequencing is evidence of the efficacy of my self-assessment process within Phase One. There were three key factors that led to this approach becoming the primary method of articulation-based organisation. Firstly, it allowed each session's task to be of a manageable length, solving the initial problem caused by using three different sequence lengths. Secondly, I was aesthetically more interested in these sounds, with the varied articulation grouping lengths adding musical interest to the practice tasks. Lastly, it established a greater sense of representative practice design: using slurs of varying lengths was more reflective of the articulation patterning that I would use in improvised performance.

The number sequences featured in Figures 4.10-4.12 are representative examples of the key approaches to articulation patterning that I developed during Phase One. For a full list of the practice session inputs, including all number sequences that were used, please refer to the Appendix (from page 122).

4.2.3 Rhythmic phrasing variation: rhythmic archetypes

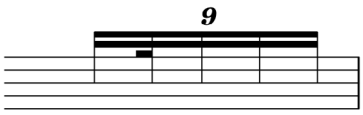
Within the original practice design, the variety of possible rhythmic material was very limited. Using subdivisions of the metrical pulse to generate even streams of notes offered me a narrow range of options, with nearly every session using one of the five subdivision options between 5 and 9. Subdivisions of 1-4

were excluded due to my existing familiarity with them, while subdivisions of 10 or above were excluded due to the difficulty of accurately feeling subdivisions of that size at the speeds I'd be playing[6]. Over the course of the practice project, a majority of the Phase One sessions used subdivisions of either 6 or 7, with 5 and 8 also being regularly used.

Three alternate approaches to generating rhythms were developed during the project. Two of these approaches were introduced in the second month of the practice period, but were quickly discarded as ineffective, as will be explained in Sections 4.2.4 and 4.2.5. A third alternate method of rhythmic organisation was introduced during the ninth month of practice, and proved to be much more effective.

This alternate approach featured short rhythmic archetypes that fit within a single metrical pulse and had sequences of attacks that used two different durations. Figure 4.13 features one such archetype drawn from the 26th September 2021 session[7]. This archetype features five attacks with a long-short-long-long-long (LSLLL) phrase shape based in a nine-part subdivision of the beat. This archetype can be heard played on a drum pad in Audio 4.8.

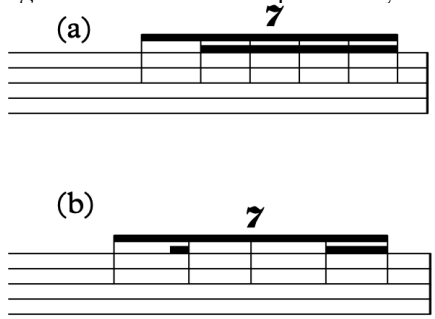
Figure 4.13. Rhythmic archetype from 26th September 2021 session



Audio 4.8. Rhythmic archetype played on drum pad

The use of archetypes proved to be an effective contrast to the uniform durations of even streams of notes, allowing for far greater task variability from one session to the next. A number of different archetypes were used as rhythmic inputs, with some common characteristics shared between them. Firstly, there were always only two different durations used, with the 'long' duration having a 2:1 rhythmic relationship to the 'short' duration. This principle is evident in the archetype seen in Figure 4.13; refer to Figure 4.14 for two other archetypes that also follow this principle and produce notably different rhythmic shapes. Archetype (a) can be heard in Audio 4.9, and archetype (b) can be heard in Audio 4.10.

Figure 4.14. Two examples of rhythmic archetypes using long-short rhythmic relationships



[6] Although these subdivisions are possible, the kinds of music played within the community of musicians I collaborate with almost never uses subdivisions above 9.

[7] An example of this archetype being used as the rhythmic input of a MPP practice task can be heard in Audio 4.7.

Audio 4.9. Archetype (a) played on drum pad

Audio 4.10. Archetype (a) played on drum pad

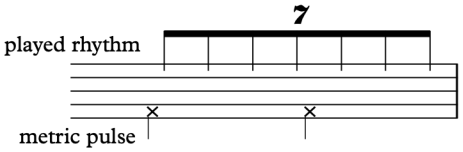
Another common characteristic of the archetypes was that nearly all were based in a subdivision of 7 or 9. I chose to focus on these two subdivisions due to my comparative lack of experience playing within them compared to other subdivisions such as 5, 6 or 8. As such, the choice to focus on archetypes in seven-part and nine-part subdivisions introduced the most effective perturbations within my practice tasks, leading to the emergence of greater stability over time while also supporting an aesthetic area within my playing that I felt was underdeveloped. To review the other archetypes used within Phase One practice sessions, please refer to the Appendix (from page 122).

4.2.4 Discarded rhythmic phrasing variation: polyrhythm-derived pulse streams

Some variations that were introduced into the Phase One practice design were discarded due to their ineffectiveness. One such example is an approach to rhythmic organisation that I first introduced in November 2020, one month into the practice period. Rather than using an even stream of notes confined to a single metrical pulse, the new approach featured countermetrical pulse streams played across multiple metrical pulses. This approach was used for two weeks across eight sessions before I discarded it as ineffective due to practical issues emerging out of incompatibility between my embodied understanding of the countermetrical pulse streams and the overall aims of the multi-parameter patterning practice design.

The polyrhythm-derived pulse stream approach drew on my aesthetic interest in polyrhythms as well as my prior experience of practising countermetrical pulse streams conceptualised as one rhythmical voice within a polyrhythm (Gill, 2018). For example, the polyrhythmic input used during the 9th November 2020 session was a 7:2 polyrhythm, which featured the countermetrical pulse stream played on the saxophone with the two metrical pulses tapped by my foot and synchronised with a metronome. Notation of this rhythmic inputs can be seen in Figure 4.15, and a played example can be heard in Audio 4.11.

Figure 4.15. Polyrhythm-derived pulse stream in 9th November 2020 session



Audio 4.11. Resultant phrase featuring polyrhythm-derived pulse stream from 9th November 2020 session

I refer to the playing of the countermetrical pulse stream from within a polyrhythm as the playing of a *polyrhythm-derived pulse stream*. Although countermetrical pulse streams can be conceived of in isolation without being contextualised within a polyrhythm, my playing of countermetrical pulse streams was

always conceived of as one voice within a polyrhythm, with the other voice being felt internally as a series of embodied metrical pulses.

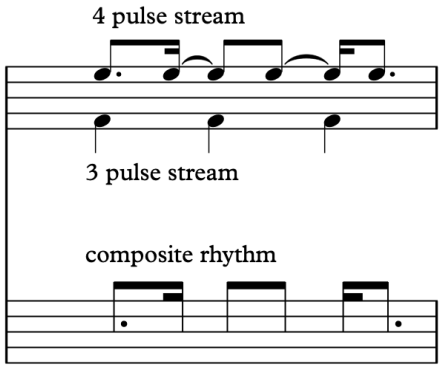
After utilising polyrhythm-derived pulse stream during eight sessions over a two-week period, I chose to discard the approach. This decision was based on self-assessment of my practice recordings as well as the critical reflections I made immediately following the completion of each session. Within the constraints-led approach, tasks are most effective in promoting skill adaptation when they "match the current ability level of the performer during the session", introducing "instability that will require the learner to search for new solutions" with a strong likelihood of success (Renshaw et al, 2019, p. 102). When using polyrhythm-derived pulse streams, however, I found that they did not introduce enough instability to promote skill adaptation. This was due to my prior practice method of internalising polyrhythms, which had mostly focused on slow tempos that allowed me to cognitively subdivide the metrical pulse while playing. However, in the context of the MPP practice design, the slow tempos resulted in played notes that were too slow to present an effective learning challenge[8].

4.2.5 Discarded rhythmic phrasing variation: composite rhythms generated by polyrhythms

Another rhythmic approach that was added to the MPP practice design was to combine both pulse streams of a polyrhythm to generate a composite rhythm. This approach was used during three practice sessions before being discarded as aesthetically undesirable.

To generate a composite rhythm, the rhythmic attacks produced by all pulse streams within a polyrhythm are combined into a single rhythmic voice. To demonstrate this process, I will analyse the composite rhythm that is produced by a 4:3 polyrhythm. In Figure 4.16, the top line features the two separate pulse streams of a 4:3 polyrhythm, and the bottom line features the composite rhythm generated when these two pulse streams are combined.

Figure 4.16. Pulse streams and composite rhythm of 4:3 polyrhythm

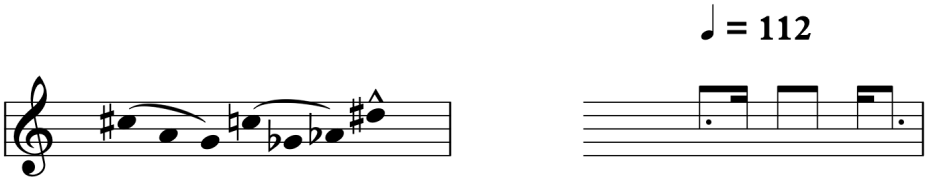


This 4:3-derived composite rhythm was included as the rhythmic input for the 27th November 2020 session, as shown in Figure 4.17. Audio 4.12 presents the resultant phrase generated by these inputs. I chose to use pitch and articulation sequences that were both seven units in length for this task, reducing the cognitive load while I learned to incorporate the new composite rhythm approach. Thus in Figure

[8] Playing polyrhythms at a faster tempo that precluded the possibility of subdividing the metrical pulse was a standalone element of my instrumental practice during the research period. However, the cognitive and embodied challenges that that practice posed at the time meant it would be impossible to incorporate into the MPP practice design, as it would greatly reduce my ability to concurrently focus on the pitch and articulation sequences being used.

4.17, the articulation pattern is expressed through musical notation rather than a written instruction.

Figure 4.17. Practice notes featuring 4:3 composite rhythm in 27th November 2020 session



Audio 4.12. Resultant phrase featuring 4:3 composite rhythm from 27th November 2020 session

Composite rhythms generated by polyrhythms were used during three multi-parameter patterning practice sessions before being discarded as a method of rhythmic organisation. Unlike the practical basis for rejecting the polyrhythm-derived pulse stream approach, my decision here was purely aesthetic. I was not interested in the musical effect produced by these composite rhythms, and did not plan to incorporate their sound into my general improvisational approach.

Towards the end of my practice project, I became aware of a similar approach to combining pitch sequences and polyrhythm-derived composite rhythms in the work of American trumpet player and composer Peter Evans. Evans has described his development of a practice approach that explores permutational combinations of pitch sequences and rhythm patterns, some of which were derived from polyrhythms (Cymerman, 2020). His approach provides a notable point of comparison, as he has found aesthetic solutions that allow him to creatively utilise this method of rhythmic organisation during improvisation.

4.3 Phase Two: subdivision recontextualisation

The second phase of practice commenced in January 2021 and concluded in October 2021. Like Phase One, this new phase also sought to examine the interaction between the movement-based processes guiding my articulation, pitch choice, rhythmic phrasing and my embodied metrical pulse. The constraints-based tasks used in Phase Two were distinct, with less focus on difficult finger motions and a greater emphasis on the interaction of articulation, phrase length and metrical pulse. This allowed me to explore new movement patterns on the saxophone, introducing functional instability in a distinct way and contributing to the development of new stable patterns of coordination and control within my playing. I also developed several new performance processes in response to challenges I encountered within this phase, as will be described in Chapter Five.

The practice design of Phase Two was formulated towards the end of 2020, around three months into Phase One. When self-assessing the effectiveness of the rhythmic approaches I had taken up to that point, a question emerged: could I exercise a greater range of physical processes if, rather than limiting myself to one subdivision for each task, I were to learn a phrase multiple times in different subdivisions?

This question lead to the formulation of the Phase Two practice design, which I have named 'Subdivision Recontextualisation'. Within each task, I would play a short phrase within every subdivision between 3 and 9, recontextualising the played phrase against different metrical pulses. The pitch, rhythm and articulation

inputs all featured the same number of units, and therefore the concept of resultant phrases was not applicable in this new design. The only variable parameter was the subdivision, with each subdivision offering a different phase relationship between the played phrase and the metrical pulse. Practice Design Outline 4.2 revisits the summary of the inputs and procedure first presented in Chapter One.

Practice Design Outline 4.2.

Phase Two: subdivision recontextualisation

Input:

- Short musical phrase with defined pitch, articulation and rhythmic content.

Procedure:

- Practise the phrase in all subdivisions between 3-9.
- Within each subdivision, play the phrase as a repeated sequence until its first note re-aligns with the metrical pulse at a coincidence point.
- Maintain the same actual speed of the played phrase across all subdivisions; calculate the tempos of the metrical pulses to accommodate the required number of rhythmic units within each subdivision.

The purpose of maintaining the speed of the played phrased across all subdivisions was to ensure that within each task, the speed of my finger and tongue motions would be consistent. This would allow me to focus on the different relationships of those movement patterns to the metrical pulse of each subdivision, and to assess if any particular metrical contexts were more destabilising than others.

This practice process allowed me to focus my self-assessment on three key questions. Firstly, would there be unique physical processes required to play a given phrase within each of the different subdivisions? If so, would certain subdivisions cause greater perturbations to my coordination and control on the saxophone, despite the speed of my finger and tongue motions being uniform throughout? And lastly, what conceptual aids and performance processes could be developed to overcome those challenges?

Section 4.3.1 will offer a detailed explanation of the practice design, with reference to key sessions. Some initial answers to the above questions will also be offered, with more detailed self-assessment and analysis of outcomes offered in Chapter Five. I am unaware of any existing practice approach that has been used to address these specific questions. As such, Phase Two offers new knowledge in three forms: the practice design itself, the model of self-assessment developed to assess its efficacy, and the insights that emerged out of that self-assessment.

4.3.1 Subdivision recontextualisation practice design

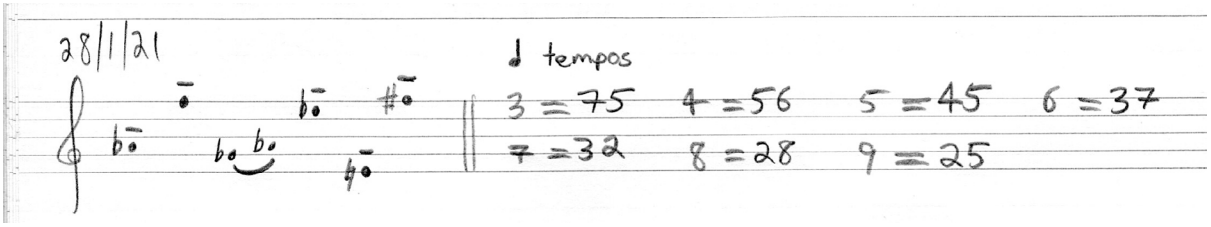
To demonstrate the Phase Two practice design in action, I will draw upon the inputs utilised in the 28th

January 2021 session. By examining these materials and providing audio examples of my saxophone playing from that session, this section will offer a detailed explanation of how a musical phrase can be recontextualised within different subdivisions. In doing so, I will also introduce the notational conventions that I developed for the communication of the Phase Two musical inputs. The practice processes and notational formats introduced here will be retained in all subsequent session analyses.

Each Phase Two session commenced with the creation of the inputs to be practised. This information was conceived of in two parts: the played phrase, including pitch, rhythm and articulation information, and the tempo of the metrical pulse for each subdivision. I had no pre-conceived systematic approach to generating these materials; the decisions were made solely at the beginning of each session, sometimes amplifying an area of interest from a previous session, and sometimes pursuing a new musical idea.

The handwritten notes for the 28th January 2021 session can be seen in Figure 4.18. The notes for all sessions were written in this format, and they include the only notated information utilised during practice. Once the phrase had been generated, it was quickly memorised so that the session could proceed without the use of visual learning aids. This allowed me to effectively target the physical and aural processes that the practice design intended to exercise. The musical information contained within these handwritten notes will be presented in digitised form for the remainder of the thesis.

Figure 4.18. Example of handwritten practice notes, from 28th January 2021 session

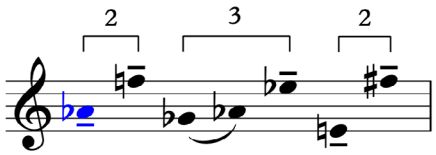


The first material to be notated was the musical phrase. This session utilised the seven-note sequence presented in Figure 4.19, featuring defined pitches and articulation. For ease of communication, the beginning note of each cycle in all subsequent sections will be indicated with a blue notehead.

Figure 4.19. Musical phrase in 28th January 2021 session

Many of the phrases used in Phase Two sessions featured pitch contours and articulation patterns that suggested internal grouping structures. Within this session's phrase, there is an implied grouping of the notes into a sequence of 2-3-2, as seen in Figure 4.20. This grouping structure is primarily generated by the three ascending motions of the phrase's pitch contour. As the practice period progressed, slurs became more prominent than single tongued notes, with those slurs being used to further generate the audible effect of groupings within each phrase.

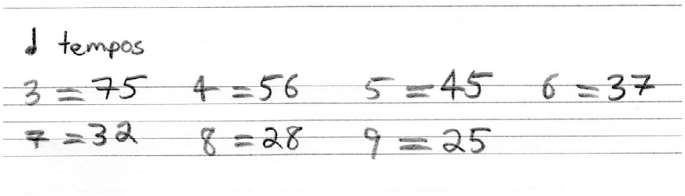
Figure 4.20. Implied groupings generated through pitch contour within 28th January 2021 phrase



These internal grouping structures often generated unusual phrasing patterns relative to the metrical pulse within each subdivision. The groupings often created aurally-projected patterns that were so rhythmically strong that they made it hard to maintain my embodied metrical pulse, making them effective perturbations within the practice design that presented me with an opportunity to develop new stable patterns of coordination and control. They also guided me to engage with movement patterns on the saxophone that were new to me, thus making them a key learning output of the practice design.

Alongside the musical phrase, the other input within the PhaseTwo practice design was the set of tempos required to generate each subdivision. This information is presented in Figure 4.21. For each $x = y$ pair of numbers within the Figure, x represents the subdivision and y represents the required tempo. During each session, I would determine the triplet tempo while memorising the phrase, choosing a speed that was challenging but achievable. I would then calculate the tempos for the other subdivisions based on the initial triplet tempo. Given that the actual speed of the played notes remained constant across the different subdivisions, each tempo indicated the speed required to accommodate the required number of notes within a metrical pulse. For example, "3 = 75" means that a tempo of 75 beats per minute (BPM) would group the phrase's notes into threes, thus generating a three-part subdivision; similarly, "4 = 56" means that a tempo of 56 BPM would group the phrase's notes in fours to generate a four-part subdivision.

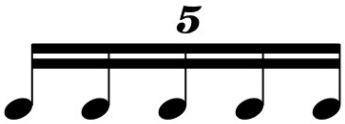
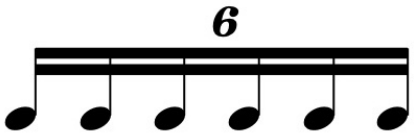
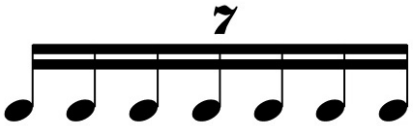
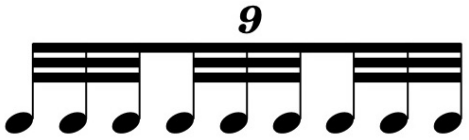
Figure 4.21. Metrical pulse tempos in 28th January 2021 session



The numbers used in my handwritten notes were a short-hand method of communicating ideas to myself during practice. Table 4.1 presents a detailed explanation of what those short-hand notes refer to. The first column features notation of each subdivision from 3 to 9, and the central column presents each subdivision's corresponding metrical pulse tempo.

The third column presents examples of each subdivision played as a single repeated pitch on the saxophone against the metrical pulse, as heard in Audios 4.13-4.19. As can be heard, the actual speed of the notes played on the saxophone is uniform across all of the played examples, with the tempo of each metrical pulse serving to group the played notes into the required number to generate each subdivision.

Table 4.1. Subdivisions 3-9,corresponding tempos, and played examples

Subdivision	Tempo	Played Example
	♩=75	Audio 4.13. Three-part subdivision
	♩=56	Audio 4.14. Four-part subdivision
	♩=45	Audio 4.15. Five-part subdivision
	♩=37	Audio 4.16. Six-part subdivision
	♩=32	Audio 4.17. Seven-part subdivision
	♩=28	Audio 4.18. Eight-part subdivision
	♩=25	Audio 4.19. Nine-part subdivision

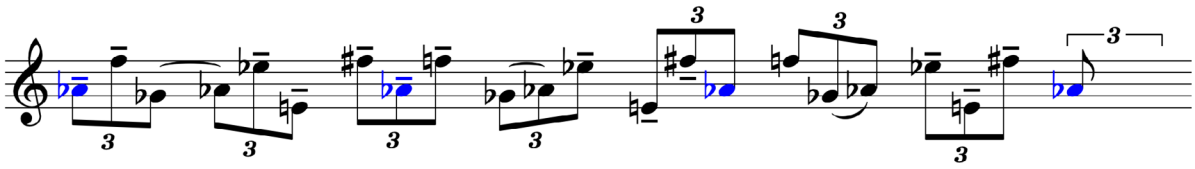
When generating the array of tempos for each practice session, the tempo markings were rounded to the nearest whole number when necessary. This was due to the tempos all being calculated relative to the quaver-triplet tempo, with that calculation leading to some tempos featuring decimals. For example, the 56 BPM shown in Table 4.1 for the semiquaver subdivision was rounded down from its true value of 56.25 BPM. A result of this rounding process was that within each practice task, there were micro-variations in the played speed between some subdivisions. However, I found that the differences in played note speeds between the rounded and unrounded tempos were negligible, and I therefore deemed the rounded tempos to be appropriate for the aims of the practice design.

A wide variety of played note-speeds were used in different Phase Two practice sessions, adding another dimension of task variability to the learning design. This tempo variability ensured that I was targeting a wide speed range of movement patterns, promoting the development of skill adaptation that would be applicable to a broad range of musical contexts. Within each session, the chosen speed of played notes was made in response to the level of difficulty presented by the finger motions within the phrase, with the chosen tempo presenting an attainable yet challenging target.

Once the inputs had been determined, there would be seven unique renderings of the phrase, played within subdivisions of 3, 4, 5, 6, 7, 8 and 9. Within each subdivision, the phrase would be repeated as a fixed sequence until its first note re-aligned with the metrical pulse at a coincidence point. In most cases, I would end the task upon reaching this coincidence point, unless I chose to repeat the phrase to extend the exercise, as can be heard in Audios 4.20 and 4.26. To demonstrate this process in action, I will provide completely notated examples from the 28th January 2021 session, accompanied by recorded excerpts. In the notated figures, the first pitch of the phrase is indicated with a blue note-head, and each metrical pulse is indicated by the start of a new beam. These notated figures were not used as visual learning aids during the session itself, but are included here to visually demonstrate the unique properties of each of the seven subdivision recontextualisations.

Figure 4.22 features a three-part subdivision, with the metrical positioning of the phrase relative to the metrical pulse shifting one triplet later upon each reiteration. This can be heard in Audio 4.20.

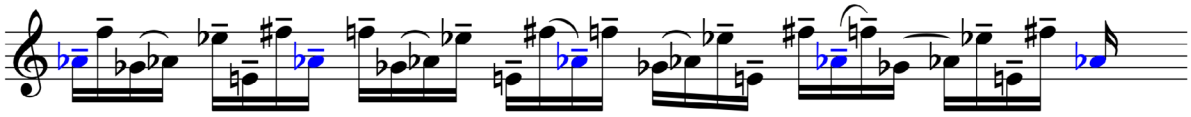
Figure 4.22. 28th January 2021 phrase played in three-part subdivision



Audio 4.20. Phrase from 28th January 2021 played in three-part subdivision

Figure 4.23 features a four-part subdivision, with the metrical positioning of the phrase shifting one semiquaver earlier relative to the metric pulse with each reiteration. This can be heard in Audio 4.21.

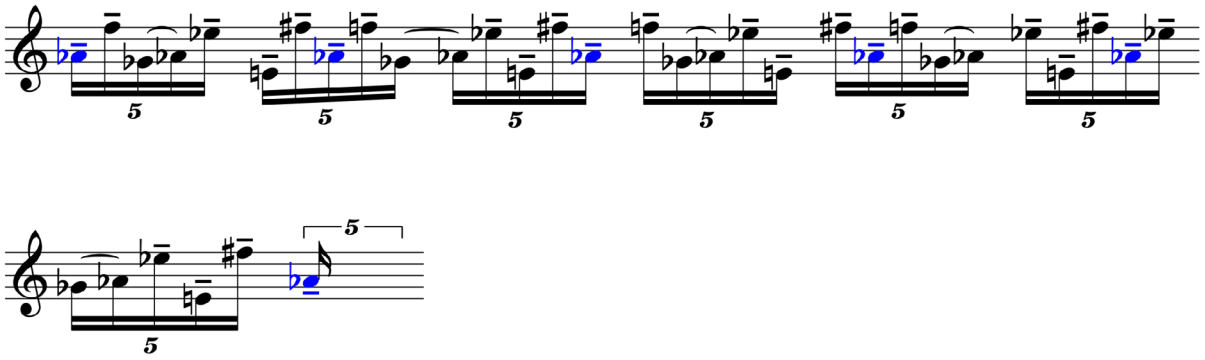
Figure 4.23. 28th January 2021 phrase played in four-part subdivision



Audio 4.21. Phrase from 28th January 2021 played in four-part subdivision

Figure 4.24 features a five-part subdivision. This can be heard in Audio 4.22. The metrical positioning of the phrase relative to the metrical pulse here does not shift in +/- 1 pattern per iteration, and its metrical positioning shifts could therefore not be easily conceptualised as having a forwards or backwards 'direction'. This characteristic made this recontextualisation of the phrase particularly challenging to accurately execute.

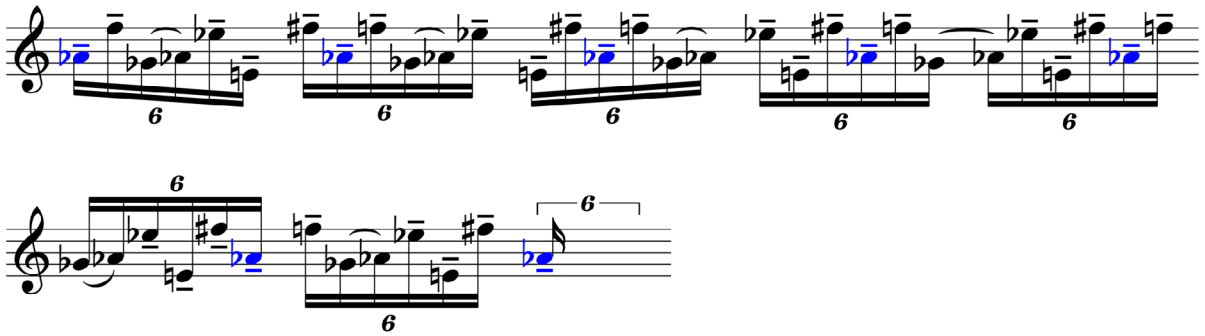
Figure 4.24. 28th January 2021 phrase played in five-part subdivision



Audio 4.22. Phrase from 28th January 2021 played in five-part subdivision

Figure 4.25 features a six-part subdivision, with the metrical positioning of the phrase shifting one sextuplet later relative to the metrical pulse with each reiteration. This can be heard in Audio 4.23.

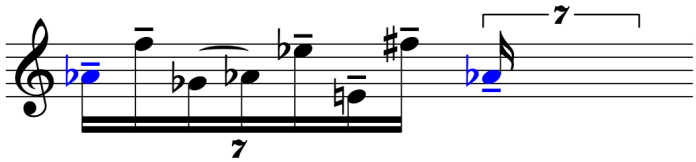
Figure 4.25. 28th January 2021 phrase played in six-part subdivision



Audio 4.23. Phrase from 28th January 2021 played in six-part subdivision

Figure 4.26 features a seven-part subdivision, with the metrical positioning of the phrase aligning with every metrical pulse, due to both being seven units in length. This can be heard in Audio 4.24.

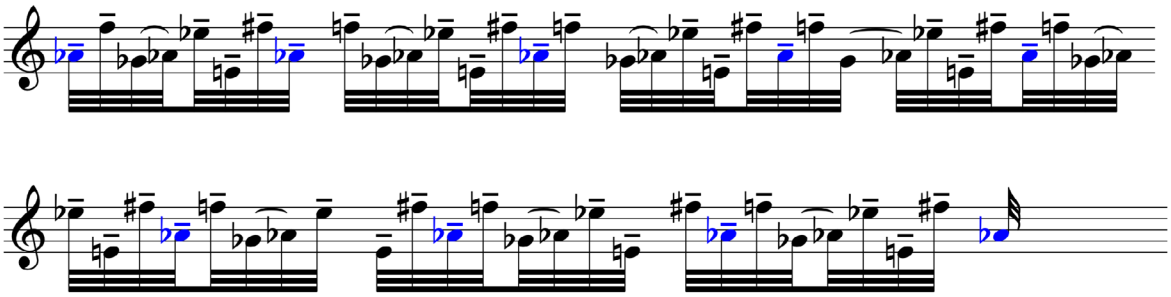
Figure 4.26. 28th January 2021 phrase played in seven-part subdivision



Audio 4.24. Phrase from 28th January 2021 played in seven-part subdivision

Figure 4.27 features an eight-part subdivision, with the metrical positioning of the phrase shifting one octuplet earlier relative to the metrical pulse with each reiteration. This can be heard in Audio 4.25.

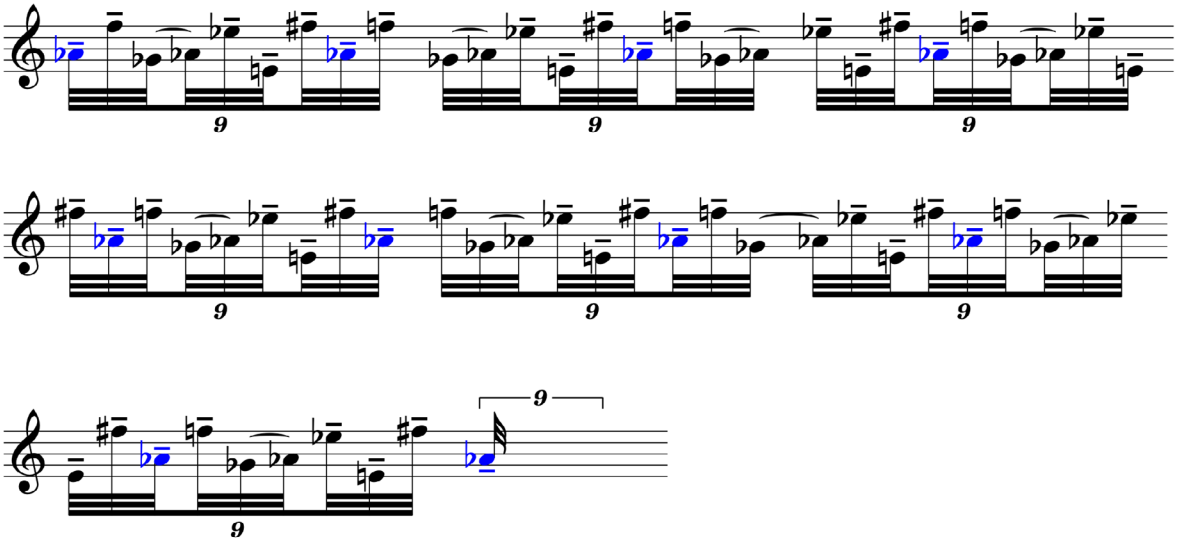
Figure 4.27. 28th January 2021 phrase played in eight-part subdivision



Audio 4.25. Phrase from 28th January 2021 played in eight-part subdivision

Figure 4.28 features a nine-part subdivision. This can be heard in Audio 4.26. Like the five-part subdivision, the metrical positioning of the phrase relative to the metrical pulse here does not shift in a +/- 1 pattern per iteration, and is not conceptualised as having a forwards or backwards 'direction'. This was the other recontextualisation that was most challenging to execute during this session.

Figure 4.28. 28th January 2021 phrase played in nine-part subdivision



Audio 4.26. Phrase from 28th January 2021 played in nine-part subdivision

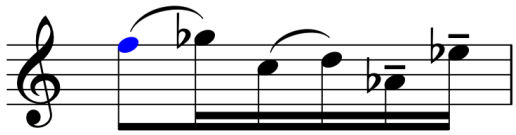
4.3.2 Rhythmic phrasing variation: defined rhythmic values

For the first eleven subdivision recontextualisation sessions, the short musical phrases did not include defined rhythmic values, with the phrase played as an even stream of notes within each subdivision. The constraint of uniform rhythmic values did not prove to be a limitation in the same way that it had been in the Phase One practice design, as task variability was generated by the seven different subdivisions. Despite the effectiveness of this initial approach, I also introduced a second method of organising rhythmic inputs for Phase Two, creating phrases that featured two different rhythmic values with a rhythmic relationship

of 2:1[9]. Introducing this variation into the Phase Two practice design in July 2021 was a creative choice that was distinct from the pragmatic necessity of introducing rhythmic variations to Phase One.

Figure 4.29 presents an example of a phrase with multiple rhythmic durations, drawn from the 23rd July 2021 session. This phrase features a single 'long' duration that adds a rhythmic emphasis to the phrase's first note. The notational use of quaver and semi-quaver durations in this figure is arbitrary; those rhythmic values are used only to indicate the relative durations of the notes, which could then be applied to whichever of the subdivisions the phrase was being played within. One such example can be heard in Audio 4.27, which features the phrase shown in Figure 4.29 being played within a seven-part subdivision.

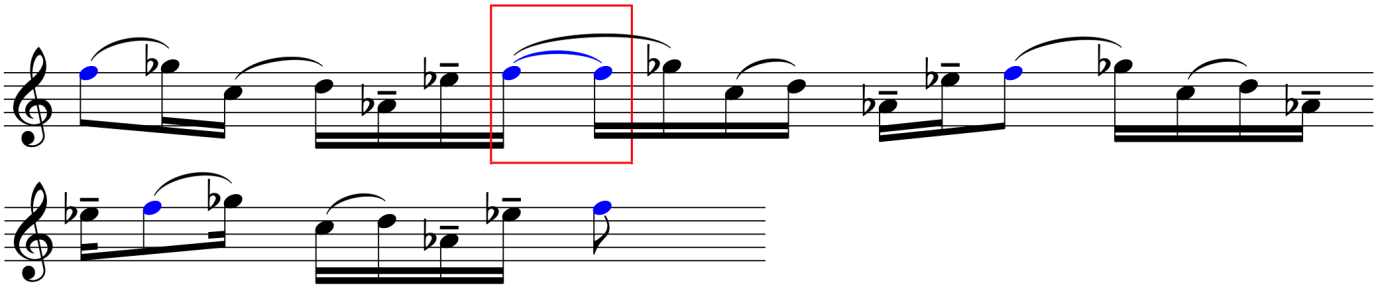
Figure 4.29. Phrase featuring long-short durations in 23rd July 2021 session



Audio 4.27. Phrase from 23rd July 2021 played in seven-part subdivision

When playing phrases with multiple note durations within each subdivision, certain metrical positionings would feature the long durations being tied across the metrical pulse. An example of this can be seen in Figure 4.30, which features the phrase played in a four-part subdivision, with the red box identifying the tied note produced by the long duration being sustained across the metrical pulse. Refer to Audio 4.28 for a played example of this metrical positioning.

Figure 4.30. Long duration tied across the metrical pulse in four-part subdivision, identified by red box

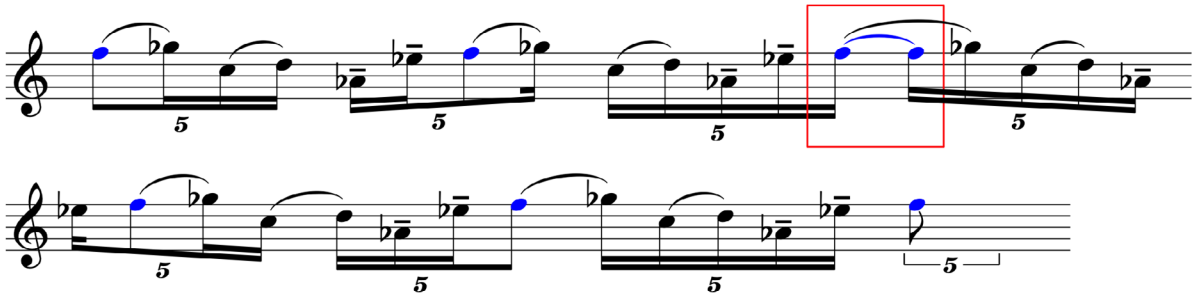


Audio 4.28. Phrase from 23rd July 2021 played in four-part subdivision

Figure 4.31 features the same phrase played in a five-part subdivision, with the red box identifying the tied note being sustained across the metrical pulse. This can be heard in Audio 4.29.

[9] With the exception of two sessions that utilised durations with a ratio of 3:1 – a rhythmic relationship that I discarded as I found it less useful within the context of these practice tasks.

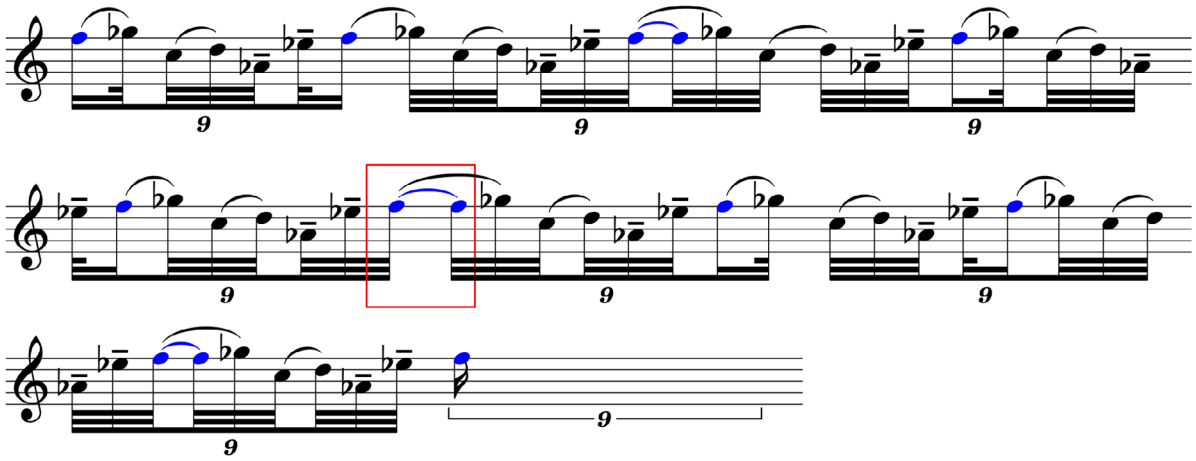
Figure 4.31. Long duration tied across the metrical pulse in five-part subdivision, identified by red box



Audio 4.29. Phrase from 23rd July 2021 played in five-part subdivision

Figure 4.32 features the phrase played in a nine-part subdivision, with the tied note being sustained across the metrical pulse identified within the red box. This can be heard in Audio 4.30.

Figure 4.32. Long duration tied across the metrical pulse in nine-part subdivision, identified by red box



Audio 4.30. Phrase from 23rd July 2021 played in nine-part subdivision

Within each subdivision recontextualisation of a phrase, metrical positionings that featured notes being tied across the metrical pulse introduced significant perturbations to the stability of my embodied metrical pulse and my finger movements. These tasks presented me with effective and functional learning challenges, exercising my ability to internally track the placement of each phrase relative to the metrical pulse without the aid of musical notation. The performance process that I developed to promote greater stability within these tasks will be introduced in Section 5.4. The emerging increase in my coordination and control that I observed across the practice period is evidence that my skills gradually adapted to the demands of these tasks as the period progressed. For a catalogue of the phrases featured in Phase Two sessions, refer to the session notes in the Appendix (from page 185).

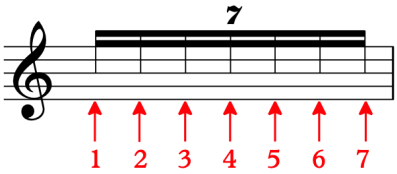
4.4 Phase Three: metrical positioning shifting

The third and final phase of practice commenced in August 2021 and concluded in October 2021. The aim of this practice design was again to examine the interacting physical movements that corresponded to my articulation, note selection, rhythmic phrasing and embodied metrical pulse. The constraints-based tasks used in Phase Three returned to focussing on a single subdivision within each session, while introducing a new method of varying the placement of each phrase relative to the metrical pulse. The practice design itself will be detailed here, while the practice outcomes will be discussed in Chapter Five.

Phase Three of practice was conceived of as a companion to Phase Two. Both practice designs investigated the different physical and cognitive challenges that emerged when a given phrase's relationship to the pulse was altered in some way. During post-practice analysis of one of the Phase Two sessions, a question arose: instead of changing the subdivision to recontextualise the phrase, what if I were to shift *when* the phrase was played relative to the metrical pulse?

Phase Three's practice design, which I have named 'Metrical Positioning Shifting', was created in response to this question. I chose to focus solely on the septuplet subdivision for all Phase Three tasks, with the rhythmic phrasing of each session being the chief variable constraint. These rhythmical phrases were practised in seven *metrical positionings*, commencing from each of the seven time points within the septuplet subdivision, as identified in Figure 4.33. All of the phrases used during Phase Three were seven rhythmic units in length, ensuring they could be practised as repeating cells that would recur at the same point relative to the metrical pulse upon each repeat. A detailed example of this process will be provided within this section.

Figure 4.33. Time points within a seven-part subdivision



Each metrical positioning of a phrase featured a unique relationship between my finger and tongue motions relative to my embodied metrical pulse. The sonic differences between each metrical positioning's relationship between the rhythmic contour and the metrical pulse also presented physical and cognitive perturbations during practice. While the finger and tongue motions were ostensibly the same for all of the metrical positionings, given that the phrase itself was not being altered, I hypothesised that some alignments of phrase to pulse would present greater perturbations to my stability and thus be effective in promoting skill adaptation. This idea was borne out in my practice and subsequent analysis.

It is important to emphasise that this approach is based in a seven-part subdivision of a single metrical pulse, rather than groupings of pulses within a time signature. Had the practice tasks been based in metrical contexts such as 7/8 (which would group the bar's seven pulses into patterns such as 3-2-2 or 2-2-3), the nature of the metrical pulses would have been significantly different and would not have been effective in challenging the interactions of my movement patterns and my embodied metrical pulse.

Once the practice design had been formulated, two key questions emerged. Firstly, would I experience different physical and/or cognitive perturbations for each of the metrical positionings due to the resultant shifting relationships between the played phrase and the metrical pulse? If so, what processes could I

implement during practice, responding to those perturbations in an effort to achieve greater stability? Answers to these questions will be assessed in detail in Chapter Five. Although this permutational approach to manipulating musical material is not new, I am unaware of existing pedagogical methods that take this systematic, rhythm-based approach with the primary aim of introducing functional perturbations in order to develop stable patterns of movement-based coordination and control. Phase Three thus offers new knowledge in the form of the practice design itself, the application of my self-assessment model, and the insights of my post-practice self-evaluation.

The Phase Three practice design will now be illustrated with examples drawn from two sessions. Through the use of notated examples and audio recordings, this section will demonstrate the process of metrical positioning shifting while also introducing the notational conventions I developed to efficiently communicate the musical ideas. The practice processes and notational formats introduced here will be retained in all subsequent analyses. Practice Design Outline 4.3 revisits the summary of the inputs and procedure first presented in Chapter One.

Practice Design Outline 4.3.

Phase Three: metrical positioning shifting

Inputs

- Short musical phrase seven rhythmic units long, with predetermined pitch, articulation and rhythmic content.
- Septuplet subdivision.

Procedure

- Practise the phrase starting on each of the seven time points within the septuplet subdivision.
- For each of these seven time points, play the phrase as a repeated sequence until it feels stable.
- Once each metrical positioning has been learned, move through these three stages:

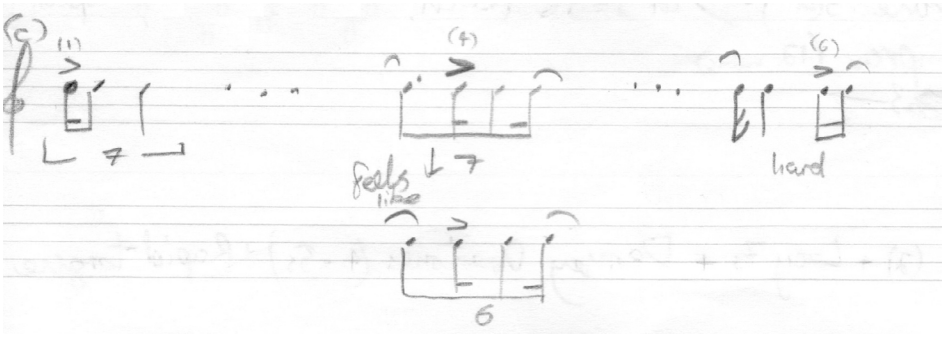
(a) Play the phrase from each of the seven time points, moving it one later each time;
(b) Play the phrase from each of the seven time points, moving it one earlier each time; and
(c) Play improvised phrases over the metrical pulse, spontaneously incorporating the phrase in each of its seven metrical positionings.

The Phase Three practice design drew heavily on the key principles of the constraints-led approach. In addition to the session-to-session variation of practice inputs, the process of learning how to play a phrase in seven different metrical positionings offered a second form of task variability. Additionally, while all three phases of practice aimed to promote improvisational skills, Phase Three was the first to incorporate improvisation into the learning process itself.

Only one variable was pre-determined at the commencement of each session: a short rhythmic phrase. I chose to leave the pitch contents and articulation largely undefined, instead allowing both of these elements to be freely improvised during practice. This allowed each session to incorporate a wider variety of pitch contours and articulation patterns per rhythmic phrase, whereas Phases One and Two were more tightly constrained in their targeting of specific pre-determined sequences. The use of less constraints here was contextually appropriate, given evidence of skill adaptation had already been observed through my self-assessment of the earlier ten months of practice.

All of the material featured in Phase Three sessions was practised without the use of notated visual aids. However, some limited notation was used for documentation purposes. An example of this can be seen in Figure 4.34, which features my handwritten practice notes for the 24th August 2021 session. For each rhythmic phrase, I would always notate the metrical positioning that aligned with the metrical pulse, as can be seen on the left of Figure 4.34. I will refer to the metrical positioning of all phrases on the metrical pulse as their *prime form*.

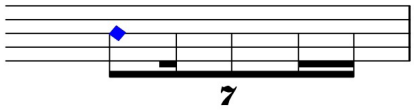
Figure 4.34. Example of handwritten practice notes, from 24th August 2021 session



The inclusion of notated prime forms was constant across all practice sessions. The only other notation I utilised was to document any metrical positionings of a phrase that introduced particularly acute instability to my playing. The absence of some possible metrical positionings in my practice notes does not indicate that they were not practised, but rather that they did not present notable perturbations during the learning process. The phrase seen on the right of Figure 4.34 is in the 6th metrical positioning, which was considered particularly difficult, as indicated by the text beneath the notation. The phrase in the centre of Figure 4.34 features its 4th metrical positioning, which was documented due to its sonic similarity to the sextuplet phrase notated below it with the label "feels like". During practice, I observed that I was erroneously playing this sextuplet-based phrase instead of the intended septuplet-based phrase, in a process that I have termed a *microtiming redistribution error*, which will be discussed in depth in Chapter Five (see Section 5.5).

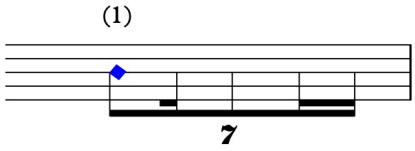
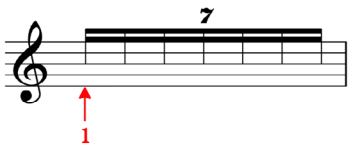
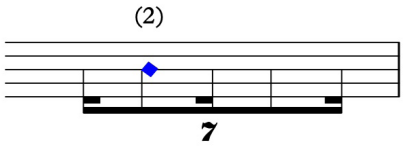
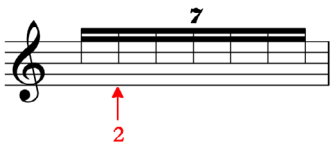
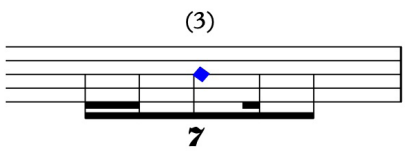
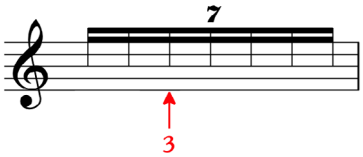
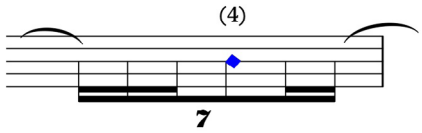
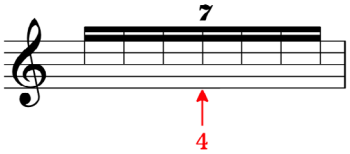
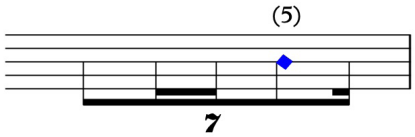
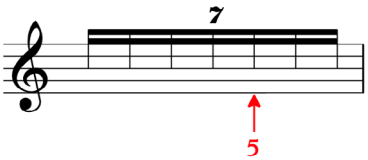
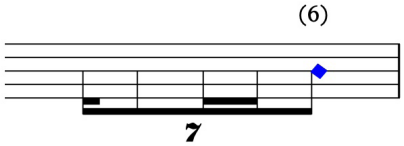
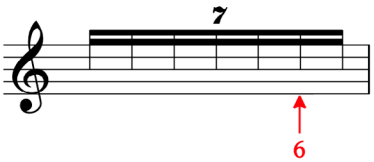
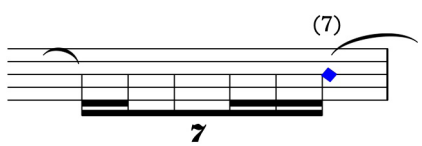
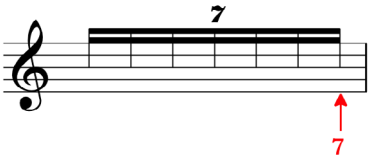
Using the phrase practised during a different session, on 11th September 2021, I will now present fully notated examples to demonstrate the process of shifting a phrase between the seven metrical positionings. The prime form of the phrase practised during this session is presented in Figure 4.35. The blue note-head indicates the start of the phrase only, and does not indicate a defined pitch.

Figure 4.35. Prime form of phrase used in 11th September 2021 session



The seven metrical positionings of this phrase are presented in Table 4.2. The left column features the phrase notated in each of its metrical positionings, with the blue note-head indicating the start of the phrase. The figures within the central column indicate which of the seven time points within the septuplet subdivision each phrase starts on. The bracketed numbers above each phrase in the left column also indicate the time point upon which that metrical positioning starts from. Each phrase can be heard in Audios 4.31-4.37, presented in the right column. Within these recordings, each phrase is repeated several times, with the pitch content primarily improvised.

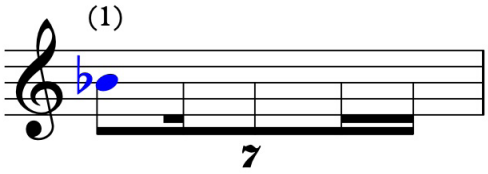
Table 4.2. Seven metrical positionings of phrase in 11th September 2021 session

Metrical Positioning of Phrase	Starting time point	Audio Examples
		Audio 4.31. First metrical positioning
		Audio 4.32. Second metrical positioning
		Audio 4.33. Third metrical positioning
		Audio 4.34. Fourth metrical positioning
		Audio 4.35. Fifth metrical positioning
		Audio 4.36. Sixth metrical positioning
		Audio 4.37. Seventh metrical positioning

As can be seen in the left column of Table 4.2, each metrical positioning could be considered a distinct rhythm rather than permutations of a single rhythmic phrase. However, by maintaining a clear sense of the phrase's first note across each of the metrical positionings, the phrase maintained its internal structure regardless of its sounded relationship to the metrical pulse. During practice, the phrase's starting note was emphasised with an accent, and I would begin and end each phrase on that starting note rather than starting or ending on the metrical pulse.

As has been previously mentioned, the pitch material of each Phase Three phrase was largely undefined, with pitch choices improvised during practice. However, I chose to implement one pitch constraint, pre-determining the first pitch of the phrase in a majority of sessions. This allowed me to play the same pitch to signify the beginning of the phrase each time it was repeated, ensuring it maintained an audible function as the phrase's starting point regardless of its placement relative to the metrical pulse. In the case of the 11th September 2021 session, the phrase's first note was a B-flat, as shown in Figure 4.36. For each metrical positioning, this B-flat would be played in the place of each blue-notehead featured in Table 4.2. This recurring pitch can be heard in each metrical positioning from that session, as heard in Audios 4.32-4.38.

Figure 4.36. B-flat starting pitch of phrase in 11th September 2021 session



This pitch-based constraint was a feature of the early sessions within this practice design, implemented in response to difficulties encountered during the learning process of the first Phase Three practice task. During that session, I initially left all pitch material undefined, but found that some metrical positionings tended to sound like their own distinct rhythms that started on the beat rather than maintaining the internal structure of the prime form as I intended. This sonic perturbation also destabilised my ability to accurately execute the physical motions required to play some of the metrical positionings. When I introduced a pre-defined starting pitch, however, the sonic identity of the prime phrase was much clearer across all metrical positionings, leading to a corresponding fluidity and ease in executing the physical motions of each positioning.

The final seven Phase Three practice sessions discarded the pre-defined first pitches, again allowing all pitches to be improvised. As the practice period progressed, I observed an increase in my stability when shifting phrases between metrical positionings, and therefore determined that the pragmatic need for a pitch-based emphasis of each phrase's first note had become less pronounced. As a result, I chose to discard pre-defined pitches and to instead use articulated accents to emphasise the first notes. This change in approach is evidence of the adaptation of skills to the performance demands presented by the Phase Three practice tasks.

I have demonstrated how the inputs of the Phase Three learning design are constructed, and will now outline the practice procedure. Each session featured three distinct stages that ordered the metrical positionings in different ways. This three-step routine usually took 20-30 minutes to complete; refer to the Appendix (from page 223) for recorded examples of complete sessions.

The first stage of the routine designated 1-3 minutes to learning each metrical positioning in isolation. This initial step was aimed at strengthening my ability to execute each metrical positioning with consistency, spending as much time on each positioning as necessary to achieve that stability. Some metrical positionings introduced significantly more instability into my playing than others, and it was during this initial stage of the practice routine that I would generate and implement practice strategies to address those difficulties. These emergent practice strategies, which form a key output of the Phase Three practice design, will be discussed in Chapter Five (see sections 5.3 and 5.5).

The second stage of the practice routine featured rapid switches between each metrical positioning. This recreated a process of rhythmic displacement that I regularly utilised during improvised performance, and as such is a representative practice design feature. During practice, I would play each metrical positioning for a short amount of time (around 15-30 seconds), take a brief pause, and then proceed to the next metrical positioning. This process would be done twice: first, I would shift the phrase through the metrical positionings from 1 through to 7, and then I would reverse the order and shift the phrase from metrical positioning 7 back through to 1. An example of this process can be heard in Audio 4.38, which presents an excerpt of the reversed order featuring a progression from the 6th to the 5th metrical placement[10] of the phrase featured in Table 4.2.

Audio 4.38. Rapid movement from 6th to 5th metrical placement in 11th September 2021 session

The third and final stage of the practice routine was to improvise over the metronome's pulse, spontaneously weaving in and out of each metrical positioning. This approach was included at the end of each session to ensure I was able to fluidly incorporate each metrical positioning into improvised phrases without encountering any destabilising perturbations. It also ensured that I could creatively conceive of each rhythm that I had practised as part of a melodic line rather than as an isolated rhythmic cell. The predefined first pitches that had been utilised within some phrases were discarded during this final step, amplifying the improvisational component across all musical parameters. An example of this process can be heard in Audio 4.39, which presents an improvised phrase that integrates the 6th metrical placement of the phrase featured in Table 4.2, played at 0:01-0:03 and 0:06-0:12.

Audio 4.39. Improvisation featuring 6th metrical placement in 11th September 2021 session

The improvisational stage of each Phase Three session was guided by two key constraints. The first was to regularly incorporate the seven metrical positionings that were practised during that session, ensuring that the improvisation had a clear learning focus connected to the session's inputs. The various metrical positionings could be incorporated into the improvisation in any order, and could be revisited any number of times. As such, this stage of the practice routine featured more task variability than the more systematic earlier stages, embracing flexibility and spontaneity. The second constraint guiding the improvised practice was to regularly shift between different subdivisions during the improvisation. This constraint was included to ensure that I could move into and out of septuplets with accuracy, which was a rhythmic shift I found very destabilising at the start of the practice project. This was a representative practice design

[10] Note that this excerpt ends with a phrase erroneously resolving on the metrical pulse rather than the intended first note of the phrase.

feature related to my overarching aesthetic goal of being able to freely move between subdivisions during improvised performance while maintaining a stable metrical pulse.

The interaction of these two constraints led to the emergence of a new skill that was unforeseen at the start of the practice period. When shifting into different subdivisions, I would find myself incorporating the session's input phrase into those new subdivisions, which amounted to a spontaneous application of the *subdivision recontextualisation* approach. This was a blending of the Phase Two and Three practice designs that I did not consciously implement, thus representing a transfer of skill that emerged towards the end of the practice period. A detailed analysis of this skill transfer will be given in Chapter Five (see Section 5.6).

4.5 Conclusion

This chapter has detailed the three learning designs that were implemented within my practice project. Each practice phase featured a distinct approach to generating and implementing task constraints, which have been presented with reference to examples drawn from key sessions. My model of self-assessment allowed me to evaluate the efficacy of my practice tasks in promoting skill adaptation for myself as an improvising saxophonist. The introduction of new learning designs in Phases Two and Three is evidence of the emergence of new stable patterns of coordination and control within my playing, with my improvisational skills adapting to the challenges presented by the earlier learning tasks within the practice period. By creating the Phase Two and Three learning designs, I found new ways of implementing task constraints to introduce functional instability, generating performance problems that were matched to my changing ability level. The three learning designs and the self-assessment model presented within this chapter are key research outputs, making original contributions to knowledge about improvisational learning processes and performance practices.

Chapter Five

Practice Outcomes

5.1 Overview

This chapter presents five outcomes of my practice project that emerged over the course of the thirteen-month practice period. The identification and theorisation of each of these outcomes represents a key output of the self-assessment processes that were utilised during practice. All five outcomes were developed across multiple sessions, with some outcomes predominantly emerging in response to the performance demands within one phase of practice, and others emerging in response to performance demands of multiple phases.

These five outcomes demonstrate skill adaptation within the context of the practice tasks themselves, with my playing during the learning process becoming more stable as the practice period progressed. This is indicative of an increase in my technical coordination and control on the saxophone, and is also reflective of the increased efficiency of my search for performance solutions in response to the perturbations presented by each task. My self-assessment process helped me to attune my attentional focus to the unique performance demands of each task during the practice process, allowing me to effectively identify and implement relevant solutions that were not foreseen at the commencement of the practice period. As such, the outcomes are presented as answers to the fourth question within my self-assessment model: what forms of self-assessment will emerge in response to the insights developed through the practice project?

The five outcomes presented in this chapter fall into two broad categories. The outcomes featured in Sections 5.1, 5.2 and 5.4 represent new understandings of physical tendencies within my playing, considered as attractor states, that recurred across multiple practice sessions. The recurrence of each of these tendencies revealed areas of movement instability that, once identified, were targeted in future practice sessions through the manipulation of task constraints, enabling "more functional (relevant and useful) patterns of behaviour [to] gradually become more stable over time" (Renshaw et al, 2019, p. 44). The theorisation of these three outcomes therefore demonstrates the effectiveness of constraints-led principles in guiding the direction of my practice project.

The outcomes of the second category are discussed in Sections 5.3 and 5.5, representing new performance-based processes that were developed through my practice. These processes were initially developed within practice contexts, but also have utility as rhythm-based organisational principles within improvised performance contexts. These two outcomes were conceived in response to performance demands that regularly caused instability as the practice period progressed, and are thus considered as emergent procedural outputs of the project.

The five outcomes are emergent products of my practice project, developed through the application of constraints-led principles within my approach to saxophone practice. The outcomes are presented as performance-based discoveries, contextualised by examples drawn from key sessions that contributed to their identification and further development. Audio examples drawn from session recordings are included as demonstrations of "process in action" (Gander, 2017, p. 12) rather than creative results, and are prime

contributors to the communication of knowledge associated with each outcome. The recordings are thus offered as original research contributions produced by my practice project.

5.2 Finger and tongue attack coupling

A key outcome of Phase One practice was the development of a more nuanced understanding of the coupling tendency within my playing. The artistic audit I undertook at the commencement of this project led to my initial theorisation of coupling, which included the identification of my tendency to place articulated accents on outlying pitches within a phrase's pitch contour, suggesting a coupling of my tongue motion with the finger motions producing that intervallic movement. This represented an attractor state of system stability within my improvisational saxophone technique. The multi-parameter patterning practice design was created to challenge this movement-based tendency, and as my practice progressed, I observed that this kind of coupling only emerged when the digital movement pattern required to move from the previous pitch to the outlying pitch involved multiple fingers being depressed. Transpositions of that same intervallic progression, but with predominantly rising finger motions, did not trigger the same tendency to articulate the outlying note.

I have termed this habitual tendency to couple depressing finger motions and accenting tongue motions *finger and tongue attack coupling* (FTAC). I will use this acronym to refer to this concept through this section. As will be demonstrated, the constraints used within Phase One practice tasks were effective learning tools that led to both the identification of the FTAC tendency and also to the exploration of new movement patterns that challenged the tendency by decoupling my finger and tongue motions. This process led to movement-based skill adaptation and the emergence of new attractor states that had direct transfer to improvised performance, allowing me to spontaneously generate musical materials without my pitch and articulation choices being constrained by the FTAC tendency.

This section will analyse two Phase One practice sessions that were designed to challenge the movement patterns associated with finger and tongue attack coupling. My analysis of the first session will predominantly demonstrate how the FTAC tendency was identified, as well as highlighting how task constraints were implemented to explore new movement patterns. The analysis of the second session will offer evidence that my implementation of task constraints had promoted skill adaptation over a developmental period.

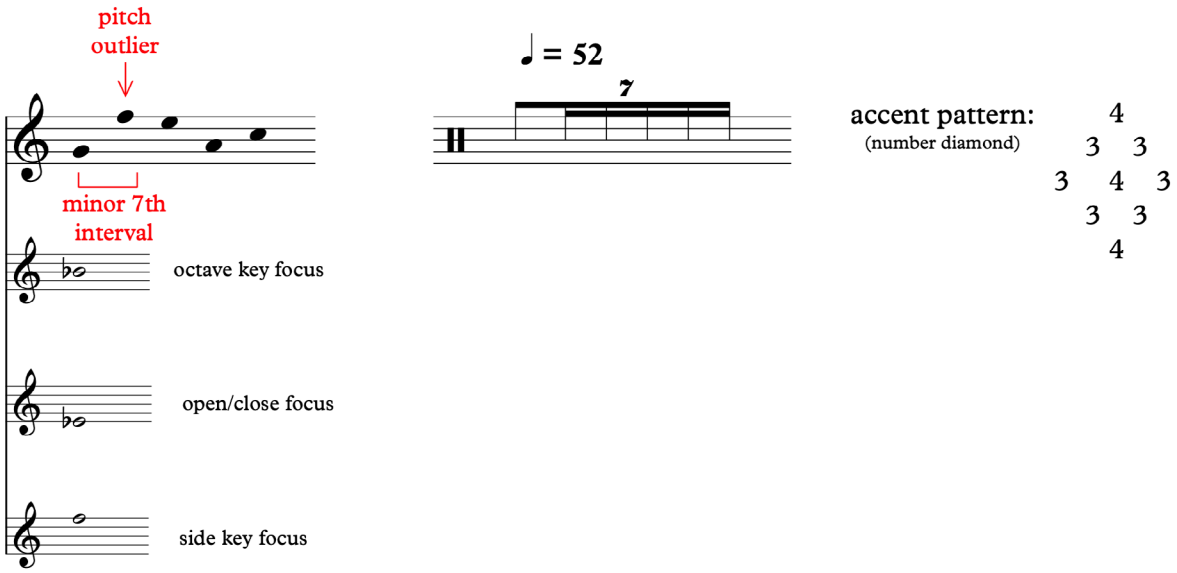
5.2.1 27th June 2021 MPP practice session

Finger and tongue attack coupling was first identified and theorised during my post-practice assessment of the 27th June 2021 multi-parameter patterning session. During this session, each of the four transpositions of the resultant phrase was chosen to target a unique combination of digital movement patterns, with the FTAC tendency clearly emerging in two of those transpositions only. During the session, it was unclear if there was a shared, identifiable characteristic that made those transpositions induce more instability; it was only during my post-practice analysis that I was able to identify FTAC as the common factor.

The practice materials featured during the session are presented in Figure 5.1. The pitch sequences of Phase One sessions often included large intervallic leaps between outlying pitches and their preceding note, as can be seen in the ascending minor 7th interval between the first and second pitches in Figure 5.1. The session's rhythmic input featured a rhythmic archetype based in a septuplet subdivision with six rhythmic attacks. The articulation pattern was derived from a number diamond. Each number within

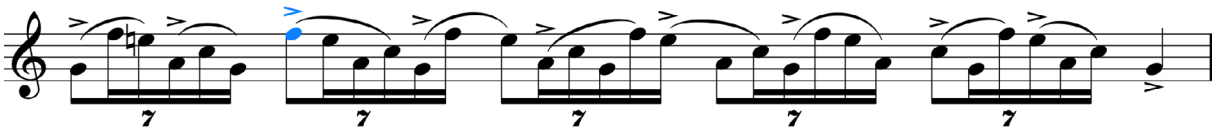
the diamond represented a slurred group of notes, with the first note of each slur being accented. These inputs generated a resultant phrase that was 30 notes in length, resolving at a coincidence point between all three sequences.

Figure 5.1. Inputs in 27th June 2021 session



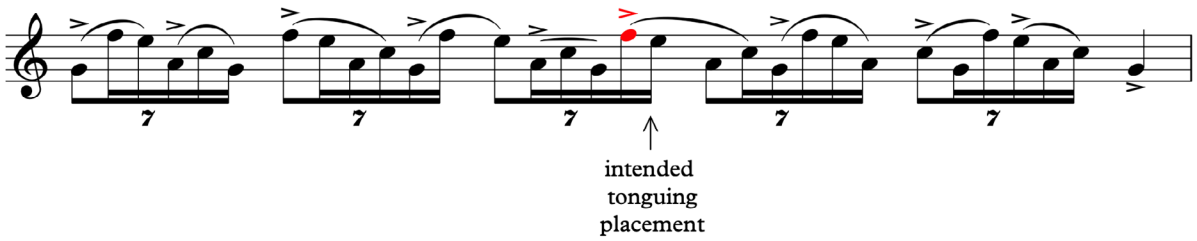
When the pitch, rhythm and articulation inputs were combined, the resultant phrase only featured one accent that aligned with the ascending minor 7th interval. The placement of the slurs within the resultant phrase introduced a perturbation to the stability of my playing, forcing me to avoid the finger and tongue attack coupling tendency and to engage with movement patterns that decoupled my articulation from the pitch contour. This decoupling is demonstrated in Figure 5.2, which features the resultant phrase in its un-transposed form. As can be seen, the accents are placed on a number of different pitches throughout the phrase; only one accent, however, falls on the outlying pitch, as indicated with a blue note-head.

Figure 5.2. Alignment of accent and outlying pitch indicated by blue notehead



The decoupling of articulation and pitch contour was further amplified by the phrase's rhythmic structure. As can be seen in Figure 5.2, the single outlying pitch that aligned with an accent also fell on a long rhythmic duration, giving it both a rhythmic and articulated emphasis. During the practice session, I found that the strength of this emphasis established an alignment of articulation and outlying pitch that was very difficult to avoid applying to subsequent repetitions of that pitch within the phrase. This most frequently manifested in an erroneous accent being placed on the fourth outlying F within the phrase, identified with the red notehead in Figure 5.3. This error occurred a large number of times during the session, and took a significant amount of time to overcome. This is a clear example of the finger and tongued accent coupling tendency, as the movement that produced the high F involved several additional keys being depressed that were not already closed to produce the preceding G. An instance of this erroneous accent placement can be heard in Audio 5.1.

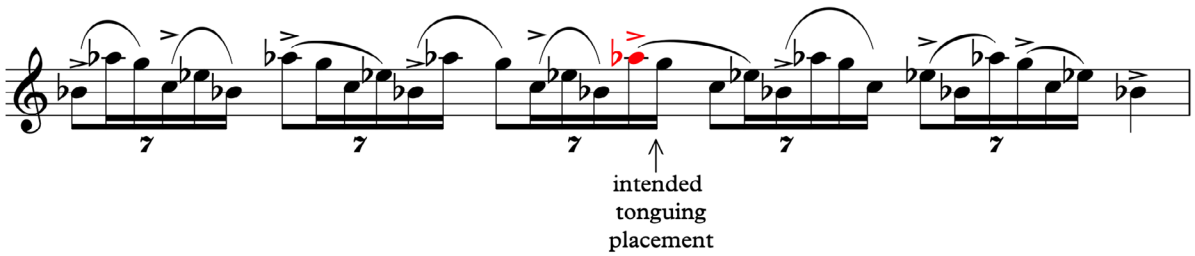
Figure 5.3. Erroneous placement of accent aligning with outlying pitch indicated with red notehead



Audio 5.1. Erroneous placement of accent aligning with pitch outlier in 27th June 2021 session

The three transpositions chosen during this session were selected to target distinct combinations of finger motions that would produce the same pitch contour. This resulted in a total of four distinct movement patterns that produced the ascending minor 7th interval, the first two involving depressing finger motions and the last two featuring rising finger motions. I experienced significantly greater perturbations when learning the two transpositions that featured depressing finger motions, with the same erroneous accent placement frequently recurring in both cases. Figure 5.4 features the resultant phrase in its first transposition, with a red note-head identifying the erroneously accented note.

Figure 5.4. Erroneous placement of accent (in first transposition) aligning with outlying pitch indicated with red notehead



The two transpositions that featured raising finger motions to produce the ascending minor 7th interval did not induce this recurring erroneous accent placement. I experienced greater stability when learning these transpositions of the phrase, and was able to maintain the desired articulation pattern without experiencing significant perturbations. Given that the pitch contour was identical across all four versions of the phrase, these findings were a clear indication that the FTAC tendency was the destabilising factor.

The theorisation of finger and tongue attack coupling is a key outcome that was not foreseen at the commencement of the practice session, and emerged out of the practice itself as well as my subsequent post-practice assessment. As such, the identification of FTAC represents a key outcome of the non-linear learning approach within Phase One. The insights gained here were later used to inform the choice of constraints in many future sessions, guiding me to explore a variety of solutions to the movement-based instabilities presented by finger and tongue attack coupling.

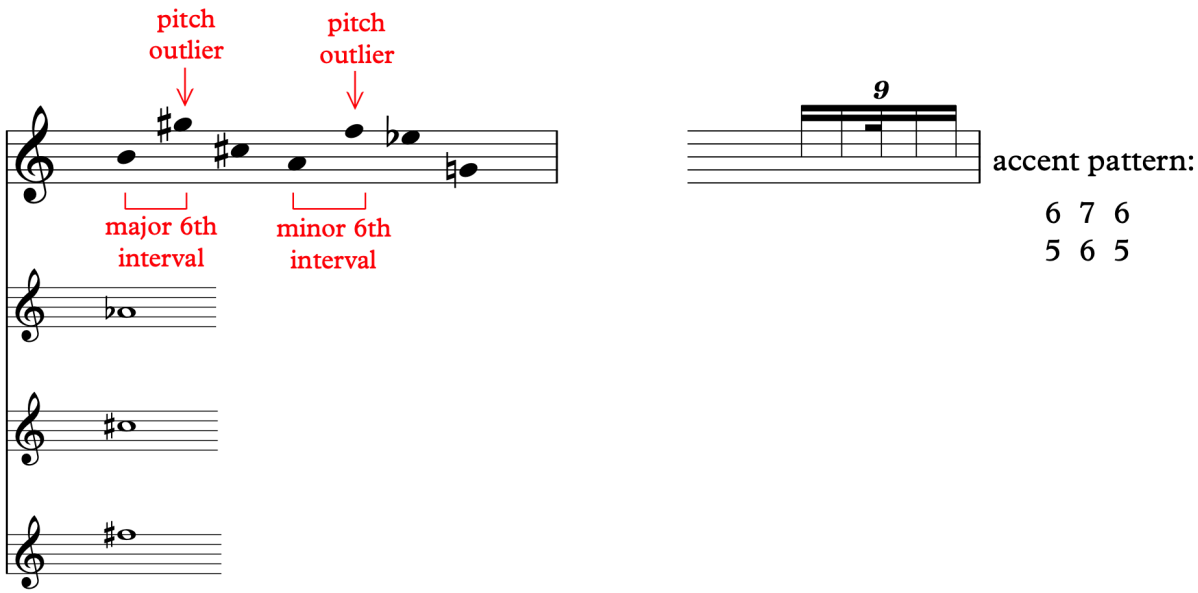
5.2.2 18th October 2021 MPP practice session

After finger and tongue attack coupling had been identified and theorised, the task constraints of many multi-parameter patterning sessions that followed were carefully designed to further decouple my finger and tongue motions. Each session featured a new set of constraints that could challenge the same underlying movement tendency, adhering to the repetition-without-repetition principle of the constraints-led approach. I will now turn to an analysis of the session that occurred on 18th October 2021, almost four months later in the project.

During this session, erroneous accent placement caused by finger and tongue attack coupling again emerged as a key contributor to instability during the learning process. The analysis presented in this section offers evidence that the selective targeting of this kind of perturbation across a developmental time scale had resulted in skill adaptation. During the session, this was demonstrated by my ability to more rapidly identify and correct instances of FTAC when compared to the 27th June 2021 session, indicating that my attentional focus had become more attuned to this kind of perturbation and that I was able to efficiently implement effective performance solutions.

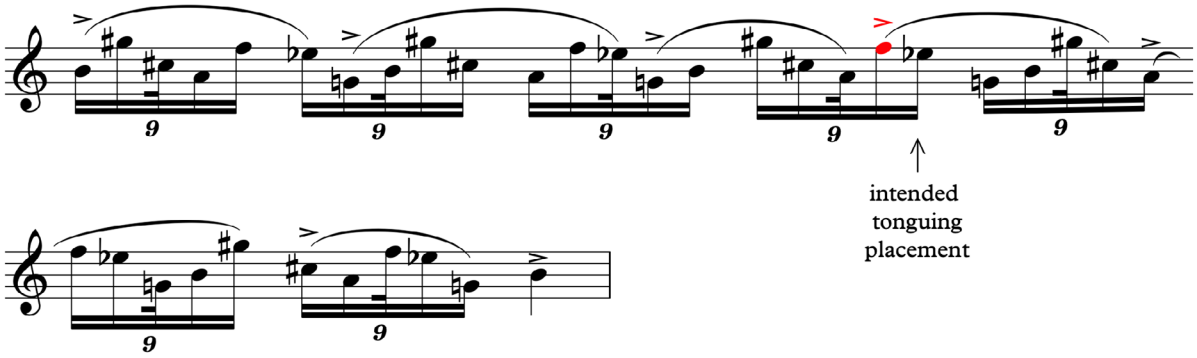
The pitch, rhythm and articulation inputs used during this session are shown in Figure 5.5. As can be seen, the pitch sequence features two large ascending intervals: a major 6th jump between its first and second notes, and a minor 6th jump between its fourth and fifth notes. When combined, the pitch, rhythm and articulation inputs generated a resultant phrase that did not feature any accents falling on either of the ascending intervallic jumps. By ensuring that the transpositions utilised depressing finger motions to produce those outlying pitches, I was able to implement constraints to explore movement patterns that decoupled my finger and tongue motions.

Figure 5.5. Inputs in 18th October 2021 session



Of the many ascending intervallic jumps within the resultant phrase, there was just one that frequently drew an erroneous accent during the session. The outlying pitch of this interval is indicated with a red note-head in Figure 5.6, which features the initial un-transposed form of the complete phrase. Audio 5.2 features a playing of the phrase with the erroneous accent heard.

Figure 5.6. Erroneous placement of accent aligning with outlying pitch indicated with red notehead



Audio 5.2. Erroneous placement of accent aligning with pitch outlier in 18th October 2021 session

This misplaced accent recurred multiple times in the opening stages of the practice session, indicating another example of instability that was attributable to the finger and tongue attack coupling tendency. However, I was able to rapidly identify FTAC as the cause, as I had honed my attentional focus through the implementation of similar constraints in a number of preceding practice sessions. By exploring performance solutions that interacted with different constraints across a developmental time scale, I had promoted greater movement stability when facing the physical challenges posed by this kind of material, with the perturbations I encountered during the initial stage of learning during this session taking significantly less time to overcome.

My choices of the next two transpositions during the session further targeted ascending minor 6th intervals within the pitch sequence that were produced through depressing finger motions. However, only the first of these two transpositions induced the same recurring articulation error. By the time I had reached the second of these transpositions, my awareness of the FTAC tendency allowed me to implement effective performance solutions and to learn the phrase without inducing the accent. This is another indication that skill adaptation had occurred: when learning a new multi-parameter pattering phrase, I was able to apply my embodied understanding of that phrase across different transpositions more efficiently and effectively, demonstrating that the adapted skills were transferrable and not connected to any particular set of notes or finger motions.

5.3 Compensatory tonguing

The perturbations that were designed into my practice tasks were intended to introduce functional instability into the learning process to promote skill adaptation. In some cases, the perturbations also revealed tendencies within my playing of which I had been previously unaware, with the identification of those tendencies being a key research outcome that was generated through the process of practising.

One such outcome regarded my ability to maintain coordination and control of my tonguing motions. I observed three related articulation tendencies that emerged as unintended movement-based responses to challenges that arose across multiple sessions in Phases Two and Three. I have termed this group of tendencies *compensatory tonguing* (CT). The common factor shared by all three forms of CT was that they involved tongue movements that I had not deliberately implemented, but that had instead emerged

spontaneously in response to the perturbations I experienced when learning to play practice tasks. Although compensatory tonguing was sometimes effective in compensating for rhythmic instabilities, CT also resulted in a corresponding lack of coordination and control of my tonguing motions and resultant articulated sound. The emergence of CT thus exposed a region of instability within my playing that I hypothesised could be addressed through the exploration of new, additional performance solutions.

The development of performance solutions to challenge the compensatory tonguing tendency became a key consideration when designing Phase Two and Three practice tasks. Sections 5.3.1-5.3.3 will analyse a number of sessions, detailing the three forms of compensatory tonguing that I observed during practice. Two of these tendencies emerged during Phase Two sessions, while the third tendency was observable during Phase Three sessions. All three forms of CT were identified and theorised early within their respective practice phase, allowing me to direct my attentional focus towards faster and more effective responses to those tendencies in later sessions. This process is evidence of my skill level adapting to the performance demands presented by the practice tasks, and is also a demonstration of how self-assessment of movement tendencies can generate understandings of playing instability that may not be identifiable through purely musical analysis of sounded performances.

5.3.1 Forceful tonguing

The most common manifestation of compensatory tonguing during Phase Two sessions was the unintended increased force of my tonguing motion in response to rhythmic perturbations. When learning certain subdivision recontextualisations of a phrase, my articulation would unintentionally be produced with a more powerful tonguing motion, resulting in notes that were either more staccato or more accented than I intended. This meant that I was unable to sustain a consistent sound across all of the metrical contexts, despite the intended tongue motions ostensibly being the same and the only movement variable being the tempo of my embodied metrical pulse. The more forceful tonguing motions compensated for the instability I experienced during practice in two ways; firstly, the sonic clarity of the note onsets made it easier to maintain an aural sense of the various time-points between each metrical pulse, and secondly, the exaggerated physicality of the tongue motions made it easier to maintain an embodied 'feeling' of the time-points within each subdivision.

The forceful tonguing tendency was first observed during the Phase Two session held on 28th January 2021. The musical material practised during this session has already been discussed in Chapter Four (see Figure 4.19). During practice, I was able to maintain a relaxed legato tonguing sound across all subdivisions, with the exception of the five-part (quintuple) subdivision and the nine-part (nonuple) subdivisions, both of which induced an unintended staccato sound. This more forceful articulation can be heard in Audios 5.3 and 5.4, which feature playings of the phrase in quintuple and nonuple subdivisions respectively. These performances can be compared to those heard in Audios 5.5 and 5.6, which feature the corrected phrases with the intended articulation, again respectively in quintuple and nonuple subdivisions.

Audio 5.3. Phrase from 28th January 2021 session in five-part subdivision with forceful tonguing

Audio 5.4. Phrase from 28th January 2021 session in nine-part subdivision with forceful tonguing

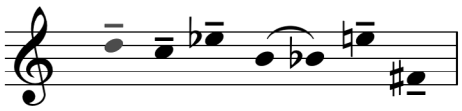
Audio 5.5. Phrase from 28th January 2021 session in five-part subdivision with intended tonguing

Audio 5.6. Phrase from 28th January 2021 session in nine-part subdivision with intended tonguing

The quintuple and nonuple subdivisions that triggered forceful tonguing were the same two subdivisions in which I found it most challenging to maintain my embodied metrical pulse during the session. The emergence of compensatory tonguing exclusively within these subdivisions was a significant discovery that was identified during my post-practice assessment of the session. My hypothesis that CT and rhythmic instability were linked informed my decision making in subsequent sessions, first to test if that link recurred when different musical inputs were used, and then as a way of amplifying similar perturbations to explore different performance solutions, promoting greater stability over time.

Another early Phase Two session that featured forceful tonguing occurred on 4th February 2021. This session featured the seven-note phrase seen in Figure 5.7, in which a majority of the pitches were articulated with legato tonguing. Although compensatory tonguing did not emerge during the quintuple subdivision during this session, it did re-emerge in the nonuple subdivision, as can be heard in Audio 5.7.

Figure 5.7. Phrase from 4th February 2021 session



Audio 5.7. Phrase from 4th February 2021 session in nine-part subdivision with forceful tonguing

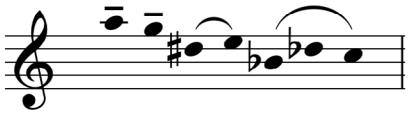
The re-emergence of compensatory tonguing within this practice task was significant, as this session's inputs were different to those of the 28th January session. This was confirmation that I should continue to explore my hypothesis that forceful tonguing was an unintended tendency that emerged in response to contextually specific rhythmic perturbations. Subsequent sessions featured a diversification of task inputs, including the use of phrases of varying lengths, the incorporation of multiple rhythmic values (see Section 4.2.3), and a mixture of articulation patterns that were either predominantly tongued or predominantly slurred. For a complete index of the inputs used during these sessions, refer to the Appendix (from page 185).

Over the ten-month period of Phase Two practice, it became clear that instances of forceful tonguing only occurred when specific combinations of phrase length and subdivision were being practised. The combinations inducing the forceful tonguing tendency were:

- A phrase five rhythmic units in length, played in a septuple subdivision;
- A phrase seven rhythmic units in length, played in a quintuple subdivision; and
- A phrase seven rhythmic units in length, played in a nonuple subdivision.

Across multiple sessions, the compensatory tonguing tendency was evident within these three contexts regardless of the intended articulation pattern within the phrase. The phrase featured in the 6th August 2021 session was predominantly slurred, as shown in Figure 5.8. This phrase was seven rhythmic units in length, and when practised in nonuplets, the tongued notes starting each slur were considerably more forceful than those heard in any of the other metrical contexts of the same phrase. This can be heard when comparing Audio 5.8, which features the phrase played in nonuplets with forceful tonguing, and Audio 5.9, which features the desired articulation sound when the phrase was played in septuplets.

Figure 5.8. Phrase from 6th August 2021 session

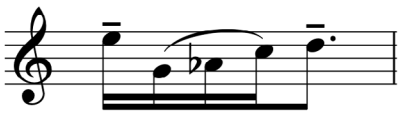


Audio 5.8. Phrase from 6th August 2021 session in nine-part subdivision with forceful tonguing

Audio 5.9. Phrase from 6th August 2021 session in seven-part subdivision with intended tonguing

Forceful tonguing was also evident in phrases that featured multiple rhythmic durations, such as the phrase shown in Figure 5.9[1], drawn from the 23rd August 2021 session. Forceful tonguing was observed when this phrase was played in quintuplets, as can be heard in Audio 5.10. The phrase can be heard played with the desired articulation in Audio 5.11, which features a septuplet subdivision.

Figure 5.9. Phrase from 23rd August 2021 session



Audio 5.10. Phrase from 23rd August 2021 session in five-part subdivision with forceful tonguing

Audio 5.11. Phrase from 23rd August 2021 session in seven-part subdivision with intended tonguing

[1] This was one of two phrases practised in Phase two that utilised a rhythmic relationship of 3:1 between long and short durations.

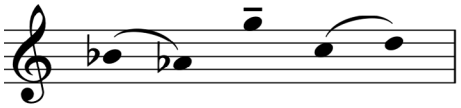
Forceful tonguing was a motion-based performance solution to rhythmic instability that I did not consciously choose to utilise. It was a tendency that I identified through an iterative process of practice and self-assessment. Despite its functionality as a response to rhythmic instability, it had the consequence of destabilising the coordination and control of my articulation movement patterns during practice. By identifying forceful tonguing during the first week of Phase Two, I was able to implement task constraints in subsequent sessions to guide my attentional focus to identify further instances of forceful tonguing when they occurred, and also to explore practice strategies that would allow me to maintain a more consistent articulation sound across all subdivision recontextualisations of a phrase. The need for conscious intervention of the forceful tonguing tendency became less acute as the practice project progressed, with the developed performance solutions leading to my skills adapting to the demands of the practice design, and to the emergence of a new region of performance stability.

5.3.2 Additional tongued notes

A second compensatory tonguing tendency that emerged during some Phase Two sessions was the erroneous tonguing of notes that were intended to be played slurred. Although this tendency emerged less frequently than forceful tonguing, it was another movement-based tendency that emerged in response to combinations of phrase-length and subdivision that were similar to those highlighted in Section 5.3.1.

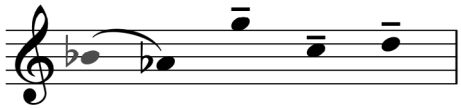
One instance of this tendency to unintentionally tongue notes occurred during the 18th April 2021 session. This session featured the five-note phrase seen in Figure 5.10, with two slurs and one isolated tongued note. During practice, I was able to execute this phrase in subdivisions of 3 to 8 without experiencing any significant perturbations.

Figure 5.10. Phrase from 18th April 2021 session



When this phrase was practised in a nonuple subdivision, however, I was frequently unable to execute the slur between C and D, instead unintentionally tonguing both notes as shown in Figure 5.11. An example of the occurrence of this error can be heard in Audio 5.12, with the D erroneously tongued at 0:04 and 0:06. Additional tonguing of the D was a recurring error during the learning process, occurring at multiple time points within the subdivision relative to the metrical pulse upon each of the repetitions of the phrase. This suggests that the additional tonguing tendency emerged not in response to particular placements of the phrase relative to the metrical pulse, but in response to the interaction between the phrase's length of five rhythmic units and the nine-part subdivision in general.

Figure 5.11. Additional tongued note within 18th April 2021 phrase

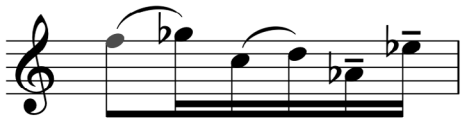


Audio 5.12. Phrase from 18th April 2021 session in nine-part subdivision with additional tongued note

I have identified two ways this compensatory tonguing tendency responded to the perturbations I was experiencing. Firstly, the additional tonguing generated more sonic demarcations of the various time-points within the nonuple subdivision, making it easier to maintain a clear aural connection to the subdivision. It also allowed the slur between the B-flat and A-flat to generate a clear aural marker of the start of the phrase that was distinct from all other articulated sounds, making it easier for me to track the repeat points of the phrase as it moved relative to the metric pulse. While this form of compensatory tonguing could be an effective learning tool in other contexts, it was in this case indicative of an undesired and unintended physical response to instability, and only emerged through errors in my phrasing.

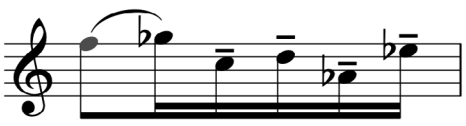
A later example of this tendency occurred during the 23rd July 2021 session, which featured a phrase that was seven rhythmic units in length and utilised two different rhythmic durations, as can be seen in Figure 5.12.

Figure 5.12. Phrase from 23rd July 2021 session



This phrase also presented significant challenges when practised in the nonuple subdivision, with the second slurred pair of notes (C and D) erroneously being tongued separately. Figure 5.13 presents the resultant played articulation pattern, an example of which can be heard between 0:05-0:07 in Audio 5.13. This erroneous articulation pattern occurred a number of times throughout the session, with the tongued D being played at multiple time points within the nonuple subdivision upon the different repetitions of the phrase. The recurrence of this error in multiple rhythmic placements relative to the metrical pulse provides further evidence that additional tonguing was an unintended response to the perturbation presented by the combination of a phrase seven rhythmic units long within a nonuple subdivision, rather than being indicative of any particularly destabilising rhythmic placements of that phrase relative to the metrical pulse.

Figure 5.13. Additional tongued note within 23rd July 2021 phrase



Audio 5.13. Phrase from 23rd July 2021 session in nine-part subdivision with additional tongued note

Additional tonguing was identified and theorised early in the Phase Two practice period. In later practice sessions, I was able to guide my attentional focus to scan for this form of compensatory tonguing, and to correct my phrasing when required. The tendency to unintentionally tongue notes emerged with

less frequency as the practice period progressed, suggesting that my practice had successfully promoted skill adaptation and had increased my ability to maintain coordination and control of my articulation movements when playing phrases in all subdivisions.

5.3.3 Tongue stopping

One manifestation of the compensatory tonguing tendency was identified during Phase Three of practice. When learning Phase Three practice tasks, I would unintentionally use my tongue motion to cut off some notes before the end of their intended duration, resulting in a momentary silence before the following note was played. This manner of unintentionally cutting off notes with my tongue will be referred to as *tongue stopping*.

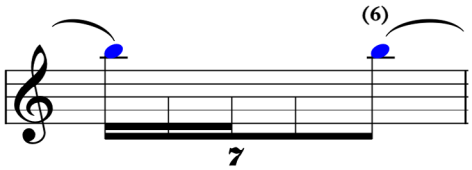
Tongue stopping was observed across a number of sessions, affecting notes with a duration of more than one rhythmic unit within the septuplet subdivision. Each phrase that was practised featured at least one such note, with a majority of the notes having a duration of 2-3 rhythmic units and some having a duration of 4-5 rhythmic units. Tongue stopping emerged primarily in metrical positionings of phrases that featured longer durations being tied across the metrical pulse. Regardless of the duration of the note, the cutting off always occurred in alignment with the metric pulse, with one exception that will be analysed in the following pages.

Although I did not deliberately implement tongue stopping motions, they acted as a performance solution helping me to maintain rhythmic stability in response to perturbations within each practice task. However, this stability led to a corresponding decrease in coordination and control of my articulation, as had been the case with the other forms of compensatory tonguing identified in Phase Two. As such, tongue stopping was an unwanted physical tendency that revealed a limit in my ability to control my articulation in certain rhythmic contexts.

The tongue stopping tendency was identified early within the Phase Three practice period. This allowed me to guide my attentional focus to contexts in which it would likely occur in later sessions, and then to explore new performance solutions in those contexts. This section will analyse examples of the tongue stopping tendency that occurred during three sessions, demonstrating its unintended emergence in response to perturbations caused by notes with durations of 2, 3, and 5 rhythmic units. The selection of these varied practice tasks exemplifies the wide range of contexts in which tongue stopping was observed.

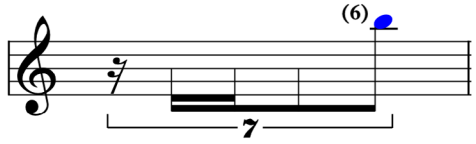
The tongue stopping tendency was identified during the first Phase Three practice session, held on 3rd August 2021. The phrase practised during this session featured a first note that had a duration of three rhythmic units within the septuplet subdivision. When the phrase was played in its sixth metrical positioning, the first note of the phrase, indicated by a blue note-head, was tied across the metrical pulse as shown in Figure 5.14.

Figure 5.14. Phrase from 3rd August 2021 session in sixth metrical positioning



When I was learning this metrical positioning, I found that the phrase sounded very rhythmically ambiguous and did not project a clear sense of the underlying septuplet subdivision. This rhythmic instability led to the emergence of tongue stopping on the metrical pulse, with the tied note across the metrical pulse being cut short to produce the rhythmic durations shown in Figure 5.15.

Figure 5.15. Tongue stopping within 3rd August 2021 phrase



The action of my tongue making contact with the reed produced a clear cut-off to the note that was an audible event aligning with the metrical pulse. Although I had not intended to do so, this action increased my aural comprehension of the phrase, and also supported my movement-based stability by making it easier to maintain my embodied metrical pulse. The sounded difference between the phrases shown in Figures 5.14 and 5.15 can be heard in Audios 5.14 and 5.15, which feature the phrase played with the desired duration and the tongue stopped duration respectively.

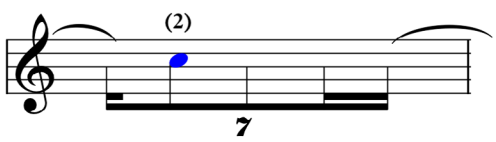
Audio 5.14. Phrase from 3rd August 2021 session in sixth metrical positioning

Audio 5.15. Phrase from 3rd August 2021 session in sixth metrical positioning with tongue stopping

While the audible effect of tongue stopping during the session was subtle, I considered it to be a significant discovery that revealed an underlying region of rhythmic and articulation-based instability within my playing. As has already been discussed, the greater sense of rhythmic stability produced by compensatory tonguing came at the expense of my articulation-based coordination and control. Having identified the tongue stopping tendency during the first Phase Three session, I attuned my attentional focus in subsequent sessions to identify and correct instances of tongue stopping when learning similar metrical positionings of long note durations.

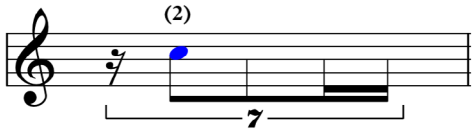
The 5th September 2021 session featured another instance of tongue stopping, this time occurring in response to rhythmic perturbations caused by a note with a duration of two rhythmic units. When the phrase was played in its second metrical positioning, it produced the rhythmic phrase shown in Figure 5.16, with the first note of the phrase indicated with a blue note-head.

Figure 5.16. Phrase from 5th September 2021 session in second metrical positioning



During the learning process, I experienced significant instability when attempting to place the phrase's first note on the correct time point within the septuplet subdivision. Tongue stopping emerged as an unintended response to this instability, interrupting the duration of the phrase's final note to produce the rhythmic durations shown in Figure 5.17. The emergence of compensatory tonguing in this context revealed its function as a physical and sonic performance solution, allowing me to execute a tongue motion that stabilised my embodied metrical pulse while also generating a sounded event that aurally emphasised the metrical pulse. Together, these physical and aural results generated a clear rhythmic reference point against which I could more accurately execute the rhythmic placement of the phrase's first note. However, tongue stopping also led to a decrease in the coordination and control of my articulation.

Figure 5.17. Tongue stopping within 5th September 2021 phrase

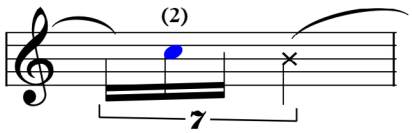


A recorded passage featuring my practice of this metrical positioning can be heard in Audio 5.16. This recording captured my first attempts to play this positioning of the phrase during the session. From 0:00-0:06, I can be heard playing the tongue stopped version of the phrase, while from 0:06 to 0:16, I make a correction and tie the note for its full duration. This is a demonstration of my practice process in action, first featuring the identification of tongue stopping and then the subsequent implementation of an effective performance solution.

Audio 5.16. Learning the phrase from 5th September 2021 session in second metrical positioning

The 16th October 2021 Phase Three session featured a distinct manifestation of the tongue stopping tendency. During this session, the involuntary tonguing motion did not align with the metrical pulse, instead occurring at a different time point within the septuplet subdivision. The phrase practised during this session featured a note with a duration of five rhythmic units, and when played in its second metrical positioning, this lengthy note was tied across the metrical pulse as seen in Figure 5.18.

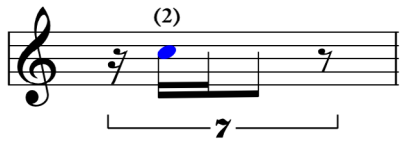
Figure 5.18. Phrase from 16th October 2021 session in second metrical positioning



This metrical positioning of the phrase presented significant perturbations during the learning process. When holding the five-unit note across the metrical pulse, it generated a lengthy span during which there were no audiated demarcations of time points within the subdivision, generating a sense of rhythmic ambiguity that made it very difficult for me to maintain my embodied metrical pulse or to have a clear aural sense of the septuplet subdivision. The tongue stopping tendency emerged as an unintended response to this instability, cutting the note off on the sixth time point within the subdivision to produce the rhythmic

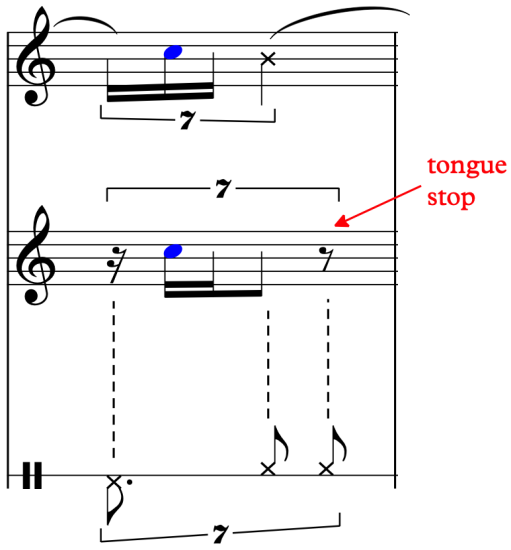
durations seen in Figure 5.19.

Figure 5.19. Tongue stopping within 16th October 2021 phrase



The placement of an erroneous tongue stop on the sixth time point within the subdivision can be attributed to the structure of a rhythmic archetype that I had been consciously using as an internalised reference point while learning the phrase. This archetype split the time points within the septuplet subdivision into subgroups of 3-2-2. Figure 5.20 features this archetype in the bottom stave, with the intended phrase in the top stave and the tongue-stopped phrase in the middle stave. The dotted lines within the figure indicate where the archetype's notes fall rhythmically relative to the played phrase. As can be seen, the tongue stop aligned with the final attack of the archetype, thus generating a sense of rhythmic stability that aligned with a significant time point within the subdivision.

Figure 5.20. Alignment of tongue stopping with archetype during 16th October 2021 session



Audio 5.17 features a recorded passage from the session featuring this rhythmic phrase being looped. The recording captures my first attempts to play this metrical positioning of the phrase. Between 0:03 and 0:08, I can be heard playing the phrase with unintentional tongue stopping, with a correction occurring at 0:09 that allows me to continue playing with the note's full duration, indicating that a balance of rhythmic stability and articulation stability had been achieved.

Audio 5.17. Learning the phrase from 16th October 2021 session in second metrical positioning

This example from late in the Phase Three practice period demonstrates that skill adaptation had occurred across the practice project's developmental period, evident in the efficiency with which I identified and corrected the tongue stopping tendency. My use of different inputs for each Phase Three session

represented an implementation of the task variability principle, allowing me to introduce functional instability during the learning process and to experience the process of solving the tongue stopping performance problem multiple times under different task constraints.

This section has presented a case study of the compensatory tonguing tendency within my own playing, demonstrating how self-assessment of movement-based tendencies can illuminate sources of instability unlikely to be detected by analysis of the musical surface alone. This conceptual framework has utility beyond my own learning project, and could assist other musicians who play wind instruments to assess the links between tongue-based movement patterns and the accuracy of their rhythmic phrasing. The performance solutions I developed in response to my own compensatory tonguing tendencies also offer practice processes that could be applied to articulation-based learning problems beyond the musical language of my own practice tasks.

5.4 Polyrhythm-guided phrasing

This section details an outcome that emerged primarily during Phase Two of practice, as well as some early Phase One sessions. In response to rhythmic instabilities that I experienced when learning practice tasks, I developed an approach that utilised polyrhythms to conceptualise the placement of pitch and/or articulation sequences relative to the metrical pulse by conceiving of the sequences as embellished countermetrical pulse streams. I refer to this performance process as *polyrhythm-guided phrasing* (PGP).

It should be noted that in all Phase One and Two sessions that featured the polyrhythm-guided phrasing approach, the pitch, rhythm and articulation inputs were always the first materials to be conceived. The polyrhythm that I utilised to conceptualise the played phrase as an embellished countermetrical pulse stream was an emergent property within each session, and was not the starting point in the devising of any practice inputs. In other words, none of the tasks were derived by choosing a polyrhythm that was then 'filled in' with extra notes between each countermetrical pulse. While this could be a productive approach, it was not the one taken during this project.

This section will present examples of how polyrhythm-guide phrasing was applied within my practice tasks, as well as highlighting a group of three polyrhythms that caused significant instability during practice when they were used to guide my phrasing. The identification and theorisation of these three destabilising polyrhythms represents a key area of knowledge within the PGP approach, alongside the performance process itself.

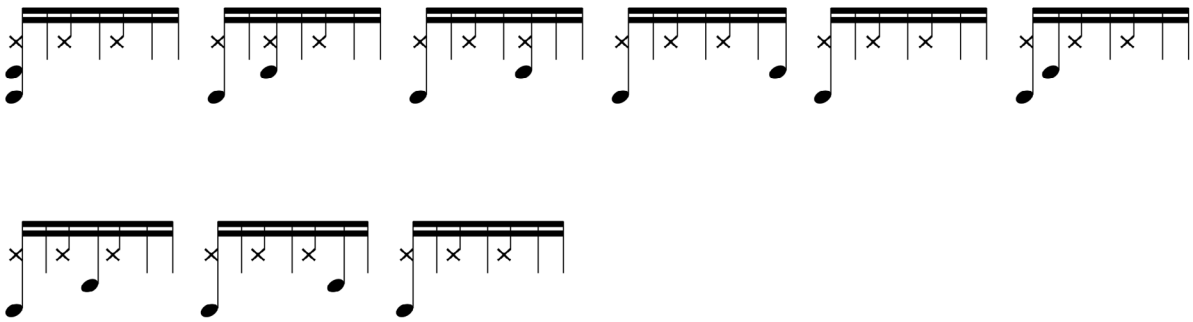
5.4.1 Polyrhythm-guided phrasing in Phase One

Polyrhythm-guided phrasing was used to guide the placement of articulation sequences in the early Phase One sessions that utilised even groupings of slurred notes. The phrase practised on 30th October 2020 offers an example of this process, featuring an even stream of septuplets slurred in groups of nines. When attempting to learn the resultant phrase during this session, I encountered significant perturbations to the stability of my embodied metrical pulse, resulting in a corresponding difficulty in the accurate rhythmic placement of the phrase. As a solution to this instability, I conceived of the relationship between the phrase's articulation sequence and the metrical pulse as a 7:9 polyrhythm, with seven slurs occurring in the space of nine metrical pulses. The start of each slur acted as an accented countermetrical pulse, and although the metrical pulses were not audiated, they were physically enacted through my embodied

metrical pulse.

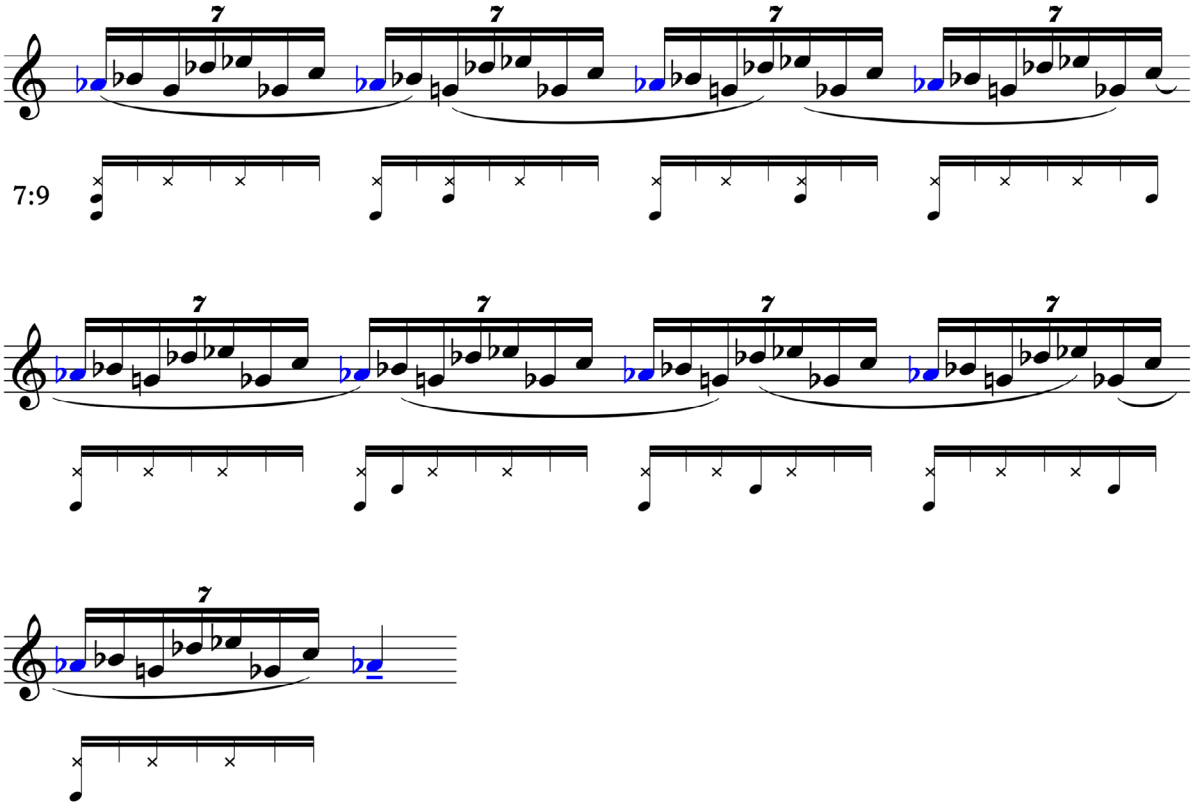
To demonstrate how the 7:9 polyrhythm was used to guide my played phrasing during practice, I will use a visual representation of the polyrhythm in the format introduced in Section 2.1.5. Figure 5.21 presents the 7:9 polyrhythm, with the nine metrical pulses represented by the lower noteheads and the seven countermetrical pulses represented by the middle noteheads. The upper-most crossed noteheads represent a septuplet rhythmic archetype that I 'heard' internally to help me maintain clarity of the subdivision and to guide my rhythmic placement of the countermetrical pulses. The notation in Figure 5.21 was not used as a visual learning aid during the session, and is included here as a notated representation of an internal rhythmic process.

Figure 5.21. Visualisation of 7:9 polyrhythm



The relationship between the 7:9 polyrhythm and the phrase practised during this session is demonstrated in Figure 5.22, which presents the played phrase in the upper staff and the guiding polyrhythm in the lower staff. The first note of the phrase, indicated with a blue notehead, can be seen in alignment with the polyrhythm's metrical pulses, while the articulation cycle, indicated by the slurs, aligns with the countermetrical pulses of the polyrhythm. The played phrase can be heard in Audio 5.18.

Figure 5.22. Phrase from 30th October 2020 guided by 7:9 polyrhythm



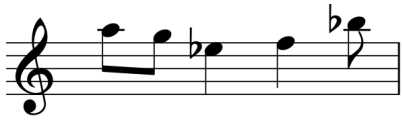
Audio 5.18. Phrase from 30th October 2020 session

Polyrhythm-guided phrasing was a successful performance solution to the perturbations experienced during this session, leading to greater rhythmic stability during the learning process of the phrase. The PGP practice process demonstrated transferability to other rhythmic contexts, evident in its effective utilisation in a further fifteen Phase One sessions. In addition to the 7:9 polyrhythm outlined in Figure 5.23, the practice phrases of other sessions required the use of guiding polyrhythms including 5:8, 7:5, 7:6, 7:8 and 8:7. The PGP approach was not carried through to later Phase One sessions, as the irregular accenting patterns generated by number sequences (see Section 4.2.2) were not compatible with the regular countermetrical pulses of this polyrhythmic framework.

5.4.2 Polyrhythm-guided phrasing in Phase Two

The polyrhythm-guided phrasing technique was utilised in all Phase Two sessions. Each practice task explored seven different polyrhythmic relationships: one for each of the subdivisions within which the played phrase was practised. To illustrate the application of PGP within the Phase Two learning design, I will detail the material practised during the 12th October 2021 session. Figure 5.23 presents the phrase from this session, which was seven rhythmic units in length. In the figure, the phrase is presented free of any metrical context, with the notated rhythmic values solely demonstrating the 2:1 rhythmic relationships between the long and short durations of the phrase.

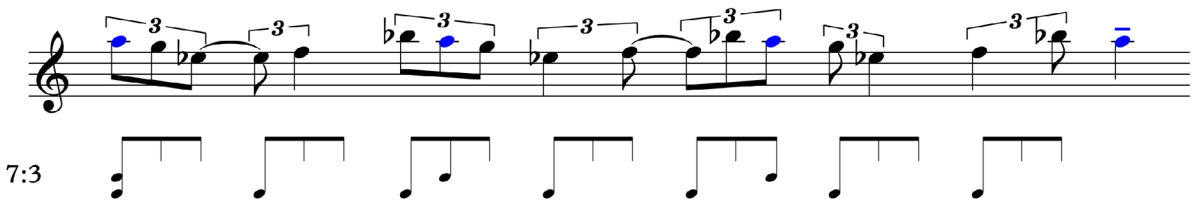
Figure 5.23. Phrase from 12th October 2021 session



Figures 5.24-5.29 present this phrase played in subdivisions of 3-9, accompanied by the visualised polyrhythms shown below each phrase. These polyrhythms were utilised during practice as internalised rhythmic frameworks helping me to maintain my embodied metrical pulse as well as the coordination and control of my finger and tongue motions. The articulation pattern has been omitted from these figures for clarity of notation, as it was the same length as the pitch pattern and thus formed the same counter-metrical pulse stream. As can be seen, the first note of the recurring pitch sequence (identified with a blue notehead) aligns with the countermetrical pulse stream of the polyrhythm in each instance.

Figure 5.24 features the phrase played in a three-part subdivision, which can be heard in Audio 5.19.

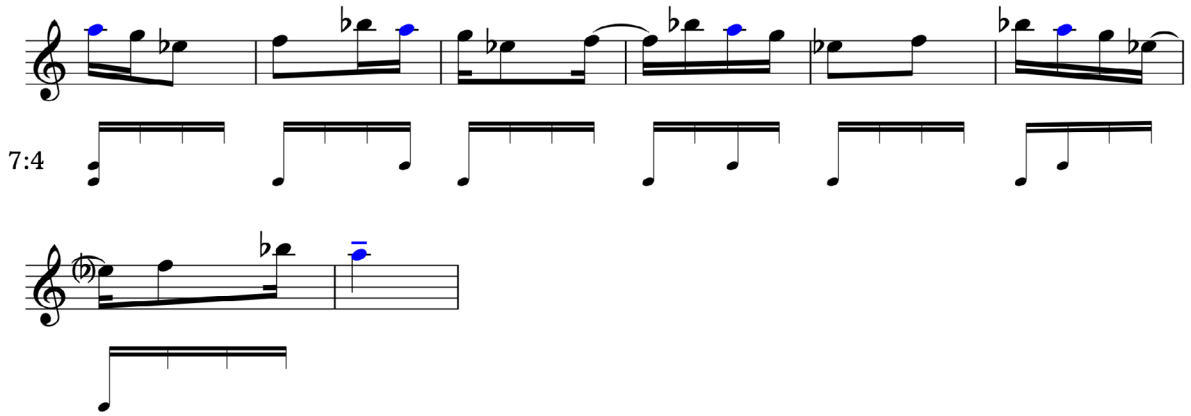
Figure 5.24. Phrase from 12th October 2021 session in three-part subdivision



Audio 5.19. Phrase from 12th October 2021 played in three-part subdivision

Figure 5.25 features the phrase played in a four-part subdivision, which can be heard in Audio 5.20.

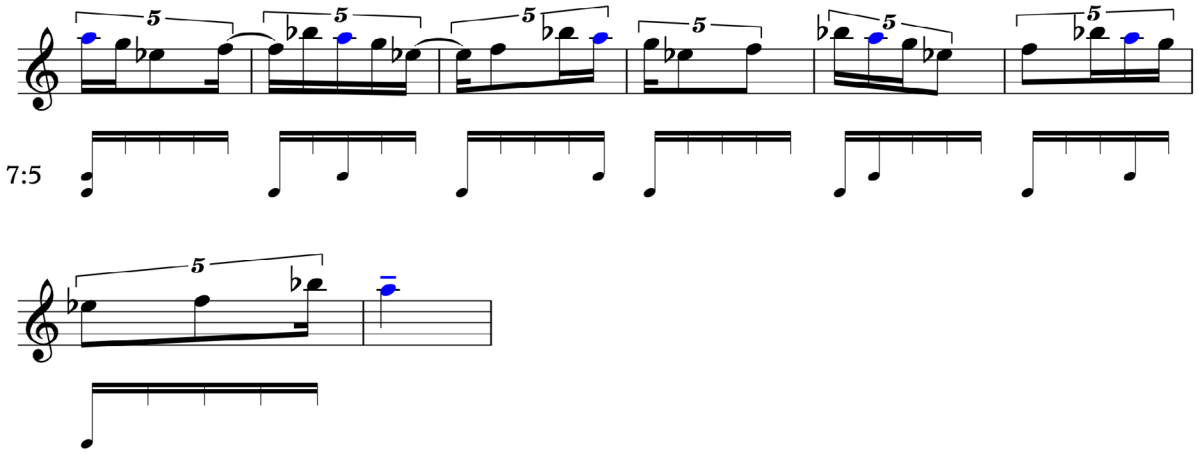
Figure 5.25. Phrase from 12th October 2021 session in four-part subdivision



Audio 5.20. Phrase from 12th October 2021 played in four-part subdivision

Figure 5.26 features the phrase played in a five-part subdivision, which can be heard in Audio 5.21.

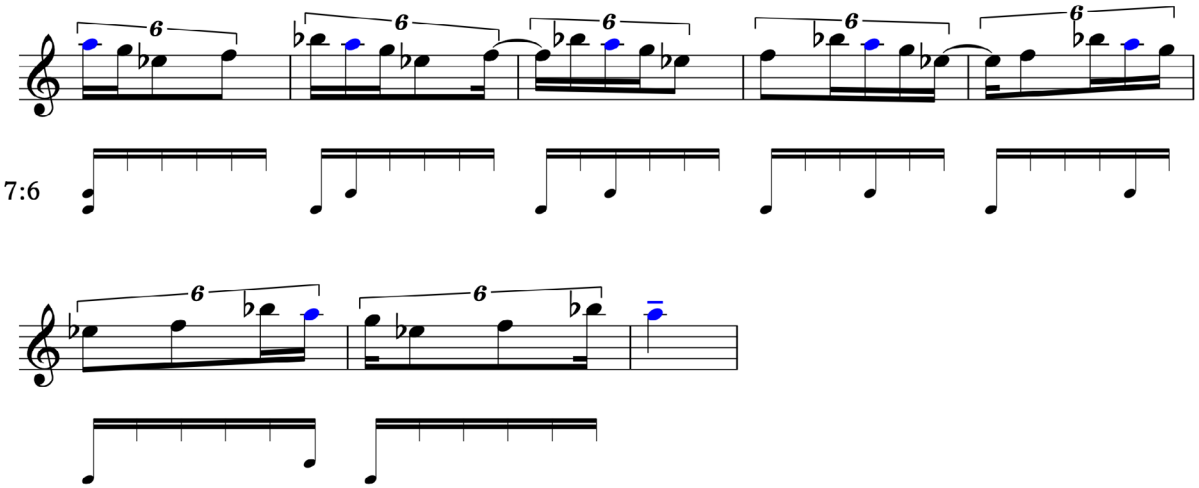
Figure 5.26. Phrase from 12th October 2021 session in five-part subdivision



Audio 5.21. Phrase from 12th October 2021 played in five-part subdivision

Figure 5.27 features the phrase played in a six-part subdivision, which can be heard in Audio 5.22.

Figure 5.27. Phrase from 12th October 2021 session in six-part subdivision

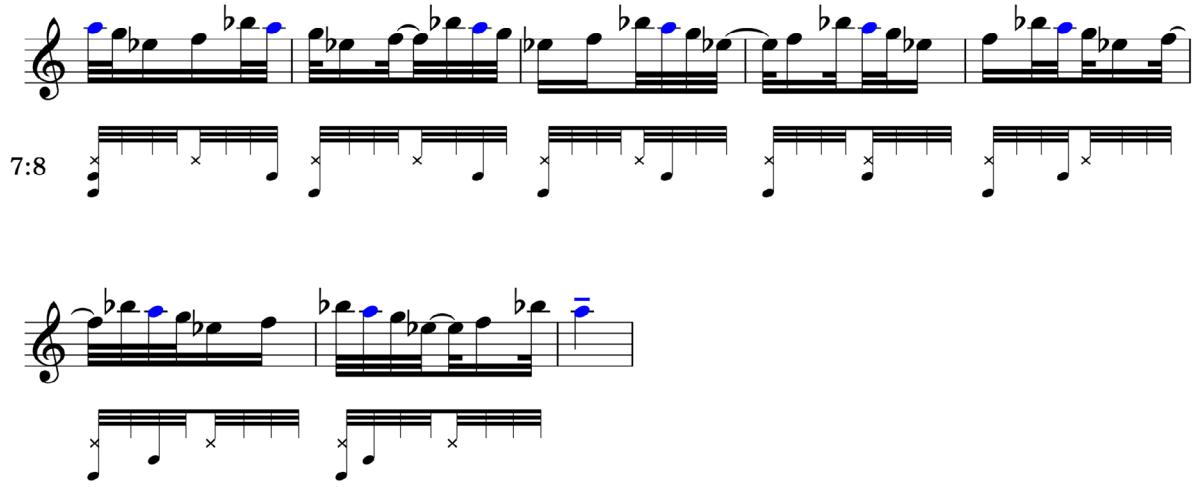


Audio 5.22. Phrase from 12th October 2021 played in six-part subdivision

A demonstration of the phrase in a seven-part subdivision is not included here. The phrase being practised was seven rhythmic units in length, thus generating a 1:1 phase relationship against the metrical pulse when played in septuplets. As a result, the PGP approach was not necessary for this metrical contextualisation.

Figure 5.28 features the phrase played in an eight-part subdivision, which can be heard in Audio 5.23. Note that a rhythmic archetype was used to group the subdivision into two even groupings of 4-4, as indicated by the crossed noteheads. This grouping approach was a feature of many Phase Two sessions, helping to add stability to the eight-part subdivision during practice.

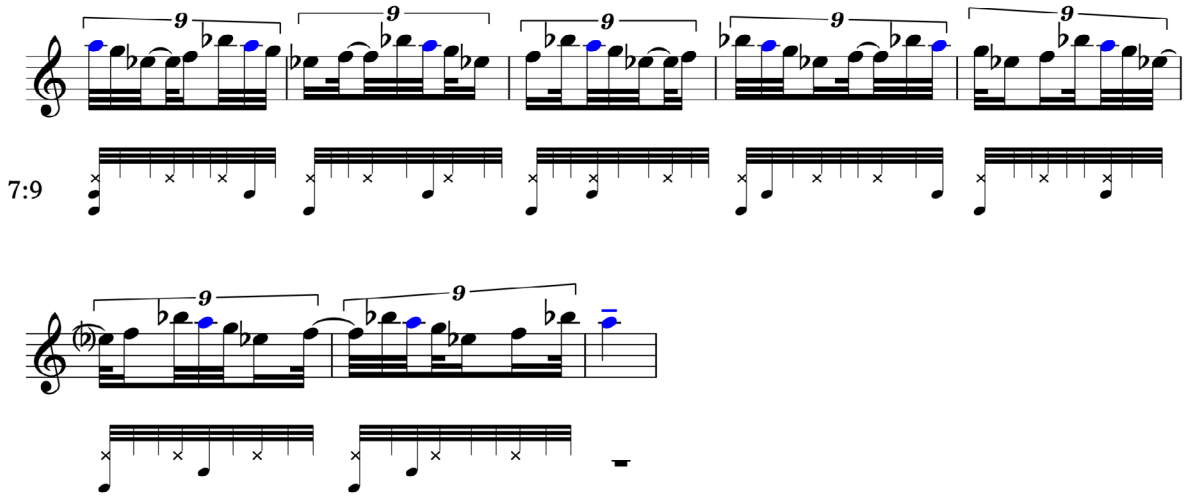
Figure 5.28. Phrase from 12th October 2021 session in eight-part subdivision



Audio 5.23. Phrase from 12th October 2021 played in eight-part subdivision

Figure 5.29 features the phrase played in a nine-part subdivision, which can be heard in Audio 5.24. A stabilising rhythmic archetype was used to create subgroups within the subdivision into groupings of 3-3-3. This strategy was utilised in all Phase Two practice sessions.

Figure 5.29. Phrase from 12th October 2021 session in nine-part subdivision



Audio 5.24. Phrase from 12th October 2021 played in nine-part subdivision

The polyrhythm-guided phrasing approach is offered as its own procedural knowledge. The examples from the 12th October 2021 session are representative of the PGP approach taken during all Phase Two sessions. A number of phrases featured in other sessions were also seven-rhythmic units in duration, and thus utilised the same polyrhythmic structures that were presented in Figures 5.24-5.29. Other sessions featured phrases that were four, five and six-rhythmic units in length, each of which generated a unique set of polyrhythmic relationships to the metrical pulse. In all of these cases, the method of implementing the polyrhythms to guide the played phrases was the same.

5.4.3 Performance solutions to perturbations within the polyrhythm-guided phrasing approach

The use of the polyrhythm-guided phrasing technique during Phase One and Two sessions uncovered a set of polyrhythmic relationships between played phrase and metrical pulse that were markedly more destabilising to my playing than others. The polyrhythms 5:7, 7:5 and 9:7 introduced perturbations that were far more prominent than those generated by any of the other polyrhythms I used, introducing significant instability to my embodied metrical pulse and aural connection to the subdivision. When playing a phrase guided by one of these three polyrhythms, two kinds of errors recurringly arose. One was that I would be unable to maintain a consistent tempo, with the notes being played either too slowly or too fast. The second error was that I was unable to accurately place accents within the phrase because I was unsure when the countermetrical pulse streams fell relative to the metrical pulse.

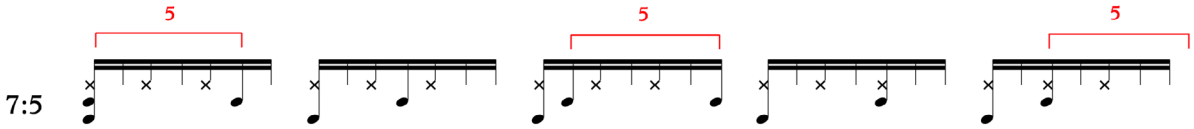
Two performance solutions were developed in response to the perturbations encountered when using the polyrhythms 5:7, 7:5 and 9:7 to guide my played phrasing. In response to the difficulty in maintaining a consistent tempo, I utilised exaggerated physical motions to maintain a clear embodied connection to the metrical pulse. During the learning process, the foot-tapping I used to mark each metrical pulse became

more pronounced, with larger physical motions and louder resultant tapping sounds allowing me to more accurately feel the metrical pulse and subdivision, leading to more rhythmic accuracy of the phrase I played on the saxophone.

A second performance solution was developed to address my difficulty in tracking the placement of the countermetrical pulse stream within phrases guided by the 7:5 and 9:7 polyrhythms. My hypothesis was that these polyrhythms were destabilising because they each featured lengthy spans of unaccented time-points between their two pulse streams, contributing to the ambiguity of countermetrical pulse placement that I was experiencing. In response, I utilised rhythmic archetypes that I would hear internally to create subgroupings of the time-points between each metrical pulse. While the lengthy spans of unaccented time-points were not sonically altered by my use of archetypes, my internalised tracking of the placement of the countermetrical pulse stream was now being made relative to the groupings within the archetype rather than relative to the metrical pulses alone.

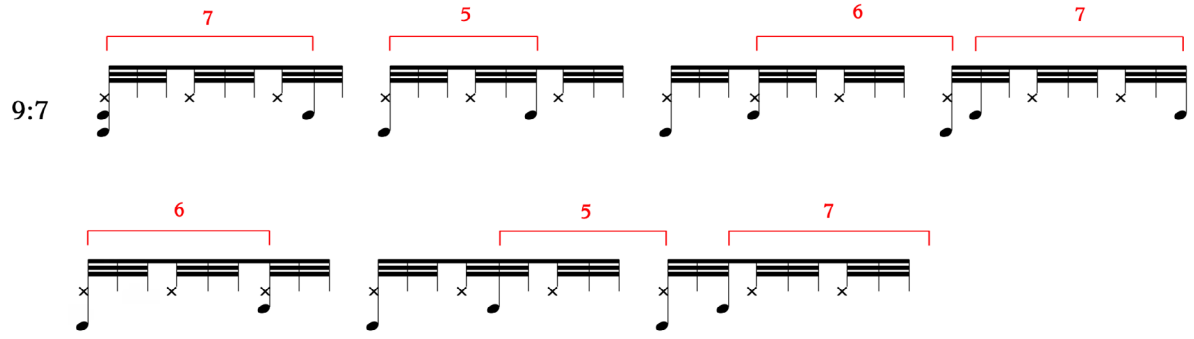
The lengthy spans of time-points between the pulse streams of the 7:5 polyrhythm are shown in Figure 5.30, as indicated by the square brackets. Note that within the polyrhythm-guided phrasing approach, these polyrhythms were not the only rhythmic events being played, and were used to indicate the placement of accents within embellished countermetrical pulse streams.

Figure 5.30. 7:5 polyrhythm with annotated spans of unaccented time points



There are also several lengthy spans of unaccented time-points between the pulse streams of the 9:7 polyrhythm, as indicated by the square brackets in Figure 5.31.

Figure 5.31. 9:7 polyrhythm with annotated spans of unaccented time points



The cross-head notation within Figures 5.30 and 5.31 represents the rhythmic archetypes I implemented as performance solutions when practising phrases guided by these polyrhythms. The archetype used within the seven-part subdivision featured a 2-2-3 grouping scheme, while the archetype used for the nine-part subdivision featured a 3-3-3 grouping structure. As can be seen, the groupings within these archetypes generated additional rhythmic events within the bracketed spans of unaccented time-points, minimising the ambiguity I had previously experienced. The archetypes thus functioned as internalised rhythmic frameworks that allowed me to maintain an embodied understanding of the time-points within

the subdivision and to guide my placement of accented and unaccented notes.

Although I experienced the same challenges when practising phrases guided by the 5:7 polyrhythm, I did not use the archetype-based technique to overcome those difficulties. The 5:7 polyrhythm featured the same spans of unaccented time-points between pulses as the 7:5 polyrhythm; however, the greater frequency of metrical pulses within 5:7 made it easier to maintain my mental tracking of the five time-points between them. As such, the practice technique of using exaggerated physical motions to maintain my embodied metrical pulse was a more effective performance solution for the challenges posed by the 5:7 polyrhythm.

A number of other polyrhythms that I used within the polyrhythm-guided phrasing approach featured similarly large spans of unaccented time points between accented pulses, yet did not present me with the same perturbations as the three polyrhythms that I have analysed. This does not reflect any intrinsic differences between the polyrhythms, and is more likely a reflection of the varying levels of familiarity that I had with different polyrhythms. 5:7, 7:5 and 9:7 were less familiar to me at the start of the practice period, and thus presented more perturbations when they were used to guide my phrasing.

The two performance solutions detailed in this section – exaggerated physical motions aligning with the metrical pulse, and the use of internal archetypes – are not restricted in their application to phrases guided by these three polyrhythms in particular. The techniques are offered here to detail my approach to overcoming the instabilities I encountered with those three polyrhythms in particular, but the techniques could be applied to the learning process when any polyrhythm was implemented within the polyrhythm-guided phrasing approach. The performance solutions also have applications to the process of learning polyrhythms themselves, helping to guide the placement of each rhythmic attack within the polyrhythm's metrical and countermetrical pulse streams. As such, the techniques are offered as pedagogical tools that can be used by other musicians when learning polyrhythms, either in their own self-regulated practice or when teaching others.

5.5 Microtiming redistribution errors

A key outcome of Phase Three of practice was the identification and theorisation of *microtiming redistribution errors* (MRE). Microtiming redistribution was defined in Chapter Two as describing multiple rhythmic arrangements of the same sequence of pitches within a uniform metrical space. In the context of Phase Three practice, microtiming redistribution errors would occur when the intended rhythm of a phrase was erroneously redistributed on a microtiming scale, producing a played rhythm that was very similar to, but not identical to, the desired phrase. This would occur as an unintended response to rhythmic perturbations encountered when practising particularly challenging positionings of a phrase. Although the microtiming redistributions led to greater stability, they also revealed a lack of rhythmic coordination and control. By targeting the areas of rhythmic instability that MRE exposed, I was able to develop performance solutions that promoted skill adaptation and greater stability over time.

The microtiming redistribution error tendency was identified early within the Phase Three practice period. Some metrical positionings of the phrases practised during these sessions produced rhythmically ambiguous sounds that obscured my aural and embodied sense of the septuplet subdivision. MRE emerged as an unintended response to this rhythmic instability, redistributing the rhythmic phrases into subdivisions that were more familiar to me in order to regain rhythmic stability. However, this unintended response

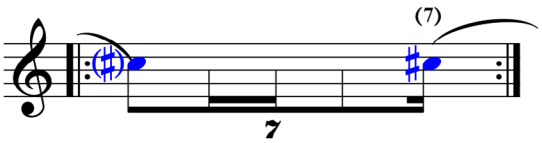
was indicative of an underlying loss of rhythmic coordination and control. My early identification of the MRE tendency allowed me to direct my attentional focus in later sessions to detect unintended instances of microtiming redistribution and to explore possible performance solutions that would allow me to maintain rhythmic stability.

The primary knowledge being communicated in this section is the development of a reiterative form of self-assessment that emerged in response to the rhythmic instabilities I experienced when learning Phase Three practice tasks. The tasks were designed to introduce perturbations that were appropriate to my existing skill level, and as such, the phrases that I found challenging may not present the same perturbations to other musicians. However, my investigation into the link between the aural ambiguity of those phrases and the difficulties I encountered when attempting to accurately produce them on the saxophone offers a case study of a self-assessment process that could be generalised and implemented within other musical learning contexts.

This section will discuss two distinct microtiming redistribution errors that were observed during two different Phase Three practice sessions. The first session I analyse will present an in-depth discussion of the concept of microtiming redistribution errors, as well as introducing a practice technique that I developed to correct those errors. A shorter analysis will be offered of the second session, demonstrating the transferability of the performance solution into a new context.

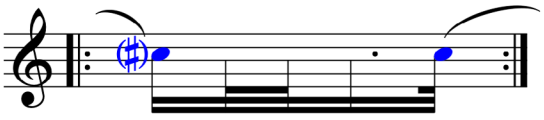
The first identified instance of a microtiming redistribution error occurred during the 3rd August 2021 practice session. The erroneous microtiming redistribution emerged when learning the seventh metrical positioning of the phrase, which is shown in Figure 5.32, with a blue note-head indicating the first note of the phrase.

Figure 5.32. Phrase from 3rd August 2021 session in seventh metrical positioning



When looping this phrase during the learning process, I became aware that I was not playing the rhythm accurately. The phrase's sound was very rhythmically ambiguous, and did not clearly project a sense of being based in a septuplet subdivision. This sonic ambiguity led to difficulties in maintaining an embodied connection to the subdivision while playing, often resulting in the unintentional playing of the rhythm shown in Figure 5.33.

Figure 5.33. MRE of 3rd August 2021 phrase in seventh metrical positioning



This emergence of a microtiming redistribution error may be attributed to the differing levels of experience I had of playing in seven-part and eight-part subdivisions of the metrical pulse. The rhythmic

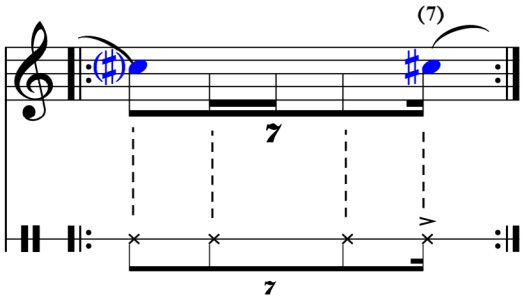
ratios of the phrases shown in Figures 5.32 and 5.33 sound very similar, despite their basis in different subdivisions. By unintentionally playing the phrase in an eight-part subdivision, I was seeking out rhythmic stability in response to the perturbations I was experiencing when attempting to play in the less-familiar septuplet subdivision. In other words, the physical movements and cognitive processes associated with playing within an eight-part subdivision represented an attractor basin, while the motions and cognition required to play in the septuplet subdivision represented an area of system instability. This microtiming redistribution produced an almost identical-sounding rhythm while significantly reducing my experience of instability; however, it also indicated an underlying area of instability within my playing as I was unable to accurately execute the intended rhythmic phrasing.

Audio 5.25 presents a recorded passage of the session featuring my practice of this metrical positioning of the phrase. It offers a real-time example of the emergence of a microtiming redistribution error, as well as my search for a performance solution that would allow me to maintain rhythmic stability and to accurately play the phrase.

Audio 5.25. Learning the phrase from 3rd August 2021 session in seventh metrical positioning

The first six seconds of Audio 5.25 feature my first attempts at playing the seventh metrical positioning of the phrase. After these initial attempts, I stop at 0:06 when I realise my execution of the phrase is inaccurate. My vocalisation between 0:07-0:10 helps me to establish that the incorrect phrasing I had been playing was based in an eight-part subdivision (as seen in Figure 5.35). A second vocalisation, heard between 0:11-0:18, features a septuplet-based rhythmic archetype that I used to aurally reconnect to the intended seven-part subdivision. This rhythmic archetype can be seen in the lower line of Figure 5.34, demonstrating the alignments between the archetype and the corresponding notes within the played phrase (shown in the upper line). Between 0:16-0:18 of Audio 5.25, my vocalisation of the rhythmic archetype introduces an accent on the final attack, falling on the seventh time-point of the subdivision. By doing this, I was able to clearly signal the starting point of the practice phrase.

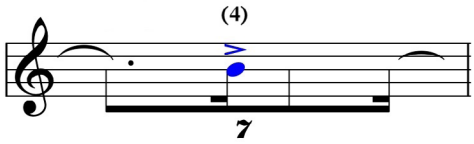
Figure 5.34. Archetype alignment with notes within 3rd August 2021 phrase



Following my vocalisation, I return to the saxophone at 0:19 in Audio 5.25. While playing the instrument, I continued to use the septuplet rhythmic archetype as an internalised framework to guide my played rhythmic placement. As can be heard between 0:23-0:34, the rhythmic accuracy of the phrase continues to fluctuate, but with an increasing trend towards greater stability of the intended septuplet version of the phrase. The use of this archetype proved to be an effective performance solution that continued to increase my stability while learning the seventh metrical placement of the phrase during the remainder of the practice session.

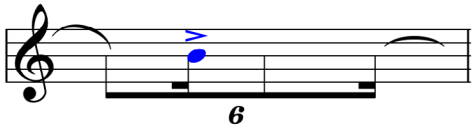
Through the process of finding a performance solution to challenges presented by this phrase, I developed a practice-based process that could also be applied to other learning tasks. A later session that featured an instance of a microtiming redistribution error occurred on 24th August 2021. MRE emerged during this session when I played the fourth metrical positioning of the phrase, which is shown in Figure 5.35, with a blue note-head indicating the first note of the phrase.

Figure 5.35. Phrase from 24th August 2021 session in fourth metrical positioning



This phrase produced a very rhythmically ambiguous sound, and when the phrase was looped during the learning process, I was unable to maintain an embodied connection to the subdivision. The microtiming redistribution error that emerged when practising this phrase is shown in Figure 5.36. During the session, the MRE tendency resulted in the phrase being redistributed into a six-part subdivision, contrasting with the eight-part subdivision shown in Figure 5.33. This is another example of an unintended move towards greater rhythmic stability in response to perturbations experienced when playing a phrase in septuplets.

Figure 5.36. MRE of 24th August 2021 phrase in fourth metrical positioning

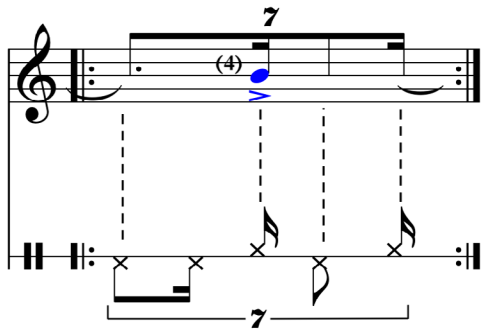


The rhythmic ratios of the intended and redistributed versions of the phrase sounded very similar. A recorded passage featuring my practice of this metrical positioning can be heard in Audio 5.26. My first attempts at playing the phrase are heard between 0:00-0:16, during which I observe the occurrence of MRE. The speed with which I was able to identify this demonstrates that my attentional focus had become more attuned to this kind of perturbation during practice.

Audio 5.26. Learning the phrase from 24th August 2021 session in fourth metrical positioning

The performance solution of utilising a vocalised archetype was applied during this session to correct my erroneous phrasing. The archetype can be heard being vocalised between 0:22-0:27 in Audio 5.26. A notable feature of this archetype's structure is that it features low and high attacks, presented in the lower line of Figure 5.37 notated with downwards and upwards note stems respectively. As was discussed in Chapter Two, these descriptors of 'high' and 'low' do not refer to pitch relationships, but rather refer to literal embodied feelings of upwards and downwards motions within the archetype. As can be seen in Figure 5.37, the two 'high' attacks of the archetype correspond to two of the played phrase's three notes, presented in the upper line. When maintaining the archetype internally, I found these high attacks to be very effective in guiding my rhythmic placement on the saxophone, providing a framework that would be more effective than an archetype with a single rhythmic voice.

Figure 5.37. Archetype alignment with notes within 24th August 2021 phrase



Microtiming redistribution errors continued to emerge during a number of later Phase Three sessions. The recurrence of erroneous redistributions into six-part or eight-part subdivisions of the metrical pulse indicated that I had a strong embodied preference to play in those more familiar subdivisions, which represented stable attractor basins within my playing. The use of rhythmic archetypes became a core practice strategy to correct erroneous rhythmic phrasing, and although a number of different archetypes were used from one session to the next, they all functioned in the same way as the two examples that have been detailed in this section.

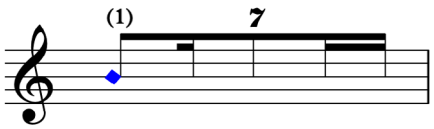
The outcome presented in this section offers two practice-based tools with utility beyond the context of my own learning. The concept of microtiming redistribution errors describes a particular form of rhythmic instability, offering a theoretical framework that may assist other musicians to understand areas of instability within their own playing. Additionally, the performance solution based on the use of internalised rhythmic archetypes demonstrates a practice methodology that could be applied to other rhythm-based learning problems beyond the specific aesthetic focus of my own practice tasks.

5.6 Improvised applications of subdivision recontextualisation

Section 4.4 introduced the improvisational step within the Phase Three practice design, in which I would incorporate metrical positionings of phrases I had practised into longer improvised passages. An unforeseen, emergent outcome of this practice was my exploration of improvised applications of the *subdivision recontextualisation* process, with phrases that were practised exclusively in septuplets being spontaneously played in other subdivisions. This is evidence that the skillset first developed systematically in Phase Two was transferable into other more improvised contexts, and that a new region of system stability had emerged through the practice project.

To demonstrate this process in practice, this section will analyse transcriptions of improvised passages from two Phase Three sessions. As was detailed in Chapter Four, the aim of these passages was to incorporate every metrical positioning of the short phrase into a variety of longer improvised passages. The first of the improvisations that will be analysed was played during the 11th September 2021 session. The prime form of the phrase from this session is shown in Figure 5.38; I will refer to this as the 'practice phrase' within this analysis.

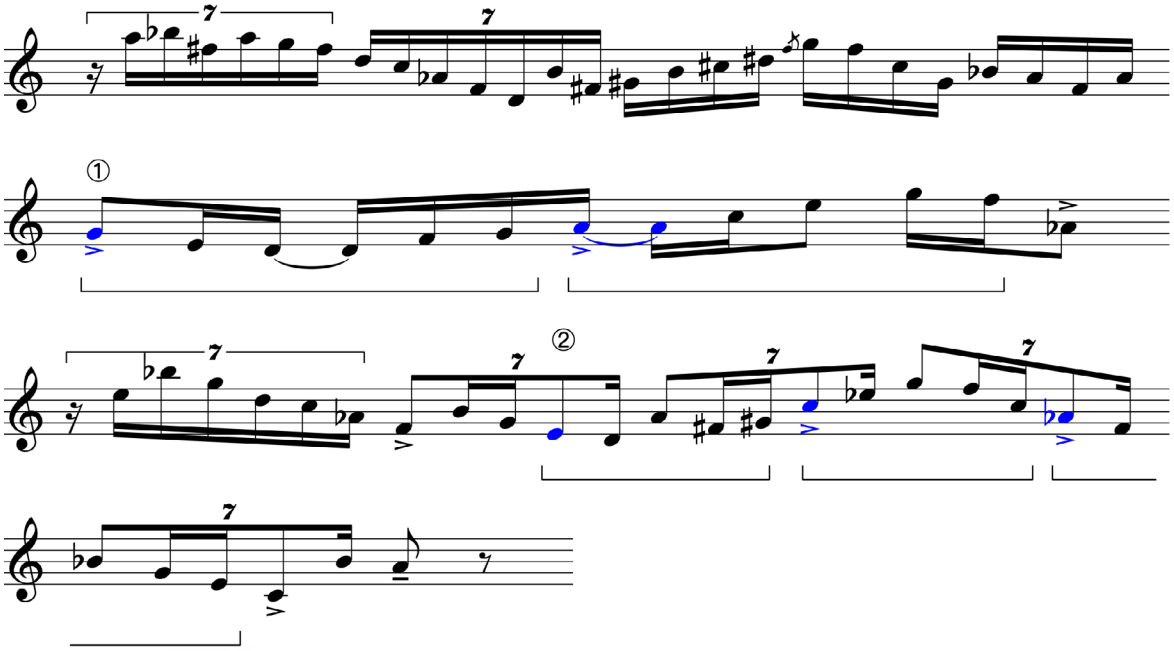
Figure 5.38. Phrase from 11th September 2021 session in prime form



During the session's improvisation, a clear example of spontaneous subdivision recontextualisation occurred. It was not a pre-planned part of the practice routine, and emerged without deliberate implementation. Audio 5.27 presents an excerpt from the session's recording that features subdivision recontextualisation, with a corresponding annotated transcription[2] presented in Figure 5.39.

Audio 5.27. Improvisation featuring subdivision recontextualisation of phrase from 11th September 2021 session

Figure 5.39. Transcription of improvisation during 11th September 2021 session



Within this transcribed passage, the practice phrase is played in both a septuplet and semiquaver subdivision. The moments at which I switch between subdivisions in this passage, occurring at 0:03 and 0:10 in Audio 5.27, were not pre-planned. They did however emerge out of the guiding principle to target transitions between subdivisions that was a key constraint of the improvisational stage of the Phase Three learning design. While I would not consciously target specific material in this way during an actual improvised performance, it was a useful approach during practice.

In Figure 5.39, each playing of the practice phrase is identified with a square bracket beneath the stave, with blue noteheads marking the start of each iteration of the phrase. At point ②, which corresponds to 0:12 in Audio 5.27, the phrase is played three times in septuplets, commencing on the fifth time point within the septuplet subdivision. This was a metrical positioning of the phrase that I had practised earlier in the session, and its emergence here in the middle of a lengthy improvised melodic phrase, no longer being played as an isolated rhythmic cell, is a strong indicator that my practice contributed to the

[2] Accidentals within this transcription apply to that note only.

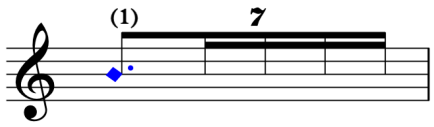
development of skills that were transferable to improvisational contexts.

The practice phrase is also played twice in a semiquaver subdivision within the transcribed passage, representing a spontaneously generated metrical recontextualisation. This occurs at point ① in Figure 5.39, which corresponds to 0:06 in Audio 5.27. Here too, the recontextualised phrase does not appear as an isolated rhythmic cell, and is incorporated into a lengthy improvised melodic phrase. I had not previously learned the practice phrase in a four-part subdivision, so the improvisation here presents a clear example of skill adaptation that was promoted by both Phase Two and Three practice designs and was not tied to specific musical material.

Following my post-practice assessment of the 11th September 2021 session, I decided to explore metrical recontextualisation as a method of rhythmic organisation within the improvisational step of subsequent Phase Three sessions. I was interested in the aesthetic results that had emerged during the session, and wanted to explore them further. This became a third guiding principle to my improvisations in Phase Three, in addition to the targeting of every metrical positioning of each practice phrase and the shifts between different subdivisions.

An instance of spontaneous metrical recontextualisation from a later Phase Three session occurred on 27th September 2021. While I was aware of the guiding principle of incorporating metrical recontextualisations during improvisation, the specific variations of the phrase that emerged during this session were generated spontaneously and not pre-conceived in any detail. The prime form of the practice phrase from the session is shown in Figure 5.40.

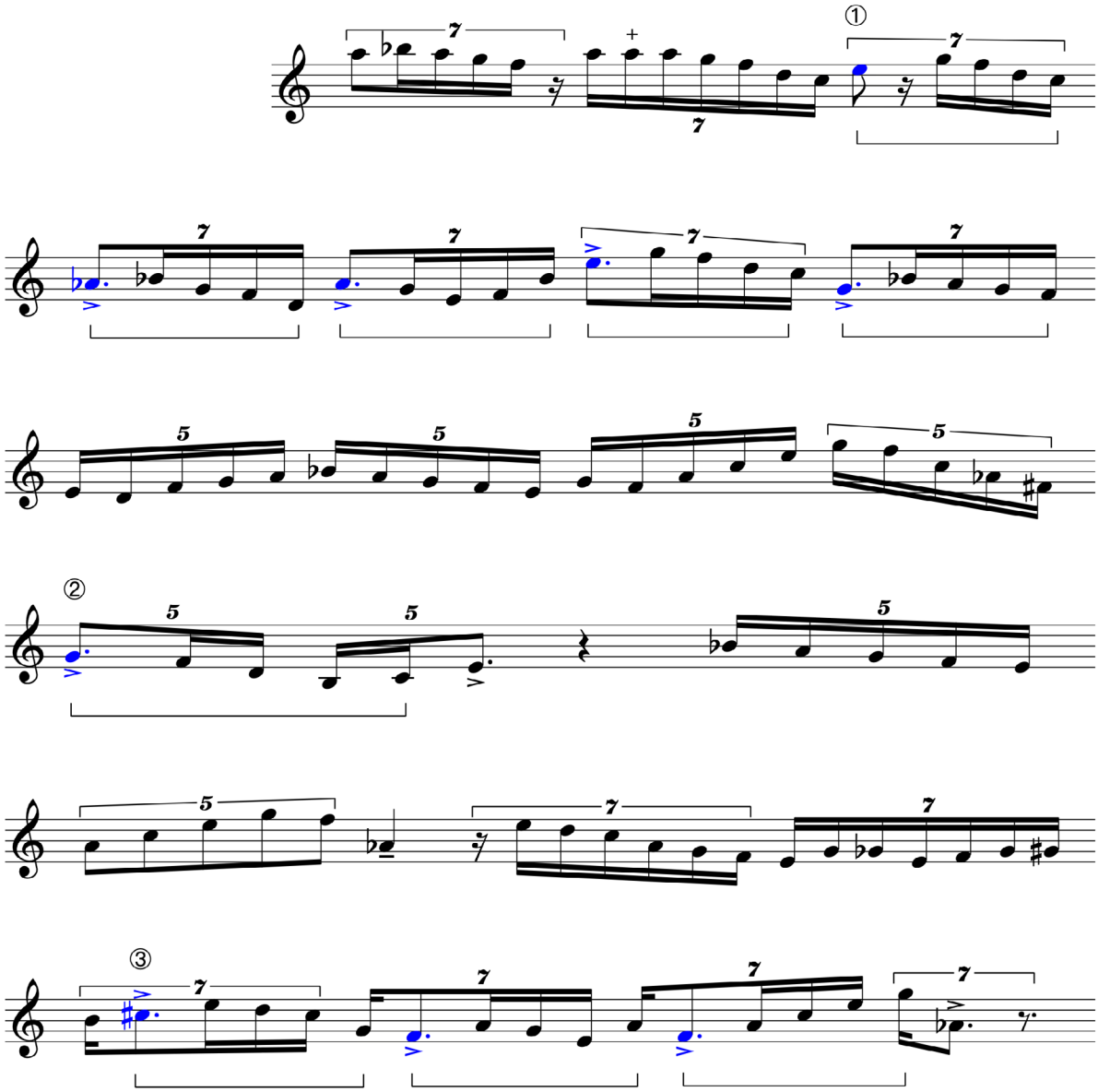
Figure 5.40. Phrase from 27th September 2021 session in prime form



Audio 5.28 features a recorded excerpt taken from the session's improvisation, with a corresponding annotated transcription presented in Figure 5.41 (on the following page). Each reiteration of the practice phrase is identified with a square bracket, with blue noteheads marking the first note of each iteration.

Audio 5.28. Improvisation featuring subdivision recontextualisation of phrase from 27th September 2021 session

Figure 5.41. Transcription of improvisation during 27th September 2021 session



Within this transcribed passage, the practice phrase is spontaneously incorporated into longer melodic phrases in both septuplet and quintuplet subdivisions. Three distinct variations of the phrase are played, as identified with circled numbers in Figure 5.41. At point ①, which corresponds to 0:02 in Audio 5.28, the phrase is played five times in septuplets, played in its prime form aligning with the metrical pulse. A second playing of the phrase in septuplets occurs at point ③, which corresponds to 0:20 in Audio 5.28. In this case, the phrase commences on the second time point within the septuplet subdivision, which was another of the metrical positionings practised earlier in the session.

The iteration of the practice phrase in quintuplets within this passage is another improvised application of the subdivision recontextualisation technique. This occurs at point ② in Figure 5.41, which corresponds to 0:11 in Audio 5.28. Although the phrase is only played once in quintuplets, it is a clear and deliberate reprise of the practice phrase's rhythmic contour that is distinct from the even stream of notes that preceded it. I had not previously practised this phrase shape in quintuplets, so my ability to spontaneously do so is further evidence of the combined effectiveness of the Phase Two and Three practice designs. The ability to spontaneously play the practice phrase in quintuplets also marks a more complex application of the recontextualisation concept when compared to the shift into semiquavers that occurred during the

11th September 2021 improvisation.

5.7 Conclusion

This chapter has presented five key outcomes of the practice project that demonstrate how new forms of self-assessment can be developed through the process of practising. The outcomes fall into two categories. *Finger and tongue attack coupling*, *compensatory tonguing* and *microtiming redistribution errors* represent newly generated understandings of movement-based tendencies within my own playing, while *polyrhythm-guided phrasing* and *improvised applications of subdivision recontextualisation* present performance-based processes that were developed through my practice. The identification and theorisation of these outcomes demonstrates the efficacy of my self-assessment processes in guiding the implementation of functional perturbations that challenged my improvisational tendencies, and also in the generation of new performance solutions that addressed regions of instability within my playing. My understanding of each outcome developed across multiple sessions during the practice period, with insights generated in earlier sessions being used to inform the task constraints implemented in subsequent sessions, leading to the emergence of new regions of system stability as the practice period progressed. The five outcomes are key research outputs, making original contributions to current understandings of the movement-based processes involved in improvised musical production on the saxophone.

Chapter Six

Creative Outputs

This chapter presents the four recorded performances that constitute the creative outputs of the research project. Two of the recordings were created during the thirteen-month practice period, while the final two recordings were created six months after the completion of the practice project. Presented as a collective body of work, these recordings offer a demonstration of the spontaneous, self-organising performance-based application of the skills developed through my practice. The recordings thus function both as creative outputs of my research, and also as sound information generated through performance that stands as its own complete form of knowledge production.

The four recordings included in this chapter feature performances by three different ensembles. All three are working groups that I regularly performed with throughout the research period, and are a sample of the diverse performance contexts that I engage with through my professional practice. Each ensemble features a distinct instrumentation, with very little overlap in the performers between groups and no shared repertoire. The sonic environment within each performance can be considered a multi-organism dynamical system co-enacted by each involved performer, whose actions both influence, and are influenced by, the other performers as well as the wider ecological context within which the performance takes place (van der Schyff et al, 2018). However, due to this project's focus on skill-adaptation within my own playing, the appropriate scale of analysis within this chapter is to focus solely on my contributions on the saxophone within each ensemble's performance. Nonetheless, I will provide additional context where necessary by discussing features of the compositions and the improvised materials produced by the other performers, which can be considered as constraints within the sonic environment.

The textual information that corresponds to each recording does not present musical analysis or a creative exegesis, but solely serves to draw the reader's attention to features that I consider to be significant within the sound information of each performance. These features of my playing are highlighted to present an investigation into the transfer of skills developed through my practice into actual performance contexts. My discussion of each recording presents indicators of the self-organising emergence of skills in response to the performance demands of each unfolding improvisation, with a focus on stability, dexterity, coordination and control.

The four recordings feature saxophone improvisations that were spontaneously performed in an interactive and intuitive way. They were played without any conscious attempt to demonstrate the skills targeted by my project or to reproduce any practised musical materials. As such, the indicators presented in this chapter draw attention to evidence of skill transfer within my improvisations, rather than highlighting passages that would demonstrate a direct connection to the materials featured within my practice tasks. In many cases, I have identified this evidence of transfer within improvised passages that bear little resemblance to the kinds of material that I practised; I therefore avoid the use of musical notation within this chapter, as transcriptions would emphasise audible features of the musical surface at the expense of discussing the underlying performance-based skills and processes that led to the music's improvised creation. This distinction has been acknowledged in the work of Hannaford and Goldman, who explain that "describing the [recorded performance] alone potentially equivocates… the many processes that could have led to a similar product" (Goldman & Hannaford, 2016, para. 8).

This chapter presents the recorded performances in chronological order. This project's self-assessment model acknowledges the nonlinear and disproportional nature of learning promoted by the constraints-led approach, which does not lend itself to a clear chronological account of skill adaptation. As such, the inclusion of recordings made at three distinct points should not be understood as offering a comparative study identifying a linear progression of skill adaptation during the research period. I treat each recording as its own discreet performance event; the sonic environment that emerged during each recorded performance was unique, and the evidence of skilled behaviour discussed within this chapter is correspondingly diverse and free of comparison to the other performances.

This chapter will be presented in three sections that group the performances based on their recording date. The first section features *Linger (part 1)*, recorded on 7th November 2020, the second section features *In All Directions, Radiant*, recorded on 4th March 2021, and the final section features *Sensemaker* and *Abundance*, recorded on 22nd April 2022. The complete recording of each performance is embedded at the start of each section; I encourage readers to listen to these first before engaging with the writing that follows, allowing for a subjective and personal experience of the music. The complete recordings are followed by discussions of key features of each saxophone improvisation, which will be accompanied by audio excerpts from the complete recordings where required.

6.1 Linger (part 1)

On 7th November 2020, my quintet Scattered performed the original composition *Linger (part 1)* at Old 505 Theatre in Newtown, Australia. This performance was recorded and filmed by Matt McGuigan of Hospital Hill productions, featuring performances by myself on alto saxophone, Paul Cutlan on B-flat clarinet, Luke Sweeting on accordion, Yutaro Okuda on electric guitar and Jacques Emery on double bass. The performance documented during this session features my instrumental playing at an early stage of the research project, approximately one month into the practice intervention.

Linger (part 1) is an excerpt from an extended piece that was composed prior to the commencement of this research project, and had been previously recorded in September 2019 and released on the Scattered album *Perspectival* (Radial Sounds, 2020). The filmed performance included here was created in late 2020 to document an additional performance in a video format, which was subsequently released on my Youtube channel in December 2020. The performance is presented in Video 6.1.

Video 6.1. *Linger (part 1)* (S. Gill), performed by Sam Gill's Scattered

The improvised passages of *Linger (part 1)* that feature saxophone can be heard in two sections:

- 0:00-0:09: unaccompanied improvised introduction;
- 0:49-3:04: saxophone solo with ensemble accompaniment.

In both of these sections, the improvisation is performed within a metrical context at a tempo of approximately ♩ = 118.

The unaccompanied introduction is presented in Audio 6.1. The musical material heard in this passage is completely improvised over four bars of 4/4 meter. While there is no pre-determined harmonic material, I approached the improvisation with the constraint of projecting a clear semiquaver pulse stream within my rhythmic phrasing while also obscuring the underlying metrical context. This creates a rhythmically ambiguous sound that serves to heighten the musical impact of the ensemble's unison entry following the introduction. This recorded version presents one realisation of the introduction's creative constraints, which are a common feature to all performances of this work.

Audio 6.1. Improvised saxophone introduction from *Linger (part 1)*

Effective realisations of the creative constraint within this introductory improvisation require a high degree of coordination and control. I would need to maintain stability of my embodied metrical pulse while simultaneously playing musical material that obscures the perception of that pulse within the musical surface. This skill was directly targeted by the practice tasks developed within this project, and I consider the performance heard in Audio 6.1 to be a successful improvisational application of that skill. Significantly, this performance demonstrates that my practice approach successfully facilitated the transfer of skills into actual performance contexts without requiring the reproduction of any practised musical materials. Rather, the transfer of musical processes is evident in several musical characteristics within the recorded passage, including the use of articulated accent placement, rhythmic durations and non-tonal melodic contours to obscure the underlying meter.

The saxophone solo with ensemble accompaniment will now be addressed. This improvisation is played over a ten-bar rhythm cycle with shifting meters, featuring a notated bassline that is played by the bass throughout the performance, generating a clear, audible metrical context for the improvisation. The guitar also contributes improvised accompaniment during this solo, with Okuda basing his rhythmic phrasing around the notated bass material. Scattered has developed a performance practice for this piece that prioritises rhythm-based interaction during this solo. While there is notated pitch material in the bass part, its harmonic implications are open to multiple interpretations by the performers, including the bassist: as can be heard in this recording, Emery is free to abandon the composed pitches in favour of his own creative ideas.

In acknowledgement of the ensemble's focus on rhythm-based interaction, this section's discussion will not discuss pitch and will highlight indicators of skill specifically within the rhythmical and phrasing-based elements of my saxophone improvisation. Here, my creative choices are not only influenced by the affordances of the compositional material, but also iteratively interact with the contributions made by

the other performers as we co-enact the sonic environment. An excerpt of the complete performance, featuring the saxophone solo with ensemble accompaniment, can be heard in Audio 6.2.

Audio 6.2. Saxophone solo from *Linger (part 1)*

This solo features a number of passages that are indicative of performance stability and control that I attribute to my focus on strengthening my embodied metrical pulse during the practice project. In performance contexts, this embodied metrical pulse allows me to improvise rhythmic phrases that may not audibly reinforce the metre while I maintain a clear but silent internalised connection to the pulse and, by extension, my place in the cyclical form. Phrasing with this ambiguous rhythmic quality is evident in this improvisation between 0:19-0:51 in Audio 6.2. During this passage, my phrasing maintains a clear aural sense of rhythmic organisation, yet at various points does not project an audible alignment with the underlying metrical pattern or subdivision. There is however a sonic indicator that I maintained an internalised connection to the pulse while playing this material, evident in the precise rhythmic placement of the final phrase resolving at 0:51 in rhythmic unison with the accompanists. I suggest that maintaining my internalised pulse despite the rhythmic ambiguity of my improvised phrasing within this extended 30-second passage is indicative of skill transfer from my practice tasks into a performance context.

Within the overall structure of the saxophone solo, my phrasing moves between passages that feature clearly-defined rhythmic content and passages that are more textural with less clearly-defined rhythmic content or reference to the underlying meter, representative of the melodic and abstract modes of improvising identified in Chapter One. The rhythmic precision of the former sections is largely articulation-derived, with precisely accented tonguing that interacts with the underlying metrical cycle. In the textural sections, the intensity is increased, but at the expense of clearly articulated notes; articulation is either absent or features textural flutter tonguing and fast double tonguing, with all three articulation techniques resulting in a less clearly defined rhythmic relationship to the underlying metrical scheme.

The movement between the melodic and abstract of improvising within the saxophone solo is fairly sectional, with the two modes rarely intersecting. As can be heard in Audio 6.2, the improvisation commences with a lengthy section of rhythmically-precise content occurring from 0:02-1:15, followed by a predominantly texture-based section from 1:15-1:47. There is a brief transition from 1:47-1:54, where an abstract growled texture continues while clear articulation is re-introduced. The phrase played between 1:55-2:03 is a notable moment, moving fluidly between growled texture and cleanly articulated tone within the same phrase, making it the only moment of intersection between the two modes during the solo.

The sectionality of the solo, and the lack of rhythmically-precise articulation within the textural passages, are both desirable aesthetic decisions during improvisation. They are creative options that I will continue to utilise in my work, and I am satisfied with their musical effect during this performance of *Linger (part 1)*. As was mentioned in the introduction, the survey I undertook of my improvisational approach at the commencement of this project identified sectionality and textural playing as recurring methods of manipulating material and structure respectively within high-intensity improvising contexts, revealing the need for my practice to explore other possible performance solutions. However, I feel that the utilisation of sectionality and textural playing in *Linger (part 1)* does not indicate a creative limitation during the performance. By introducing dense, gestural phrasing into my improvisation, I offered contrasting

material to the pointillistic and rhythmically-precise material that had dominated the performance until that point – a resourceful creative response to affordances within the sonic environment of the unfolding improvisation.

6.2 In All Directions, Radiant

Mind On Fire is an experimental improvising duo project featuring myself on alto saxophone and Bradley Gill on vibraphone and percussion. A recording session on 4th March 2021 documented my original composition *In All Directions, Radiant*, which is performed by a quartet version of Mind On Fire in collaboration with vocalist Tina Stefanou and guitarist Nick Mielczarek. This recording session occurred six months into the practice intervention, documenting my playing approximately halfway through the research project. The recording was released on the Mind On Fire album *Still, Vol. 2*[1] (Radial Sounds, 2022). The complete performance is presented in Audio 6.3.

Audio 6.3. *In All Directions, Radiant* (S. Gill), performed by Mind On Fire

In All Directions, Radiant features several extended passages of improvisation. This section will address my contributions within a saxophone & vocal duo improvisation that occurs between 4:01-6:27 of the recording, which is presented as an isolated excerpt in Audio 6.4.

Audio 6.4. Duo improvisation by Sam Gill and Tina Stefanou from *In All Directions, Radiant*

The compositional framework contextualising this improvisation is considerably different to that of *Linger (part 1)*. While the duo improvisation is preceded and followed by composed material, the improvisation itself has no pre-determined parameters whatsoever, other than the directive to utilise physical cues to synchronise four improvised phrases, heard at 2:06 in Audio 6.4, that signal the end of the duo passage and cue the next composed section. As such, the passage can be considered as an open improvisation in which all of the musical material is generated extemporaneously by the performers.

The performance heard within this duo passage is characterised by a high level of interactivity between the saxophone and vocals, featuring myself and Stefanou co-enacting an extended[2] sonic environment. The sonic characteristics of the material being improvised by one performer are frequently imitated by the other, resulting in the employment of a number of extended techniques throughout the passage. On a structural level, abrupt shifts in musical materials occur frequently, initiated by one performer and then quickly mirrored by the other. These features of the improvisation emerged spontaneously during the performance, with this recording presenting one realisation of the many possible outcomes of the highly dynamic performance context of open improvisation.

This duo improvisation presented me with a number of unique performance demands that required a high level of dexterity in order to maintain the momentum and character of the unfolding musical material.

[1] This album also featured two recordings made on 26th September 2020, prior to the commencement of the practice project.

[2] 'Extended' cognition is one of the concepts proposed by 4E theory, describing the coupling of cognitive processes between multiple organismic agents.

It is important to acknowledge that this sonic environment emerged through the improvised interaction between myself and vocalist Tina Stefanou, and that I was in effect simultaneously *generating* and *responding to* those performance demands. This discussion does not present a musical analysis of the improvisation, but will highlight key features of my playing that I believe are indicative of the instrumental dexterity that was developed through my practice project.

One indicator of dexterity within this improvisation is the resourcefulness evident in the sonic imitation heard between myself and Tina Stefanou. In order to interact with the sonic characteristics of Stefanou's contributions, I employed a number of extended techniques including slap tongue, multiphonics, double-tonguing, growling, altissimo and vocalisations. I draw the listener's attention to several instances of these techniques being used to generate sonic imitations within the improvisation. Multiphonics are used to create a recurring chromatic cluster texture that can be heard in Audio 6.4 between 0:41-0:50 and 1:10-1:17. Altissimo is used to generate a pointillistic call-and-response texture between 1:37-1:43. At several points, I transition from growled notes (produced by vocalising while playing the saxophone) into purely vocalised sounds as a way of directly interacting with the vocal nature of sound production utilised by Stefanou. These instances can be heard between 1:17-1:20 and 1:43-1:45.

Another related indicator of dexterity within this improvisation is the sustained stability of my instrumental technique. In many cases, the techniques identified are not heard in isolation but are utilised in the middle of a phrase; I consider the fluidity with which these techniques are incorporated into the longer phrases to be indicative of stability. Additionally, the abrupt structural shifts within the performance are indicative of focussed attunement to the sonic features of the unfolding improvisation, allowing me to engage with its affordances in order to either introduce new, contrasting material or to rapidly respond to new material introduced by Stefanou. These shifts between contrasting materials, and corresponding instrumental techniques, are also indicative of technical stability, with a high level of coordination and control being evident in the execution of those transitions.

The indicators of dexterity presented in this section are representative of skill adaptations that I consider to have directly emerged out of this practice project. While there are significant differences between the practised musical materials and those that can be heard in this improvisation, I consider the emergence of greater technical stability and sonic resourcefulness to be evidence of skill transfer beyond the musical constraints presented by the practice tasks themselves.

6.3 Sensemaker and Abundance

On 22nd April 2022, my ensemble Coursed Waters recorded two original compositions, *Sensemaker* and *Abundance*. The recordings are included as the final creative output of this research project, documenting my playing at the end of the practice period[3]. Coursed Waters is an improvising quartet featuring myself on alto & soprano saxophones[4], Novak Manojlovic on piano, Jacques Emery on double bass, and James McLean on drum set. These recordings have not yet been commercially released, but will be included in a release planned for early 2024. The performance of Sensemaker is presented in Audio 6.5, and Abundance is presented in Audio 6.6.

[3] This recording session was originally scheduled for December 2021 immediately following the conclusion of the practice period. Due to COVID-19 restrictions, the session was postponed until the April 2022 date.

[4] I play alto saxophone on *Abundance* and soprano saxophone on *Sensemaker*.

Audio 6.5. *Sensemaker* (S. Gill), performed by Sam Gill's Coursed Waters

Audio 6.6. *Abundance* (S. Gill), performed by Sam Gill's Coursed Waters

Each of the two pieces offers a distinct compositional framework within which improvisation occurs. There are, however, some common features that will be introduced here. Both pieces prioritise rhythmic interaction as a key focus for the performers during improvisation, utilising composed rhythmic cycles that function as shared rhythmic frameworks during performance. As was the case with *Linger (part 1)*, rhythmic interaction was of primary importance, with the composed pitch material being open to multiple interpretations by the performers during improvisation. *Sensemaker* and *Abundance* both prioritise rhythmical ambiguity during improvisation, with each piece utilising distinct structural features and performance processes to achieve that shared aesthetic goal.

6.3.1 Sensemaker

Of the two compositions, *Sensemaker* features the more complex rhythmic framework. It utilises a six-bar rhythm cycle in 3/2 meter that frequently shifts between rhythmic phrasing based in triplets, semiquavers and quintuplets, changing between these subdivisions at least once per bar. The aesthetic aim of these shifts is to present the listener with a rhythmically ambiguous musical surface that nonetheless retains a sense of underlying organisation, while also offering the performers clearly defined musical material that can inform their creative decision-making and guide their rhythmic interaction as they co-enact the sonic environment during improvisation. Performances of *Sensemaker* feature group improvisation over the rhythm cycle, and do not feature solos with accompaniment.

Successful improvised realisations of *Sensemaker*'s rhythmic material rely on a stable, sustained sense of the metrical pulse for each performer, ensuring shifts in subdivision are executed accurately. In the context of this research project, this skill was directly targeted through each practice task's emphasis on developing rhythmic accuracy and stability relative to my embodied metrical pulse. While the recorded improvisation does not feature any musical materials drawn from the practice sessions, there is a clear link to the type of material and processes featured within those practice tasks more broadly. I draw the listener's attention to two musical indicators of stability within the performance: the effective targeting of rhythmic cadence points within the rhythm cycle, and the incorporation of silence into my improvised materials.

There are a number of rhythmic cadence points within the composed material of *Sensemaker* that offer affordances as 'targets' for phrase resolution during improvisation. The accurate alignment of improvised phrases with those rhythmic cadence points amidst the composition's frequent subdivision shifts was facilitated by a strong and stable embodied metrical pulse during performance. The targeting of these cadence points was an approach shared by all members of the ensemble, leading to the spontaneous emergence of synchronised phrasing when more than one ensemble member chose to target any given cadence point. There are many such instances of alignment within this recording, three of which can be heard in the excerpt presented in Audio 6.7, occurring at 0:09 (saxophone and bass), 0:23 (all instruments) and 0:42 (saxophone, bass and drums).

Audio 6.7. Synchronised rhythmic cadences within group improvisation from *Sensemaker*

Skill adaptation promoted by my practice project also facilitated the effective incorporation of silences into my improvisation without destabilising my embodied metrical pulse. When I had improvised over similarly complex rhythmic cycles prior to the commencement of this project, I had occasionally experienced a destabilising loss of connection to the metrical pulse when leaving silences in my phrasing. I attribute this instability to perturbations emanating from the rhythmical ambiguity of the musical surface, leading me to adopt the performance solution of playing dense and near-continuous phrases as a way of maintaining a direct physical 'enactment' of the metrical pulse through finger and tongue motions. While dense phrasing is an aesthetically desirable option within these musical contexts, my frequent recourse to density indicated a form of instability within my playing. The utilisation of silences within my playing in this recording of *Sensemaker* is evidence that the focus on metrical pulses within this project's practice tasks has led to skill adaptation, allowing me to effectively explore other phrasing possibilities during improvisation.

6.3.2 Abundance

The improvisational framework featured in *Abundance* has several distinct characteristics. Unlike the group improvisation heard in *Sensemaker*, this piece features piano and saxophone solos with improvised rhythm-section accompaniment. The rhythmic cycle utilised during improvisation features 14 bars of 9/8 meter, with the three-part subdivision of the metrical pulse maintained throughout the performance. Within the 14 bar form, the cycle features a series of countermetrical pulse streams, heard sequentially as groupings of quavers played against the dotted crotched metrical pulse.

A detailed compositional analysis of this rhythmic cycle and its pulse streams is not necessary for this discussion. They are introduced here only to highlight that the metrical and countermetrical pulse streams act as affordances offering two distinct rhythmic layers for the performers to engage with during improvisation. The 9/8 metrical pulse stream, heard as the more dominant pulse for most of this recorded realisation, is aurally perceived as a swung 3/4 meter. The countermetrical pulses are more rhythmically ambiguous; their aural effect is often one of syncopation against the metrical pulse, but when they emerge as the more prominent sound, their regularity generates the sense of a momentary shift to a different meter, as can be heard from 0:11-0:21 in Audio 6.8.

Audio 6.8. Countermetrical pulses during saxophone solo from *Abundance*

Using the multiple pulse streams within *Abundance*'s rhythm cycle as a basis for improvised interaction presents performers with several performance demands. Coursed Waters has developed an approach to this material in which we do not attempt to synchronise which pulse stream each of us is using as a basis for our rhythmic phrasing, instead opting to pursue our own musical ideas simultaneously. We do, however, maintain our place within the rhythm cycle's form at all times. The potential for conflicting rhythmic phrasing to be simultaneously sounded within the ensemble could present perturbations to the

stability of each performer, obscuring our place in the form given that the metrical pulse may not always be aurally perceivable in the musical surface. The success of our approach thus relies on the stability of each performer's sense of the metrical pulse – a skill that I targeted within this practice project, and is an indicator of dexterity within my playing in this recorded performance.

The sonic environment of this performance of *Abundance* presented multiple affordances to the performers. These were offered by the compositional features of the rhythm cycle that have already been described, but were also offered by the improvised musical material being produced by the ensemble. The ability to identify and respond to this dynamic array of affordances as they emerge during improvisation is an indicator of resourcefulness – one of the four characteristics of dexterity proposed by Bernstein (1967). It is difficult to identify empirical evidence of resourcefulness within any given performance. I do not claim to have recall of my creative decision-making processes to determine which features of the sonic environment I was responding to at any given time within the recorded performance. However, the variety of rhythmic phrasing utilised within my solo, heard in complete form in Audio Example 6.9, contributes to what I consider to be an effective improvisational realisation of the piece's aesthetic goals, which indicates effective engagement with the affordances that emerged during this passage of the performance.

Audio 6.9. Saxophone solo from *Abundance*

6.4 Conclusion

This chapter has presented four recorded performances that document the self-organising creative application of the skills and performance processes that were developed through my practice project. The tracks were recorded at three different recording sessions, demonstrating my improvisational approach at three distinct points of creative development. The recordings are complete sound-based form of knowledge production that are not subject to musical analysis; the text based component of this chapter instead serves to highlight key features of each performance that demonstrate the adaptation of skills targeted by my practice project. As a collective body of work, these recordings are the primary creative output of my research, presenting sound information that demonstrates the efficacy of a constraints-led approach to improvised saxophone learning and thus makes an original contribution to contemporary improvisational practice.

Chapter Seven

Conclusion

This research project has presented a case study of my instrumental practice, documenting the application of a constraints-led approach to my creative development as an improvising saxophonist. This pedagogical method guides learners to explore multiple solutions to performance demands, developing stable yet flexible movement patterns that efficiently and effectively engage with the affordances of the performance environment. This learning approach correlates with the creative goals that I identified at the commencement of the project: to find new ways of practising that would allow me to function within the dynamic performance context of musical improvisation with greater spontaneity, creative variety and instrumental dexterity.

The practice design principles underpinning my project were informed by ecological dynamics theories. The constraints-led approach offers a nonlinear learning methodology that exercises the self-organising capacity of learners to form patterns of behaviour in response to interacting constraints within the performance environment. My project utilised three practice designs that manipulated task constraints in order to challenge my existing musical and movement-based tendencies by exploring new functional movement patterns. Key principles of the constraints-led approach were a key feature of my practice designs: task variability was utilised to promote flexibility and stability of the performance solutions being discovered, while representative practice design ensured that the skills and performance processes being developed had transfer to actual performance contexts.

Engaging with the movement-oriented focus of the constraints-led approach, the three practice designs that were developed through this research offer a new conception of the interrelationships between physical processes on the saxophone and the musical sounds produced by those movements within melodic, pitch-based modes of improvisation. While there are countless saxophone-based technical studies that promote the development of digital dexterity, the practice designs presented in Chapter Four were concerned with a wider range of physical motions involved in saxophone playing, addressing the interaction of finger motions, tongue motions and embodied metrical pulse. My project's focus on exercising the functional relationships between multiple movements patterns at a granular scale of resolution is, to my knowledge, the first approach of its kind to be documented.

Evidence of skill adaptation and new performance processes attributable to the effects of my practice project were presented in two forms within this thesis. The practice outcomes presented in Chapter Five included three discoveries about my own movement tendencies on the saxophone that I was able to challenge through my practice, as well as two newly developed organisational processes that have application in both practice and performance contexts. The creative outputs in Chapter Six are offered as documentation of the application of developed skills and processes within improvised performances. Together, these outputs demonstrate the efficacy of a constraints-led practice approach in affecting change upon my performance tendencies as an improvising musician.

The learning methodologies developed within this project have continued to be a core component of my instrumental practice following the conclusion of the practice-based research period. The outcomes documented in this thesis do not represent an 'end goal' that has been reached, but are key points within

an ongoing process of creative development. I have also generated new practice design variations that increase the role of improvisation within each practice task, with a particular focus on improvised multi-parameter patterning: the spontaneous generation of layered pitch, rhythm and articulation sequences. This new approach to MPP no longer aims to challenge the decoupling tendencies within my playing, as the original design had done, but instead utilises the MPP concept as an organisational process during improvisation to generate musical material. I anticipate that this new practice approach will be a long-term area of investigation within my future creative work.

My project contributes to a growing body of practice-led research investigating the application of ecological dynamics principles within self-regulated musical learning projects. My research makes two original contributions to knowledge within CLA literature. Firstly, it provides a case study of the application of the constraints-led approach within the discipline of improvised music, demonstrating CLA's effectiveness as a learning tool outside of the sporting contexts it has largely been developed within to date. Secondly, the self-regulated nature of my project demonstrates that the constraints-led approach can be effectively self-administered, offering an alternative to the pedagogical context promoted within most existing CLA literature in which the practice tasks undertaken by learners are designed and administered by an educator and/or assessor.

My project also makes two original contributions to current understandings of improvisational creative processes. Firstly, the practice methodologies and corresponding methods of self-assessment that I developed offer a model of improvisational learning that is distinct from existing jazz-based pedagogical methods, prioritising the development of improvisational dexterity rather than the internalisation of new musical materials. Additionally, my work engages with the rhythm-based processes and vocabulary explored in practice-led projects produced by electric bassist Hale (2022), and drummers Barker (2015) and McLean (2018). These project present three instrument-specific case studies investigating the interaction of physical movement patterns and rhythmic production, all featuring instruments whose sound production is activated by striking, scraping or plucking motions. My project presents a similar investigation on the saxophone, presenting what is, to my knowledge, the first study of its kind that conceives of the tonguing and finger motions involved in sound production as 'striking' motions. This motion-based conception facilitated engagement with the processes developed by Hale, Barker and McLean while also engaging with the unique affordances of the saxophone.

My project offers several pathways for future research. An analytical model that seeks to identify coupling within recorded improvisations could offer a second application of the coupling concept beyond its initial function as a tool for understanding musical and movement-based tendencies within my own playing. Identifying sonic coupling of musical parameters within transcribed improvisations could lead to the identification of corresponding movement patterns that may not be otherwise evident in the musical surface, adding to current understandings of improvisational practice. My approach to identifying and challenging this coupling tendency within my own playing was inherently specific to saxophone-based movement patterns, but could offer a pathway to other improvising musicians to explore and challenge coupling tendencies specific to their instrument/s within their own practice.

The ecological dynamics principles and constraints-led learning methodologies incorporated into my practice project are free of stylistic associations or implications, offering a significant resource to other improvising musicians wishing to engage with the unique interaction of personal, environmental and task constraints within their own performance practice. While the learning approach detailed within this

thesis was developed in response to creative questions specific to my own musical practice, it is my hope that the musical ideas and performance processes that emerged through my practice can offer a case study that "enters into dialogue with existing practical and theoretical paradigms" (Bolt, 2007, p, 33). This project presents a process-based template that can prompt others to reconceptualise their own creative practice, challenging their musical and movement-based tendencies to explore new creative possibilities.

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Catalogue of Practice Sessions

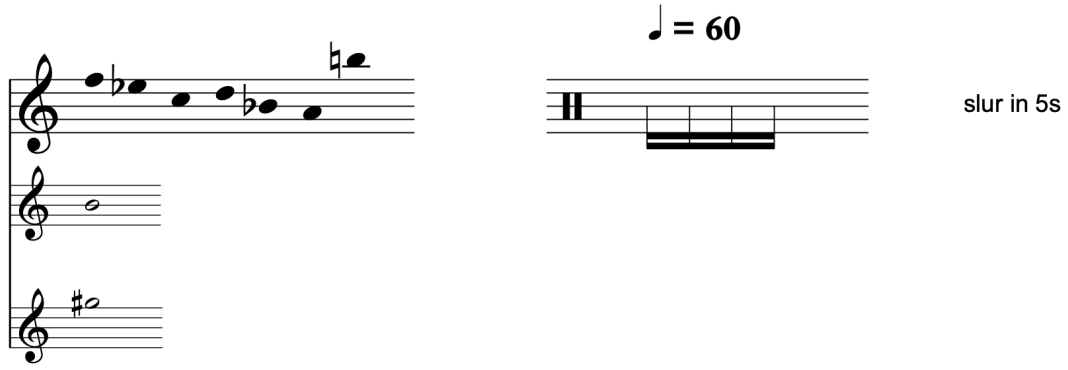
This appendix presents details of the learning activities undertaken within my practice project. For each session, I will present a digitised reproduction of the notes from my practice diary, which feature the practice inputs and handwritten forms of self-assessment that were made during the session. Recordings documenting my practice during each session will also be included.

A.1 Phase One: multi-parameter patterning sessions

The figures within this section present the inputs for each multi-parameter patterning (MPP) session, notated in the format introduced in Section 4.2. The audio examples feature excerpts from the session recordings, presenting one successful rendering of each transposition of the resultant phrase.

Phase One, Session 1: October 1, 2020

Figure A.1. Inputs for October 1, 2020 MPP session



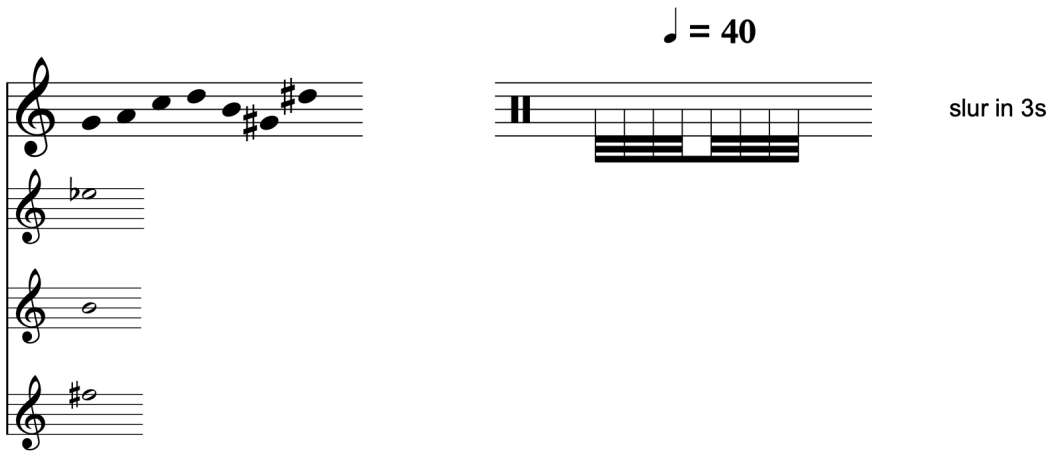
Audio A.1. Resultant phrase from October 1, 2020 MPP session in original key

Audio A.2. Resultant phrase from October 1, 2020 MPP session in first transposition

Audio A.3. Resultant phrase from October 1, 2020 MPP session in second transposition

Phase One, Session 2: October 12, 2020

Figure A.2. Inputs for October 12, 2020 MPP session



Audio A.4. Resultant phrase from October 12, 2020 MPP session in original key

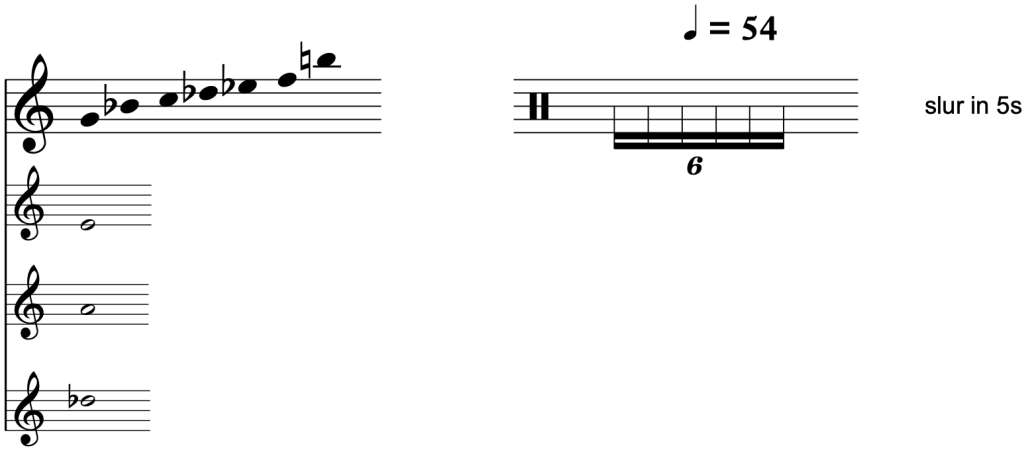
Audio A.5. Resultant phrase from October 12, 2020 MPP session in first transposition

Audio A.6. Resultant phrase from October 12, 2020 MPP session in second transposition

Audio A.7. Resultant phrase from October 12, 2020 MPP session in third transposition

Phase One, Session 3: October 13, 2020

Figure A.3. Inputs for October 13, 2020 MPP session



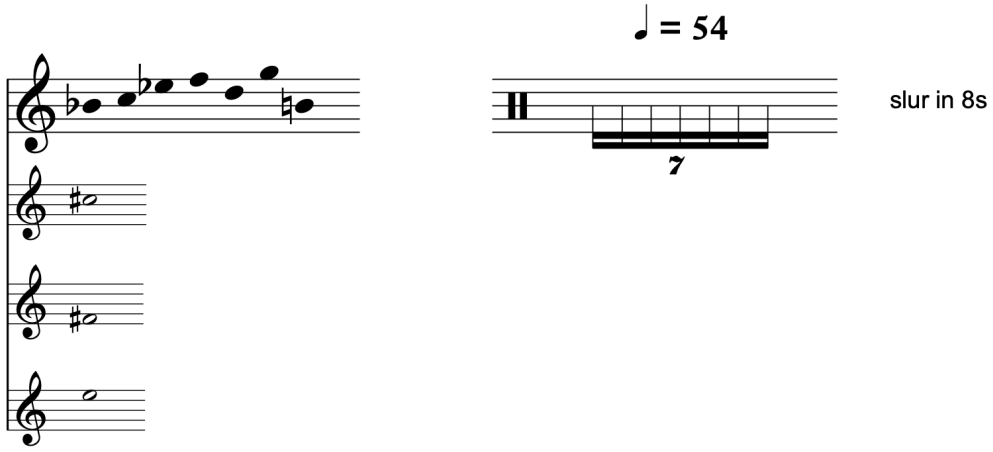
Audio A.8. Resultant phrase from October 12, 2020 MPP session in original key

Audio A.9. Resultant phrase from October 12, 2020 MPP session in first transposition

Audio A.10. Resultant phrase from October 12, 2020 MPP session in second transposition

Audio A.11. Resultant phrase from October 12, 2020 MPP session in third transposition

Figure A.4. Inputs for October 18, 2020 MPP session



Audio A.12. Resultant phrase from October 18, 2020 MPP session in original key

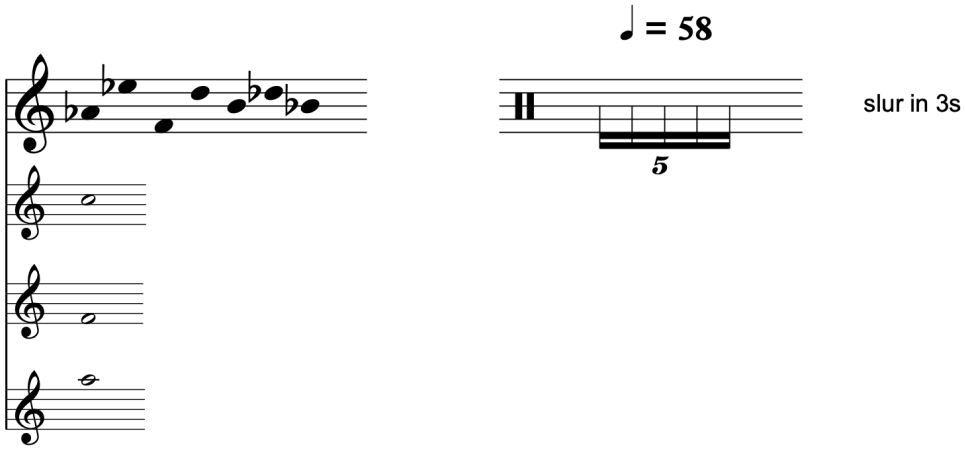
Audio A.13. Resultant phrase from October 18, 2020 MPP session in first transposition

Audio A.14. Resultant phrase from October 18, 2020 MPP session in second transposition

Audio A.15. Resultant phrase from October 18, 2020 MPP session in third transposition

Phase One, Session 5: October 21, 2020

Figure A.5. Inputs for October 21, 2020 MPP session



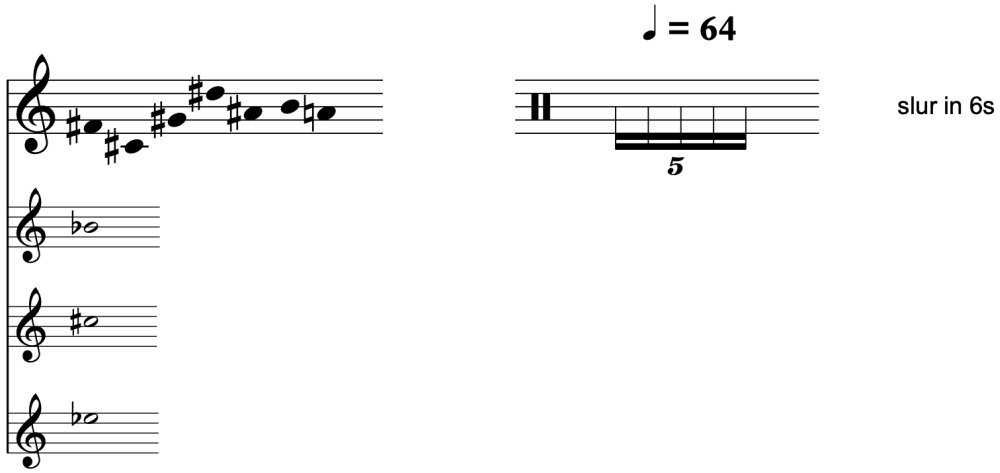
Audio A.16. Resultant phrase from October 21, 2020 MPP session in original key

Audio A.17. Resultant phrase from October 21, 2020 MPP session in first transposition

Audio A.18. Resultant phrase from October 21, 2020 MPP session in second transposition

Audio A.19. Resultant phrase from October 21, 2020 MPP session in third transposition

Figure A.6. Inputs for October 23, 2020 MPP session



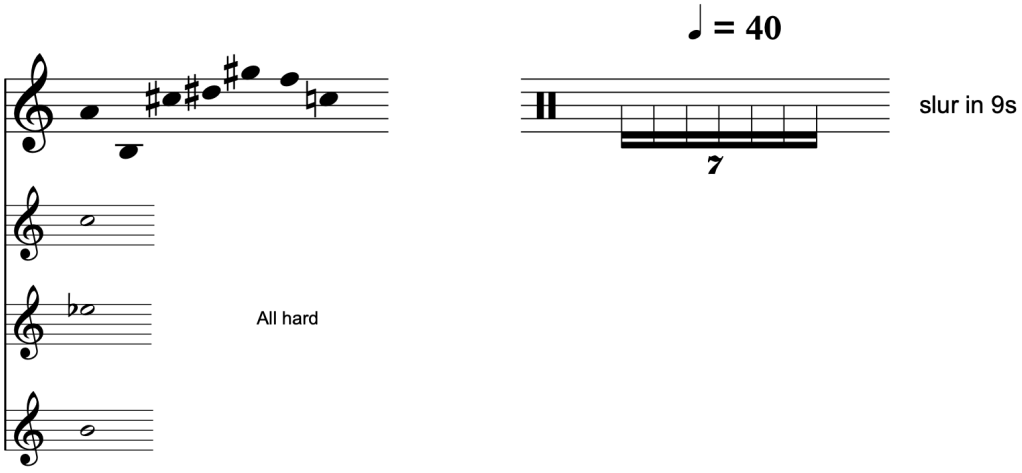
Audio A.20. Resultant phrase from October 23, 2020 MPP session in original key

Audio A.21. Resultant phrase from October 23, 2020 MPP session in first transposition

Audio A.22. Resultant phrase from October 23, 2020 MPP session in second transposition

Audio A.23. Resultant phrase from October 23, 2020 MPP session in third transposition

Figure A.7. Inputs for October 27, 2020 MPP session



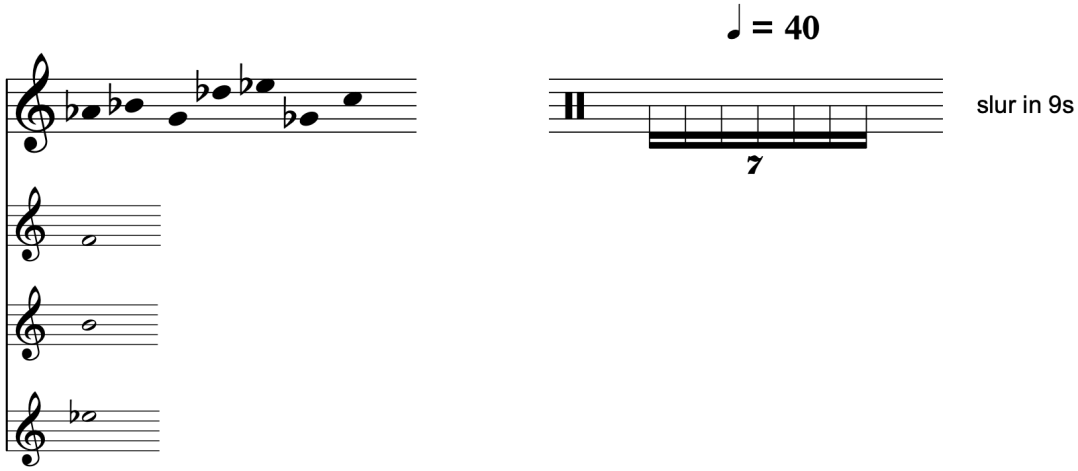
Audio A.24. Resultant phrase from October 27, 2020 MPP session in original key

Audio A.25. Resultant phrase from October 27, 2020 MPP session in first transposition

Audio A.26. Resultant phrase from October 27, 2020 MPP session in second transposition

Audio A.27. Resultant phrase from October 27, 2020 MPP session in third transposition

Figure A.8. Inputs for October 30, 2020 MPP session



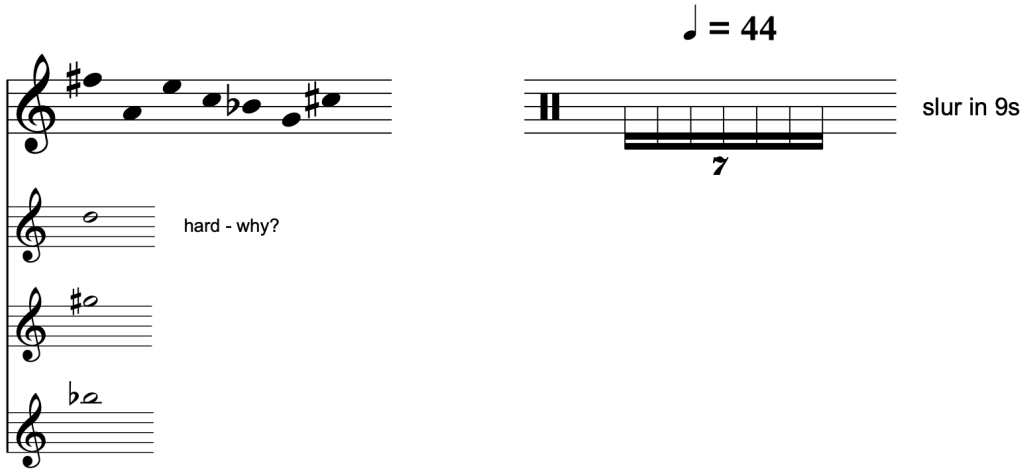
Audio A.28. Resultant phrase from October 30, 2020 MPP session in original key

Audio A.29. Resultant phrase from October 30, 2020 MPP session in first transposition

Audio A.30. Resultant phrase from October 30, 2020 MPP session in second transposition

Audio A.31. Resultant phrase from October 30, 2020 MPP session in third transposition

Figure A.9. Inputs for November 2, 2020 MPP session



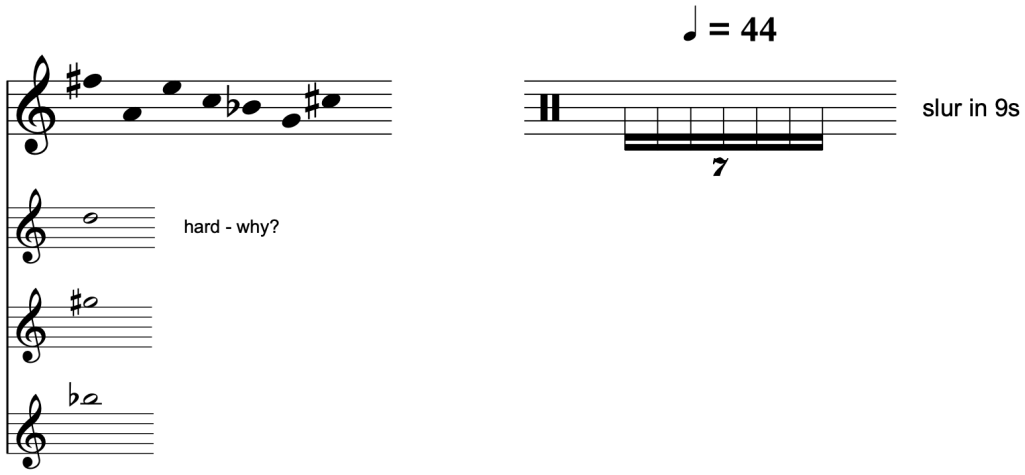
Audio A.32. Resultant phrase from November 2, 2020 MPP session in original key

Audio A.33. Resultant phrase from November 2, 2020 MPP session in first transposition

Audio A.34. Resultant phrase from November 2, 2020 MPP session in second transposition

Audio A.35. Resultant phrase from November 2, 2020 MPP session in third transposition

Figure A.10. Inputs for November 3, 2020 MPP session



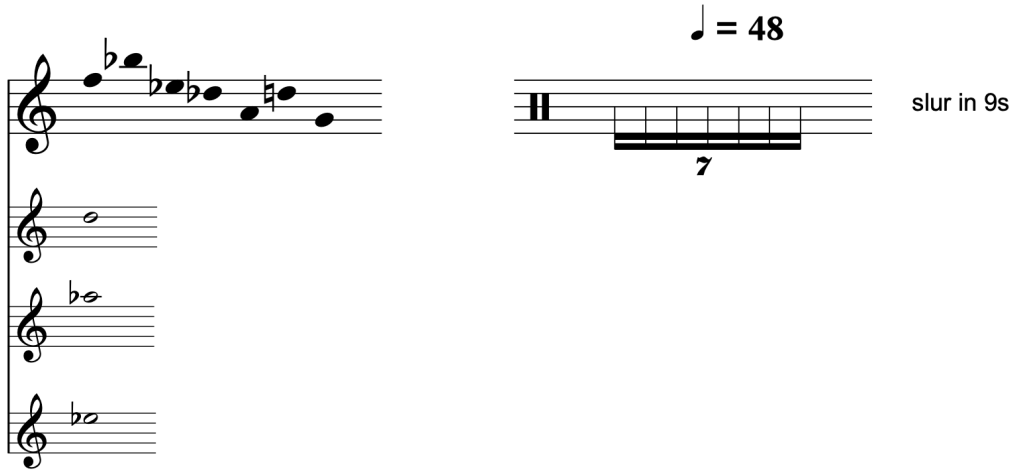
Audio A.36. Resultant phrase from November 3, 2020 MPP session in original key

Audio A.37. Resultant phrase from November 3, 2020 MPP session in first transposition

Audio A.38. Resultant phrase from November 3, 2020 MPP session in second transposition

Audio A.39. Resultant phrase from November 3, 2020 MPP session in third transposition

Figure A.11. Inputs for November 4, 2020 MPP session, task 1



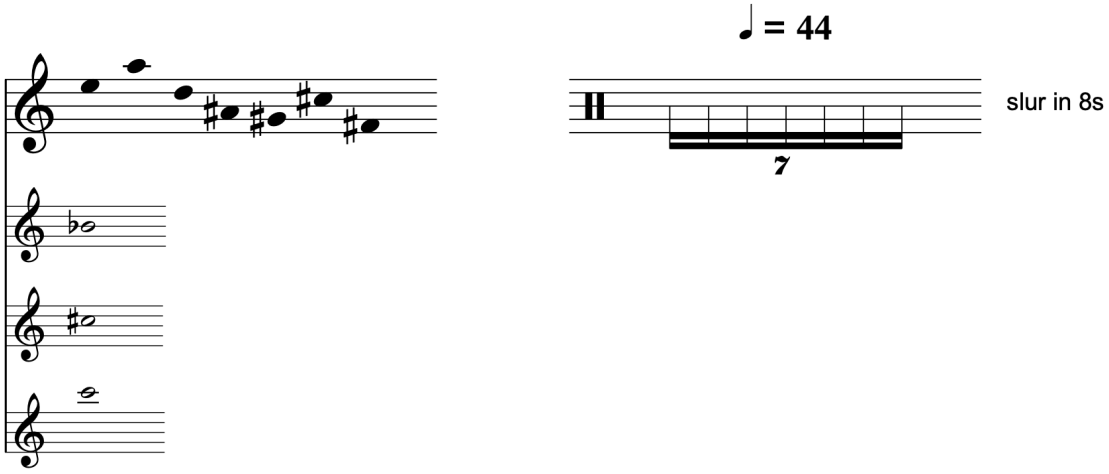
Audio A.40. First resultant phrase from November 4, 2020 MPP session in original key

Audio A.41. First resultant phrase from November 4, 2020 MPP session in first transposition

Audio A.42. First resultant phrase from November 4, 2020 MPP session in second transposition

Audio A.43. First resultant phrase from November 4, 2020 MPP session in third transposition

Figure A.12. Inputs for November 4, 2020 MPP session, task 2



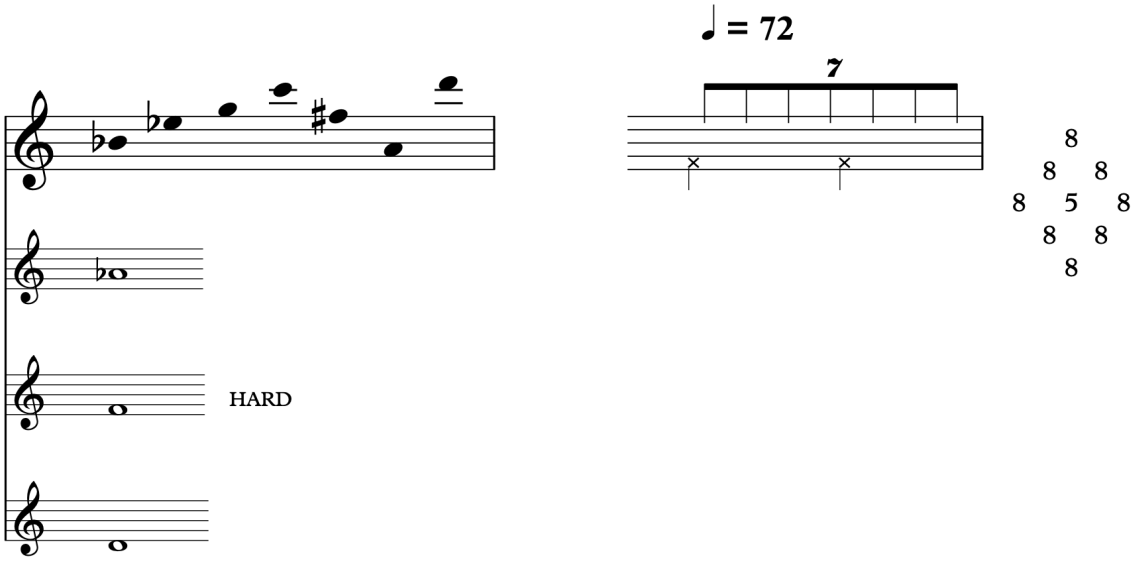
Audio A.44. Second resultant phrase from November 4, 2020 MPP session in original key

Audio A.45. Second resultant phrase from November 4, 2020 MPP session in first transposition

Audio A.46. Second resultant phrase from November 4, 2020 MPP session in second transposition

Audio A.47. Second resultant phrase from November 4, 2020 MPP session in third transposition

Figure A.13. Inputs for November 9, 2020 MPP session, task 1



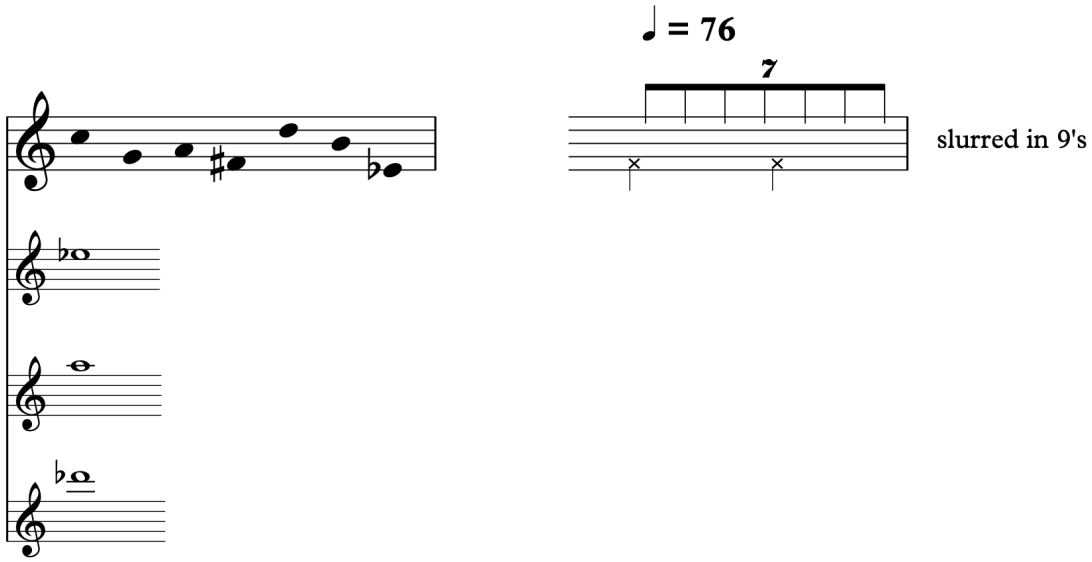
Audio A.48. First resultant phrase from November 9, 2020 MPP session in original key

Audio A.49. First resultant phrase from November 9, 2020 MPP session in first transposition

Audio A.50. First resultant phrase from November 9, 2020 MPP session in second transposition

Audio A.51. First resultant phrase from November 9, 2020 MPP session in third transposition

Figure A.14. Inputs for November 9, 2020 MPP session, task 2



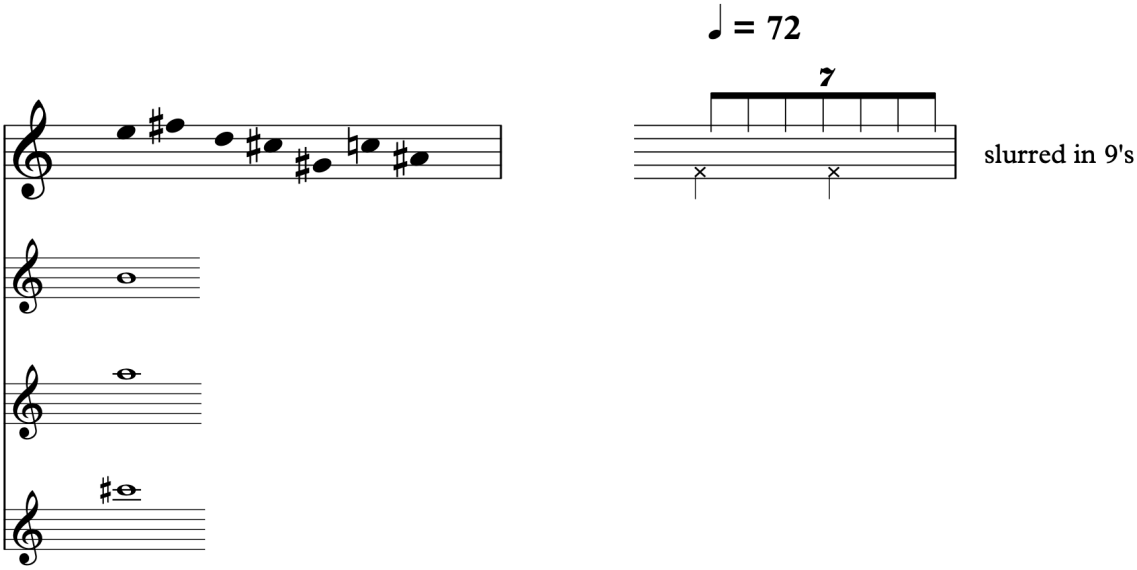
Audio A.52. Second resultant phrase from November 9, 2020 MPP session in original key

Audio A.53. Second resultant phrase from November 9, 2020 MPP session in first transposition

Audio A.54. Second resultant phrase from November 9, 2020 MPP session in second transposition

Audio A.55. Second resultant phrase from November 9, 2020 MPP session in third transposition

Figure A.15. Inputs for November 10, 2020 MPP session, task 1



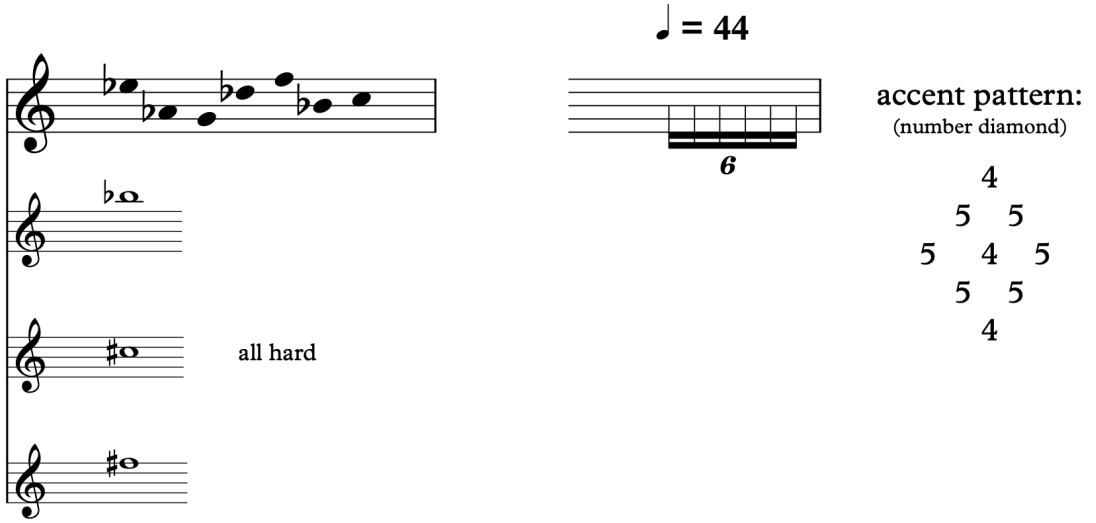
Audio A.56. First resultant phrase from November 10, 2020 MPP session in original key

Audio A.57. First resultant phrase from November 10, 2020 MPP session in first transposition

Audio A.58. First resultant phrase from November 10, 2020 MPP session in second transposition

Audio A.59. First resultant phrase from November 10, 2020 MPP session in third transposition

Figure A.16. Inputs for November 10, 2020 MPP session, task 2



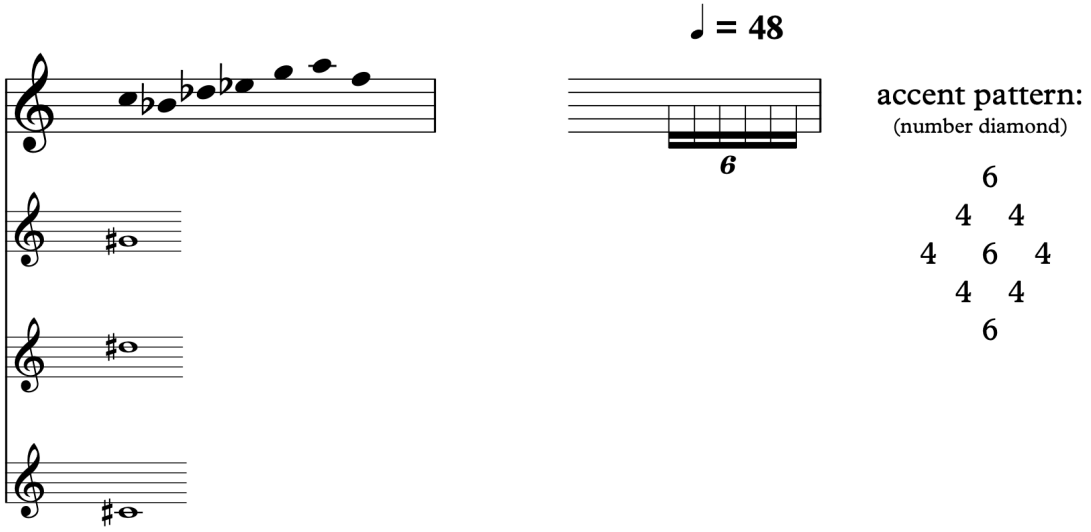
Audio A.60. Second resultant phrase from November 10, 2020 MPP session in original key

Audio A.61. Second resultant phrase from November 10, 2020 MPP session in first transposition

Audio A.62. Second resultant phrase from November 10, 2020 MPP session in second transposition

Audio A.63. Second resultant phrase from November 10, 2020 MPP session in third transposition

Figure A.17. Inputs for November 11, 2020 MPP session, task 1



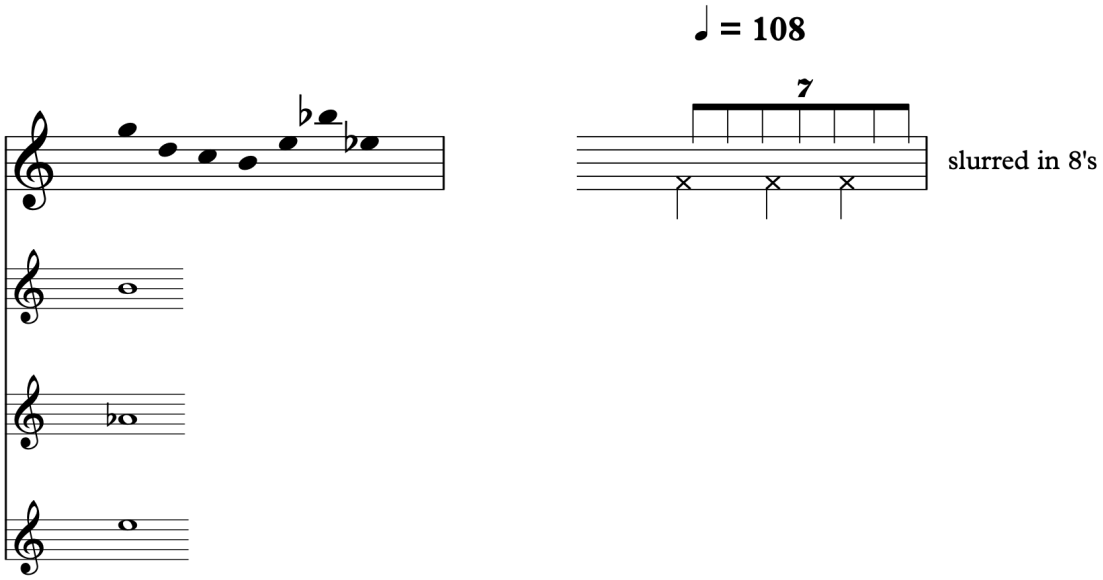
Audio A.64. First resultant phrase from November 11, 2020 MPP session in original key

Audio A.65. First resultant phrase from November 11, 2020 MPP session in first transposition

Audio A.66. First resultant phrase from November 11, 2020 MPP session in second transposition

Audio A.67. First resultant phrase from November 11, 2020 MPP session in third transposition

Figure A.18. Inputs for November 11, 2020 MPP session, task 2



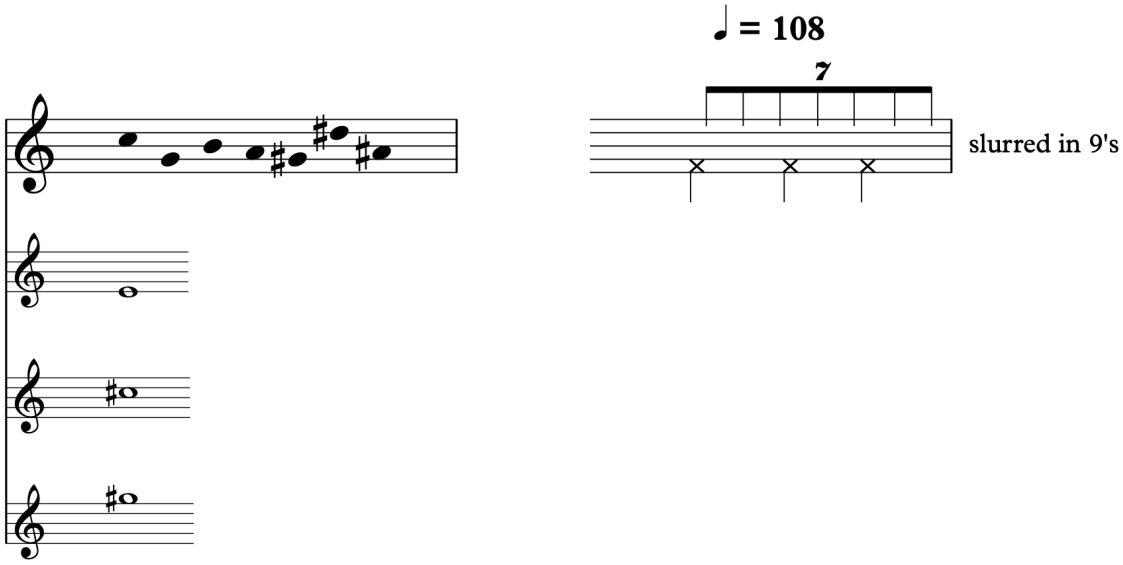
Audio A.68. Second resultant phrase from November 11, 2020 MPP session in original key

Audio A.69. Second resultant phrase from November 11, 2020 MPP session in first transposition

Audio A.70. Second resultant phrase from November 11, 2020 MPP session in second transposition

Audio A.71. Second resultant phrase from November 11, 2020 MPP session in third transposition

Figure A.19. Inputs for November 12, 2020 MPP session, task 1



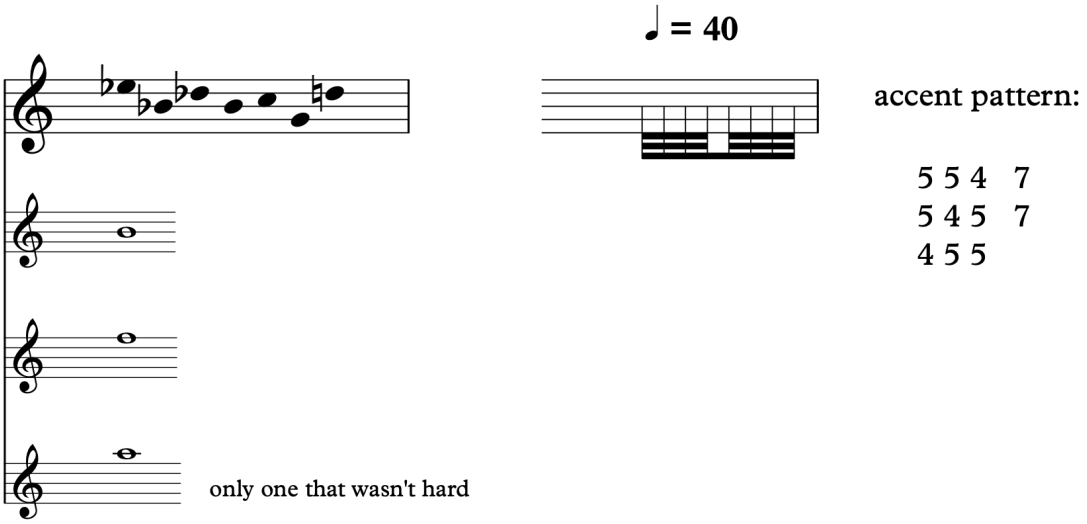
Audio A.72. First resultant phrase from November 12, 2020 MPP session in original key

Audio A.73. First resultant phrase from November 12, 2020 MPP session in first transposition

Audio A.74. First resultant phrase from November 12, 2020 MPP session in second transposition

Audio A.75. First resultant phrase from November 12, 2020 MPP session in third transposition

Figure A.20. Inputs for November 12, 2020 MPP session, task 2



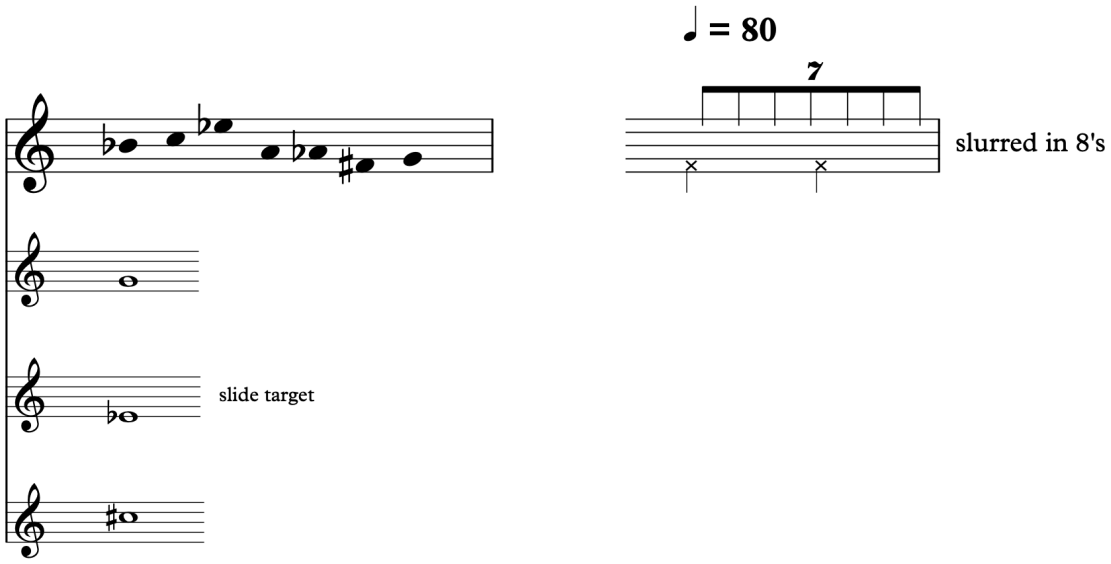
Audio A.76. Second resultant phrase from November 12, 2020 MPP session in original key

Audio A.77. Second resultant phrase from November 12, 2020 MPP session in first transposition

Audio A.78. Second resultant phrase from November 12, 2020 MPP session in second transposition

Audio A.79. Second resultant phrase from November 12, 2020 MPP session in third transposition

Figure A.21. Inputs for November 13, 2020 MPP session, task 1



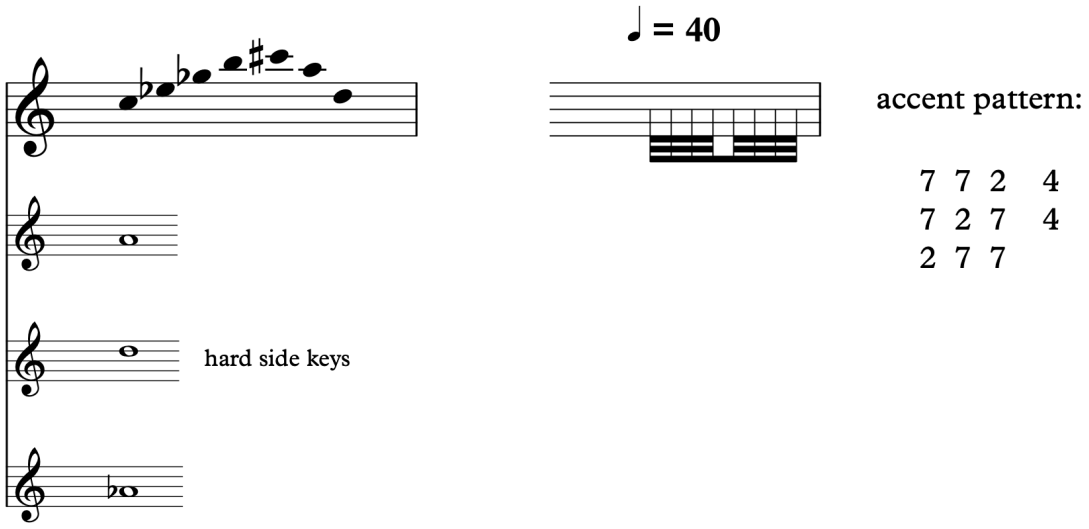
Audio A.80. First resultant phrase from November 13, 2020 MPP session in original key

Audio A.81. First resultant phrase from November 13, 2020 MPP session in first transposition

Audio A.82. First resultant phrase from November 13, 2020 MPP session in second transposition

Audio A.83. First resultant phrase from November 13, 2020 MPP session in third transposition

Figure A.22. Inputs for November 13, 2020 MPP session, task 2



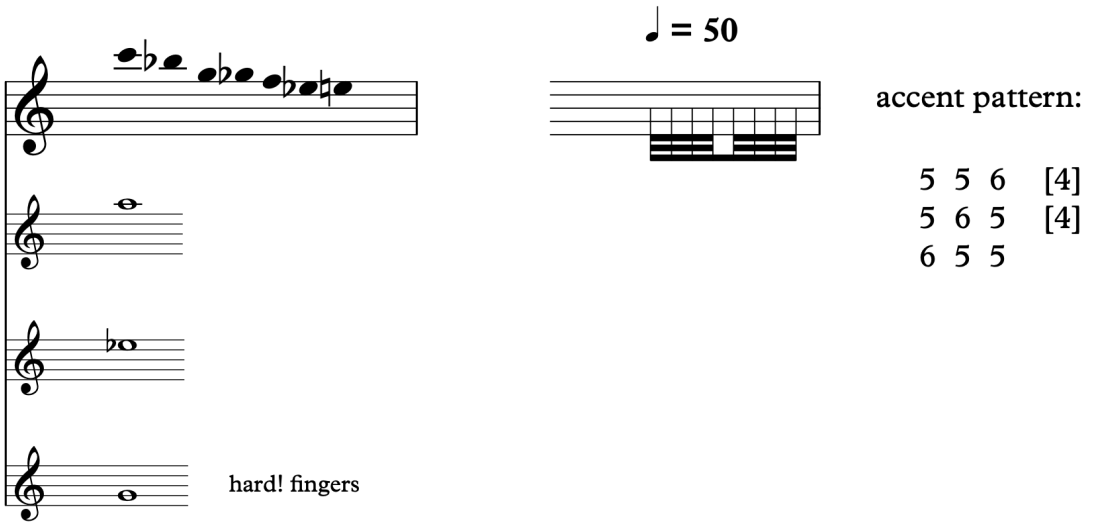
Audio A.84. Second resultant phrase from November 13, 2020 MPP session in original key

Audio A.85. Second resultant phrase from November 13, 2020 MPP session in first transposition

Audio A.86. Second resultant phrase from November 13, 2020 MPP session in second transposition

Audio A.87. Second resultant phrase from November 13, 2020 MPP session in third transposition

Figure A.23. Inputs for November 18, 2020 MPP session, task 1



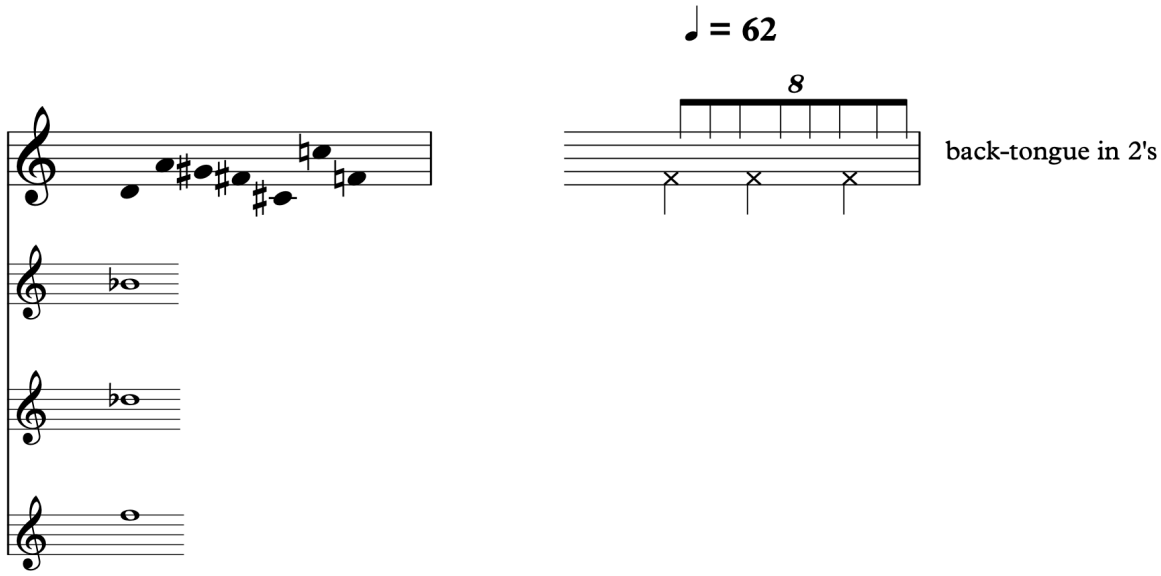
Audio A.88. First resultant phrase from November 18, 2020 MPP session in original key

Audio A.89. First resultant phrase from November 18, 2020 MPP session in first transposition

Audio A.90. First resultant phrase from November 18, 2020 MPP session in second transposition

Audio A.91. First resultant phrase from November 18, 2020 MPP session in third transposition

Figure A.24. Inputs for November 18, 2020 MPP session, task 2



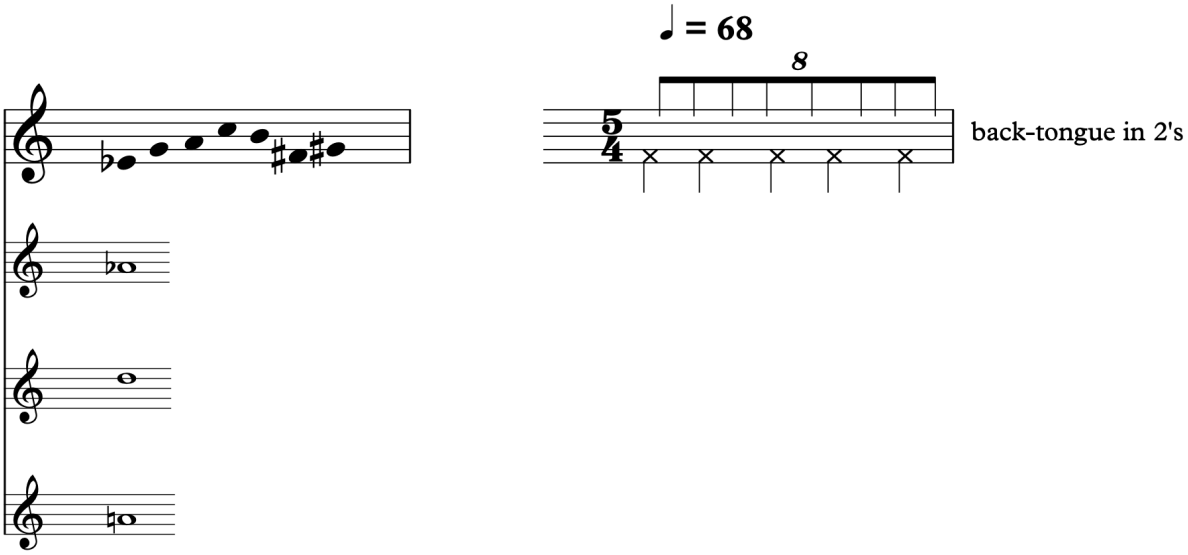
Audio A.92. Second resultant phrase from November 18, 2020 MPP session in original key

Audio A.93. Second resultant phrase from November 18, 2020 MPP session in first transposition

Audio A.94. Second resultant phrase from November 18, 2020 MPP session in second transposition

Audio A.95. Second resultant phrase from November 18, 2020 MPP session in third transposition

Figure A.25. Inputs for November 20, 2020 MPP session, task 1



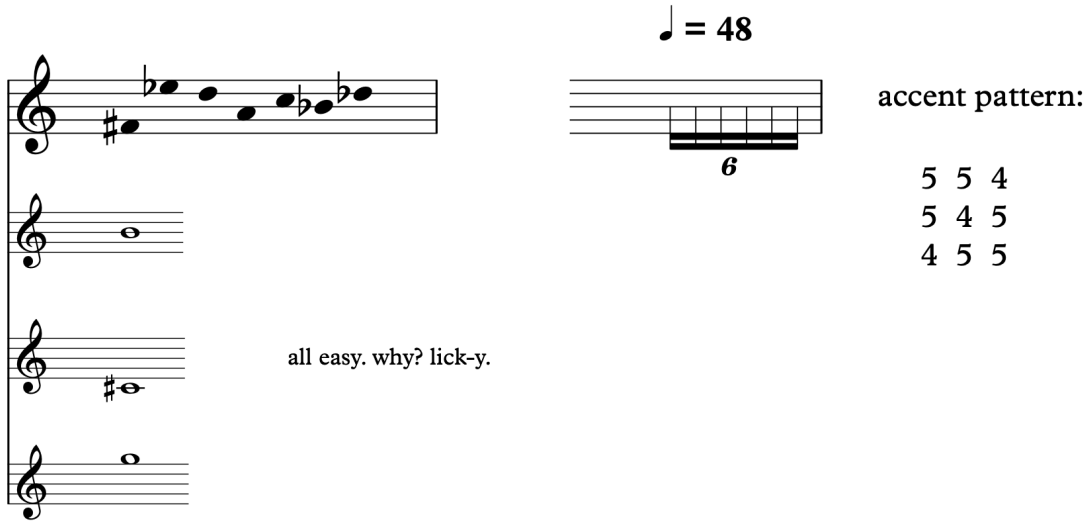
Audio A.96. First resultant phrase from November 20, 2020 MPP session in original key

Audio A.97. First resultant phrase from November 20, 2020 MPP session in first transposition

Audio A.98. First resultant phrase from November 20, 2020 MPP session in second transposition

Audio A.99. First resultant phrase from November 20, 2020 MPP session in third transposition

Figure A.26. Inputs for November 20, 2020 MPP session, task 2



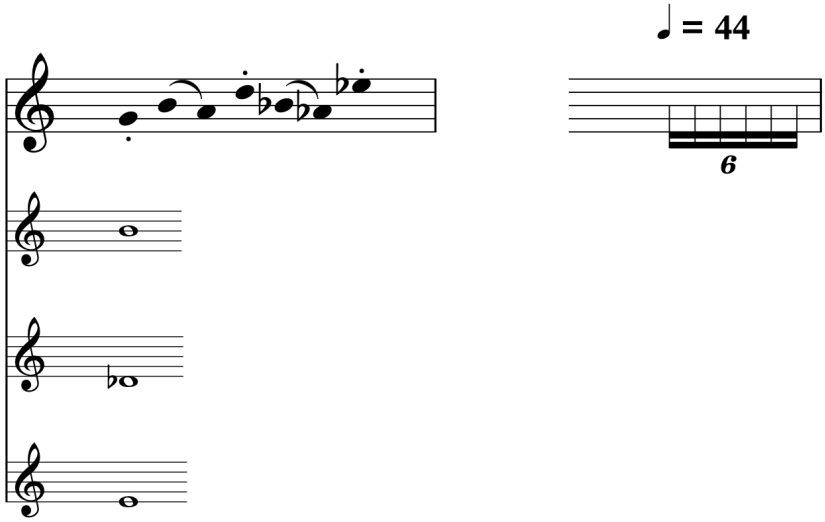
Audio A.100. Second resultant phrase from November 20, 2020 MPP session in original key

Audio A.101. Second resultant phrase from November 20, 2020 MPP session in first transposition

Audio A.102. Second resultant phrase from November 20, 2020 MPP session in second transposition

Audio A.103. Second resultant phrase from November 20, 2020 MPP session in third transposition

Figure A.27. Inputs for November 23, 2020 MPP session, task 1



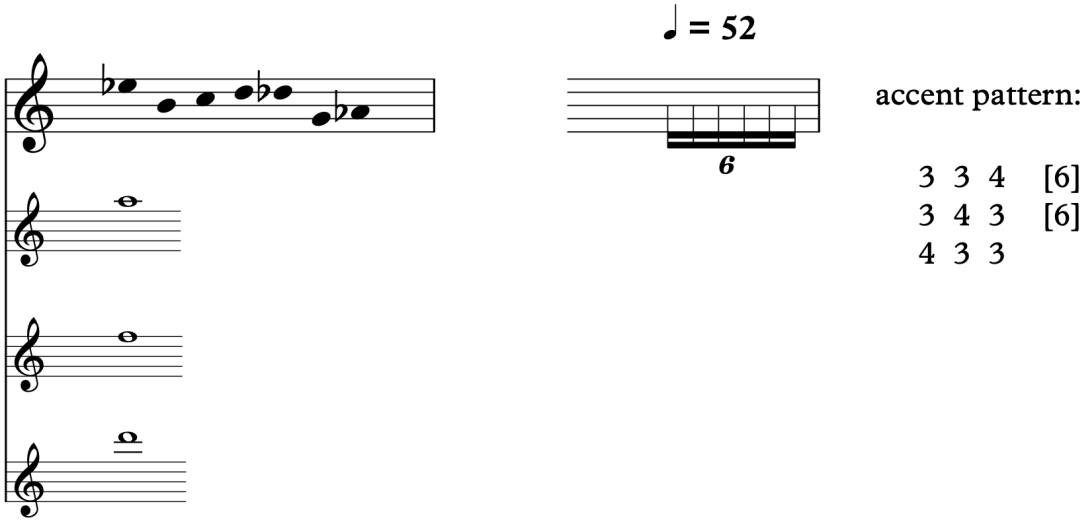
Audio A.104. First resultant phrase from November 23, 2020 MPP session in original key

Audio A.105. First resultant phrase from November 23, 2020 MPP session in first transposition

Audio A.106. First resultant phrase from November 23, 2020 MPP session in second transposition

Audio A.107. First resultant phrase from November 23, 2020 MPP session in third transposition

Figure A.27. Inputs for November 23, 2020 MPP session, task 2



Audio A.108. Second resultant phrase from November 23, 2020 MPP session in original key

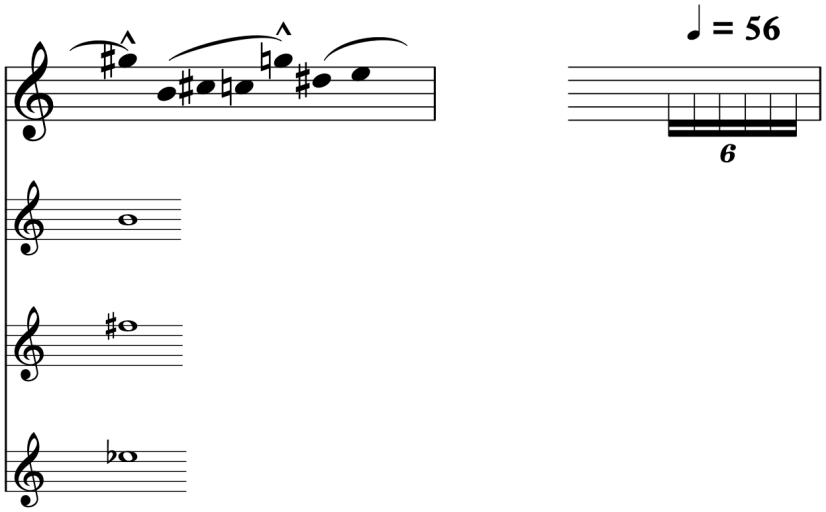
Audio A.109. Second resultant phrase from November 23, 2020 MPP session in first transposition

Audio A.110. Second resultant phrase from November 23, 2020 MPP session in second transposition

Audio A.111. Second resultant phrase from November 23, 2020 MPP session in third transposition

Phase One, Session 20: November 24, 2020

Figure A.28. Inputs for November 24, 2020 MPP session



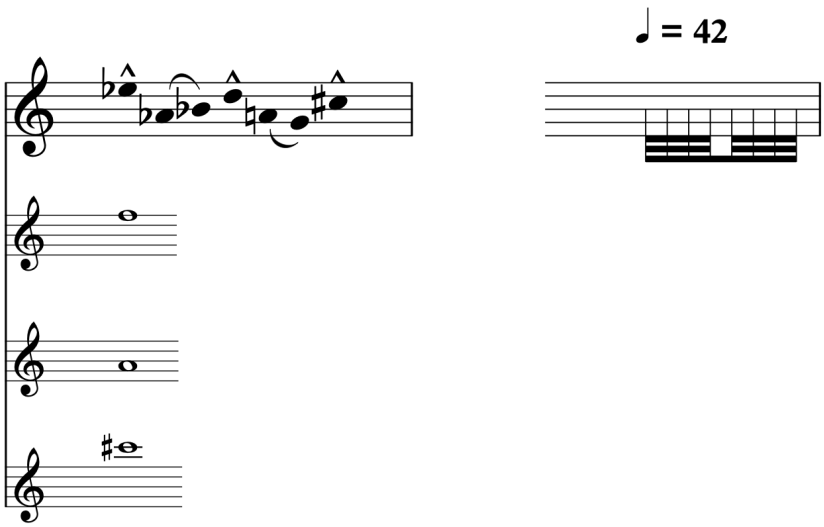
Audio A.112. Resultant phrase from November 24, 2020 MPP session in original key

Audio A.113. Resultant phrase from November 24, 2020 MPP session in first transposition

Audio A.114. Resultant phrase from November 24, 2020 MPP session in second transposition

Audio A.115. Resultant phrase from November 24, 2020 MPP session in third transposition

Figure A.29. Inputs for November 26, 2020 MPP session, task 1



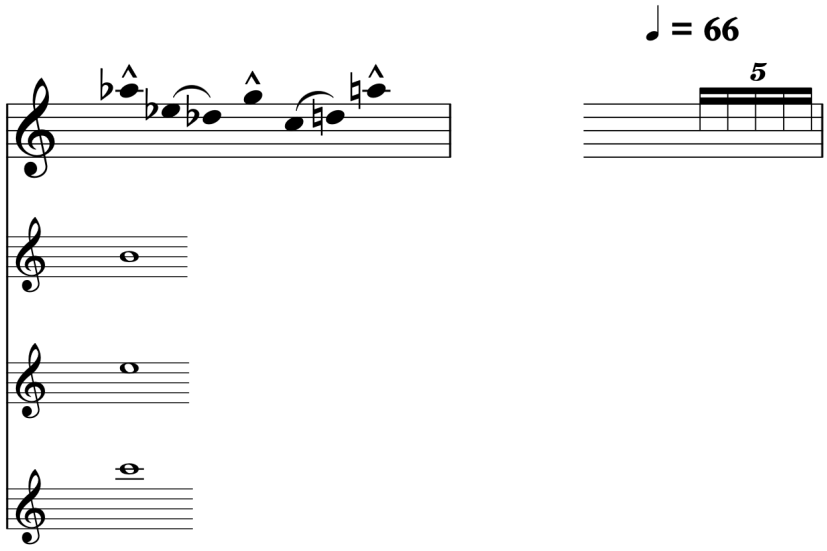
Audio A.116. First resultant phrase from November 26, 2020 MPP session in original key

Audio A.117. First resultant phrase from November 26, 2020 MPP session in first transposition

Audio A.118. First resultant phrase from November 26, 2020 MPP session in second transposition

Audio A.119. First resultant phrase from November 26, 2020 MPP session in third transposition

Figure A.30. Inputs for November 26, 2020 MPP session, task 2



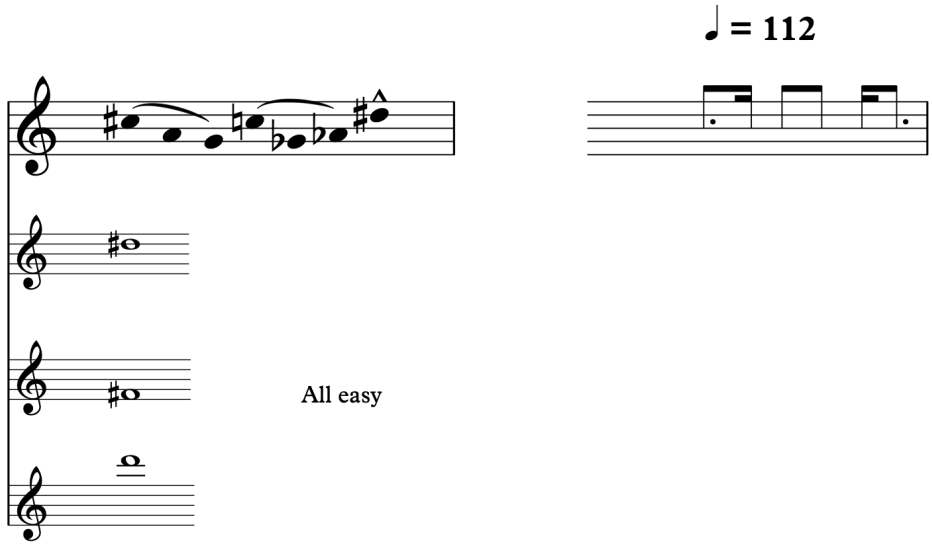
Audio A.120. Second resultant phrase from November 26, 2020 MPP session in original key

Audio A.121. Second resultant phrase from November 26, 2020 MPP session in first transposition

Audio A.122. Second resultant phrase from November 26, 2020 MPP session in second transposition

Audio A.123. Second resultant phrase from November 26, 2020 MPP session in third transposition

Figure A.31. Inputs for November 27, 2020 MPP session, task 1



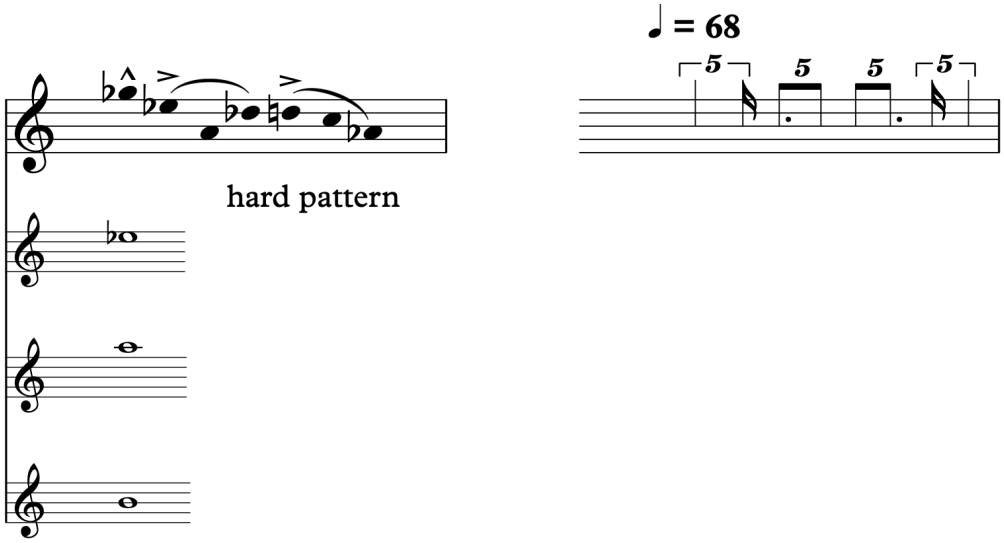
Audio A.124. First resultant phrase from November 27, 2020 MPP session in original key

Audio A.125. First resultant phrase from November 27, 2020 MPP session in first transposition

Audio A.126. First resultant phrase from November 27, 2020 MPP session in second transposition

Audio A.127. First resultant phrase from November 27, 2020 MPP session in third transposition

Figure A.32. Inputs for November 27, 2020 MPP session, task 2



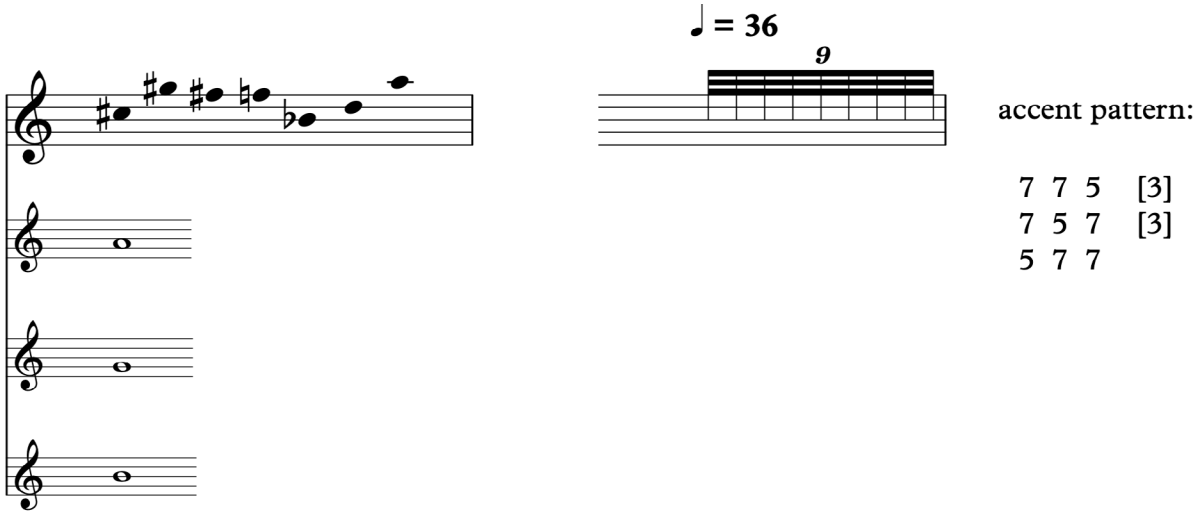
Audio A.128. Second resultant phrase from November 27, 2020 MPP session in original key

Audio A.129. Second resultant phrase from November 27, 2020 MPP session in first transposition

Audio A.130. Second resultant phrase from November 27, 2020 MPP session in second transposition

Audio A.131. Second resultant phrase from November 27, 2020 MPP session in third transposition

Figure A.33. Inputs for November 28, 2020 MPP session, task 1



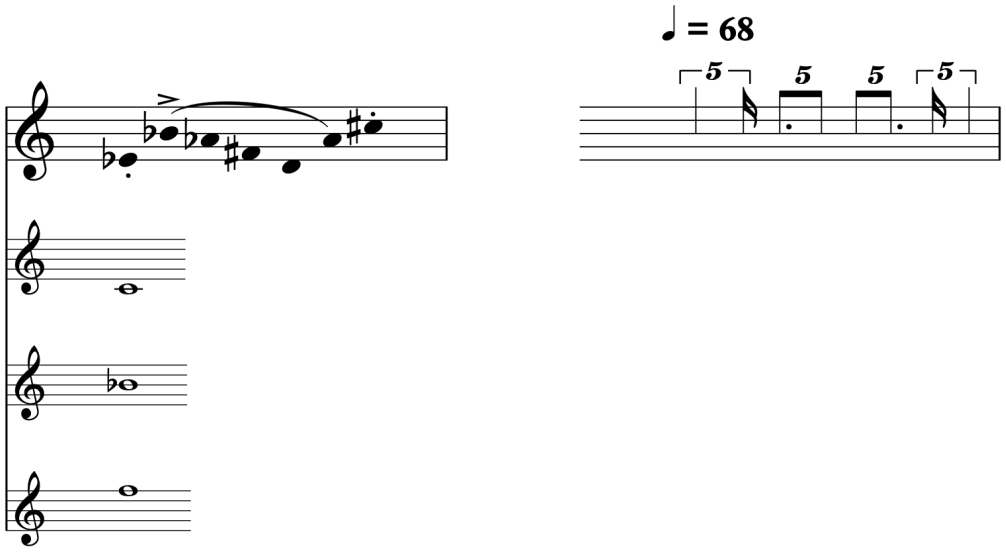
Audio A.132. First resultant phrase from November 28, 2020 MPP session in original key

Audio A.133. First resultant phrase from November 28, 2020 MPP session in first transposition

Audio A.134. First resultant phrase from November 28, 2020 MPP session in second transposition

Audio A.135. First resultant phrase from November 28, 2020 MPP session in third transposition

Figure A.34. Inputs for November 28, 2020 MPP session, task 2



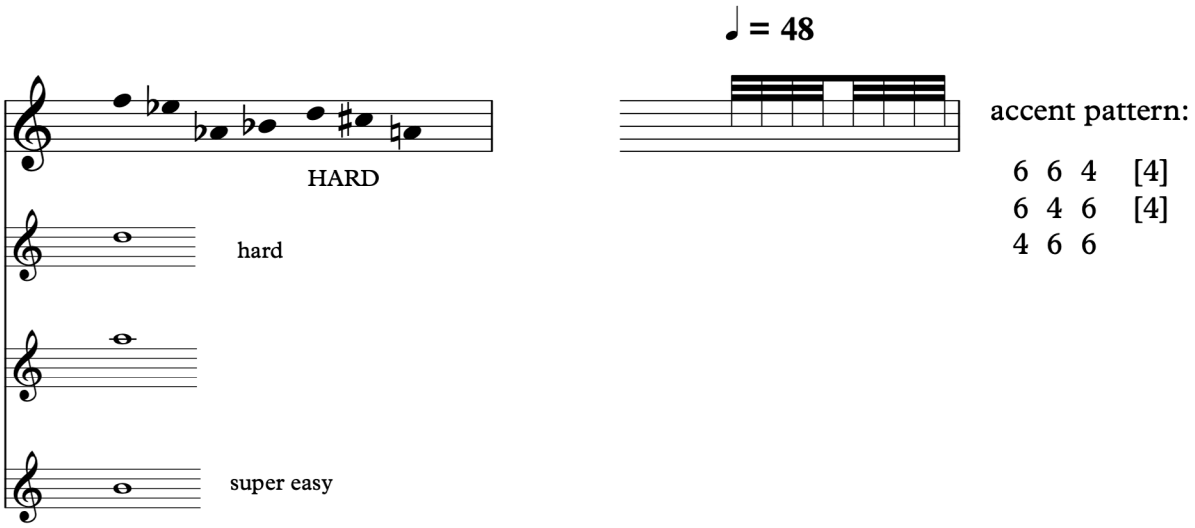
Audio A.136. Second resultant phrase from November 28, 2020 MPP session in original key

Audio A.137. Second resultant phrase from November 28, 2020 MPP session in first transposition

Audio A.138. Second resultant phrase from November 28, 2020 MPP session in second transposition

Audio A.139. Second resultant phrase from November 28, 2020 MPP session in third transposition

Figure A.35. Inputs for November 30, 2020 MPP session



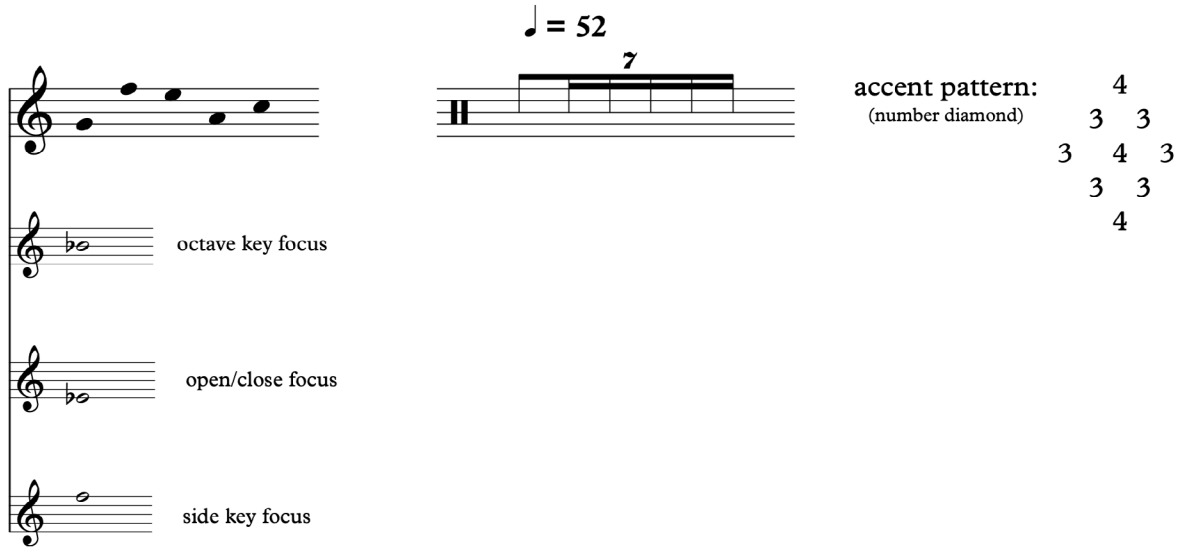
Audio A.140. Resultant phrase from November 30, 2020 MPP session in original key

Audio A.141. Resultant phrase from November 30, 2020 MPP session in first transposition

Audio A.142. Resultant phrase from November 30, 2020 MPP session in second transposition

Audio A.143. Resultant phrase from November 30, 2020 MPP session in third transposition

Figure A.36. Inputs for June 27, 2021 MPP session



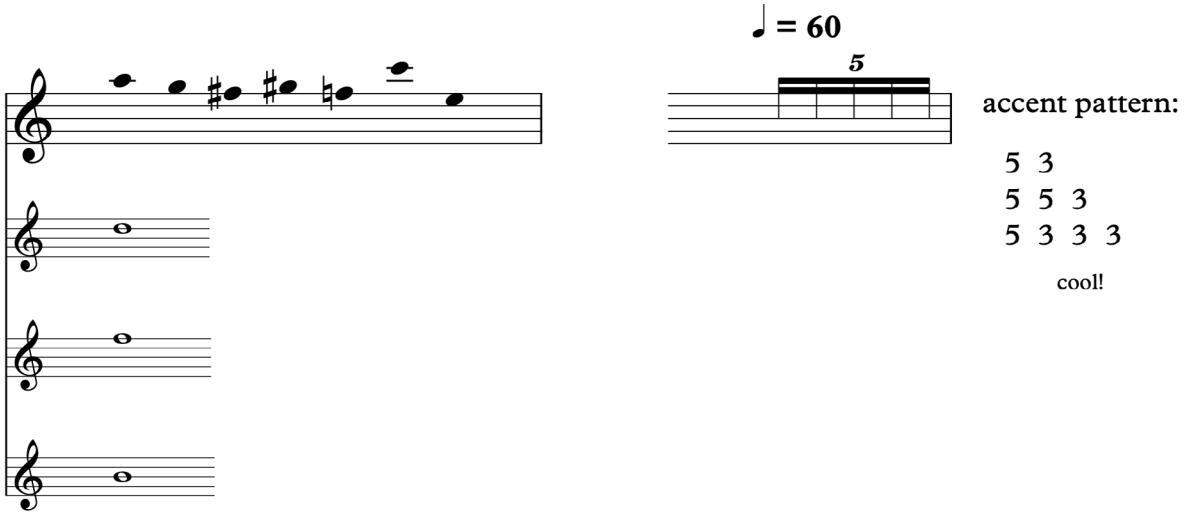
Audio A.144. Resultant phrase from June 27, 2021 MPP session in original key

Audio A.145. Resultant phrase from June 27, 2021 MPP session in first transposition

Audio A.146. Resultant phrase from June 27, 2021 MPP session in second transposition

Audio A.147. Resultant phrase from June 27, 2021 MPP session in third transposition

Figure A.37. Inputs for June 28, 2021 MPP session



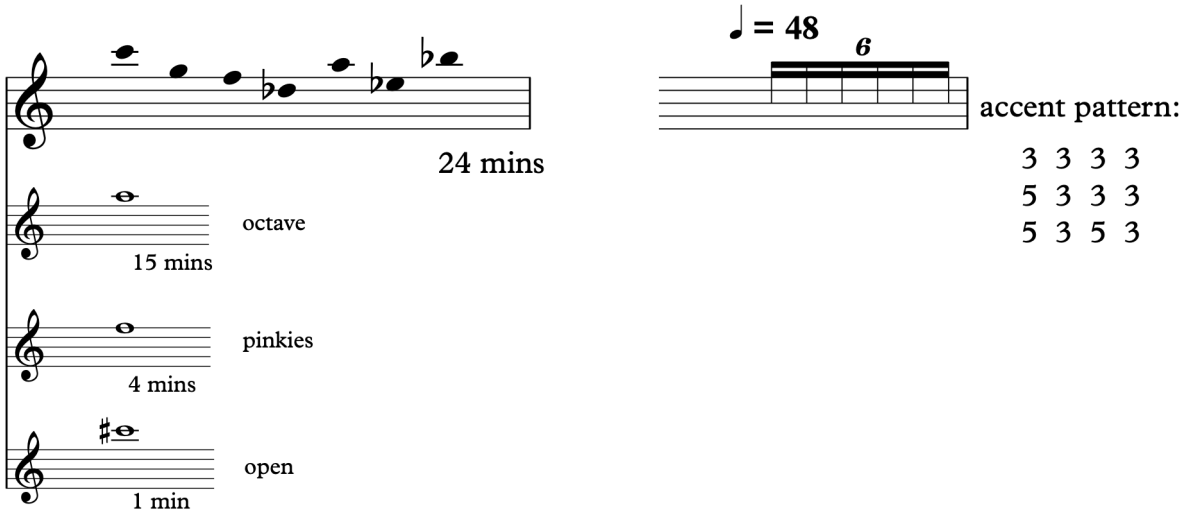
Audio A.148. Resultant phrase from June 28, 2021 MPP session in original key

Audio A.149. Resultant phrase from June 28, 2021 MPP session in first transposition

Audio A.150. Resultant phrase from June 28, 2021 MPP session in second transposition

Audio A.151. Resultant phrase from June 28, 2021 MPP session in third transposition

Figure A.38. Inputs for June 29, 2021 MPP session



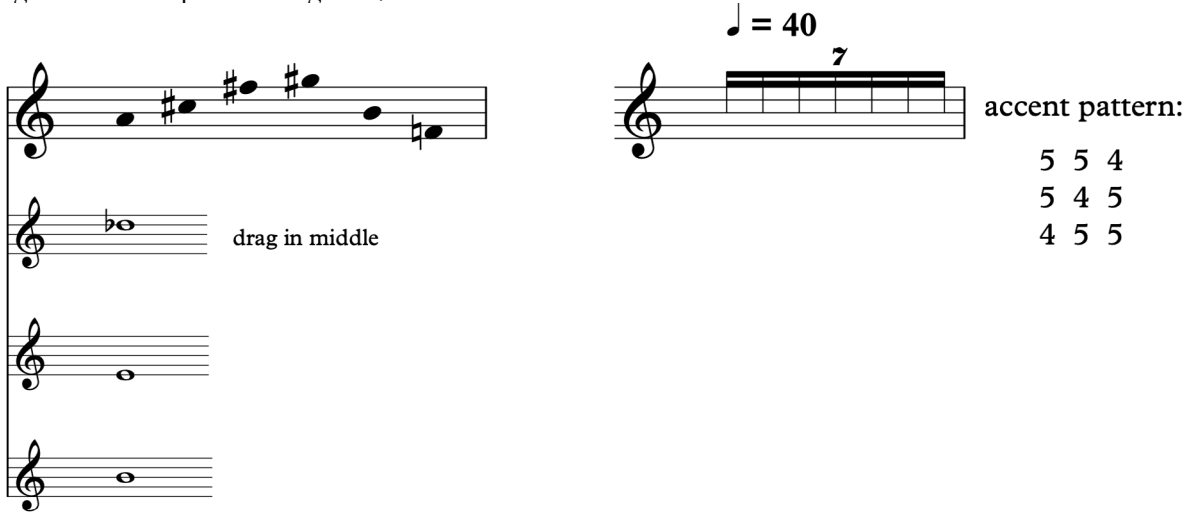
Audio A.152. Resultant phrase from June 29, 2021 MPP session in original key

Audio A.153. Resultant phrase from June 29, 2021 MPP session in first transposition

Audio A.154. Resultant phrase from June 29, 2021 MPP session in second transposition

Audio A.155. Resultant phrase from June 29, 2021 MPP session in third transposition

Figure A.39. Inputs for August 8, 2021 MPP session



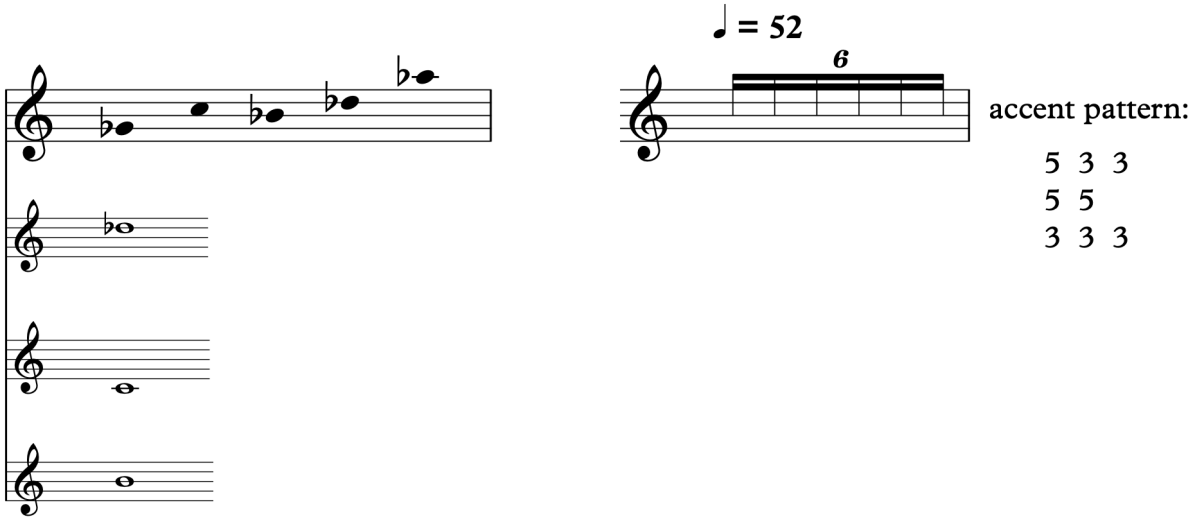
Audio A.156. Resultant phrase from August 8, 2021 MPP session in original key

Audio A.157. Resultant phrase from August 8, 2021 MPP session in first transposition

Audio A.158. Resultant phrase from August 8, 2021 MPP session in second transposition

Audio A.159. Resultant phrase from August 8, 2021 MPP session in third transposition

Figure A.40. Inputs for August 16, 2021 MPP session



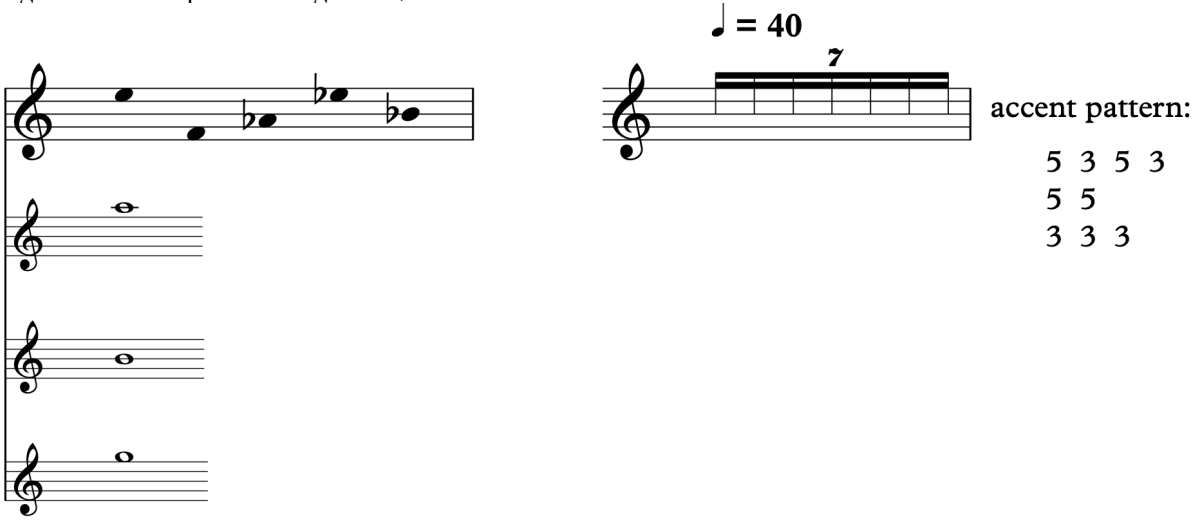
Audio A.160. Resultant phrase from August 16, 2021 MPP session in original key

Audio A.161. Resultant phrase from August 16, 2021 MPP session in first transposition

Audio A.162. Resultant phrase from August 16, 2021 MPP session in second transposition

Audio A.163. Resultant phrase from August 16, 2021 MPP session in third transposition

Figure A.41. Inputs for August 19, 2021 MPP session



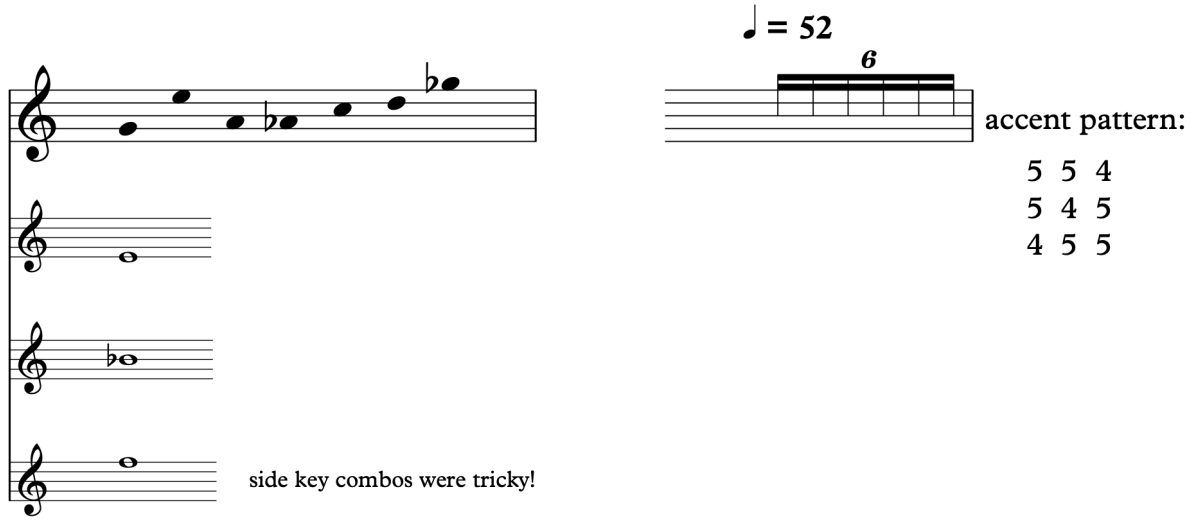
Audio A.164. Resultant phrase from August 19, 2021 MPP session in original key

Audio A.165. Resultant phrase from August 19, 2021 MPP session in first transposition

Audio A.166. Resultant phrase from August 19, 2021 MPP session in second transposition

Audio A.167. Resultant phrase from August 19, 2021 MPP session in third transposition

Figure A.42. Inputs for August 20, 2021 MPP session



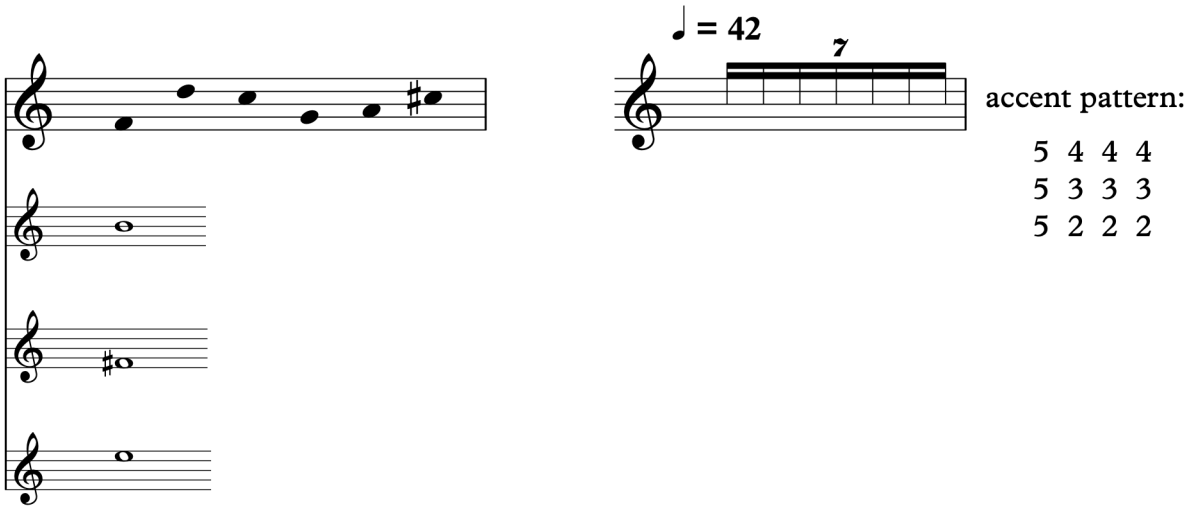
Audio A.168. Resultant phrase from August 20, 2021 MPP session in original key

Audio A.169. Resultant phrase from August 20, 2021 MPP session in first transposition

Audio A.170. Resultant phrase from August 20, 2021 MPP session in second transposition

Audio A.171. Resultant phrase from August 20, 2021 MPP session in third transposition

Figure A.43. Inputs for August 22, 2021 MPP session



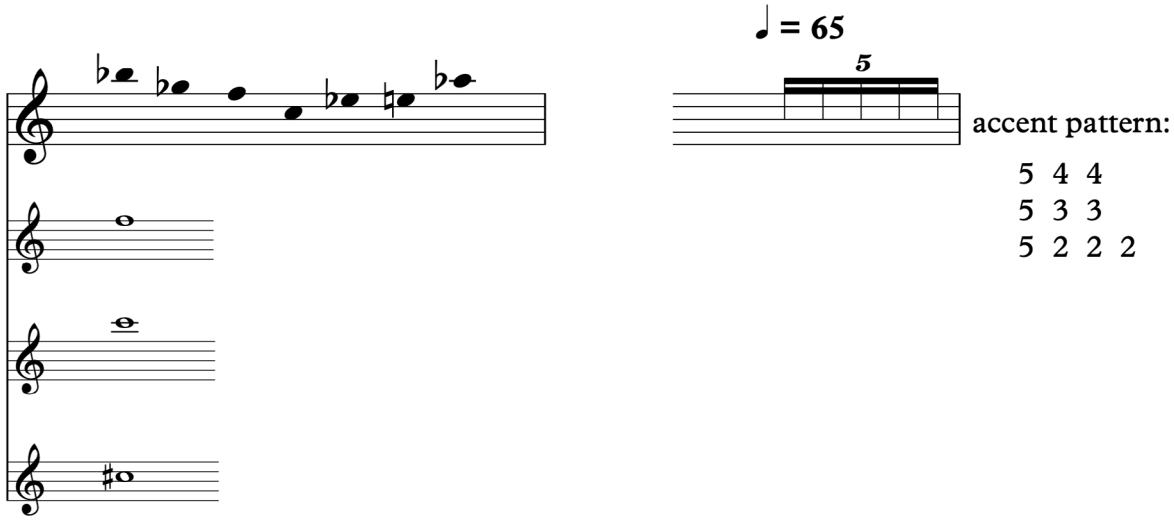
Audio A.172. Resultant phrase from August 22, 2021 MPP session in original key

Audio A.173. Resultant phrase from August 22, 2021 MPP session in first transposition

Audio A.174. Resultant phrase from August 22, 2021 MPP session in second transposition

Audio A.175. Resultant phrase from August 22, 2021 MPP session in third transposition

Figure A.44. Inputs for August 23, 2021 MPP session



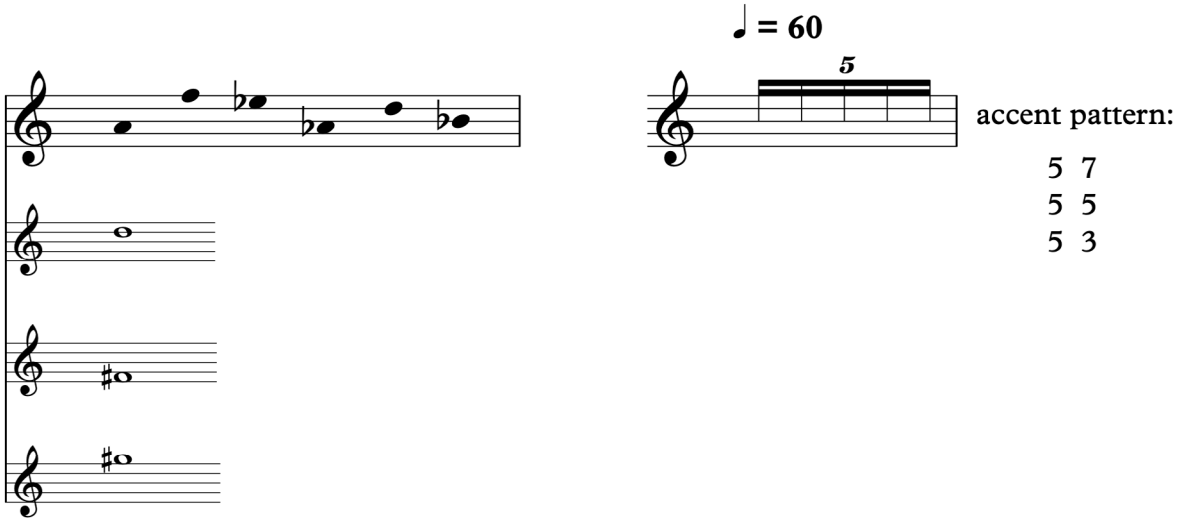
Audio A.176. Resultant phrase from August 23, 2021 MPP session in original key

Audio A.177. Resultant phrase from August 23, 2021 MPP session in first transposition

Audio A.178. Resultant phrase from August 23, 2021 MPP session in second transposition

Audio A.179. Resultant phrase from August 23, 2021 MPP session in third transposition

Figure A.45. Inputs for August 24, 2021 MPP session



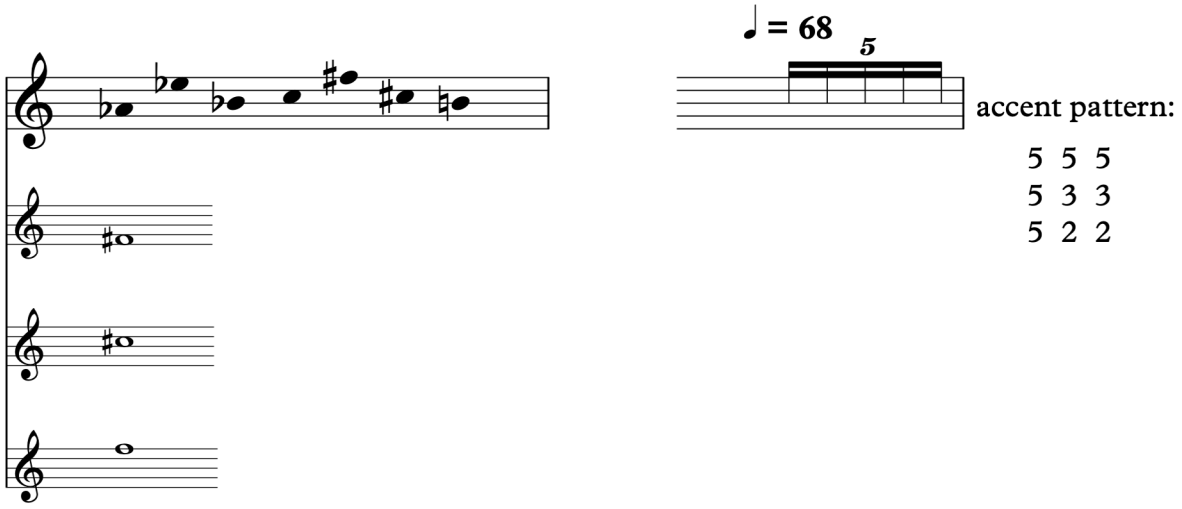
Audio A.180. Resultant phrase from August 24, 2021 MPP session in original key

Audio A.181. Resultant phrase from August 24, 2021 MPP session in first transposition

Audio A.182. Resultant phrase from August 24, 2021 MPP session in second transposition

Audio A.183. Resultant phrase from August 24, 2021 MPP session in third transposition

Figure A.46. Inputs for August 28, 2021 MPP session



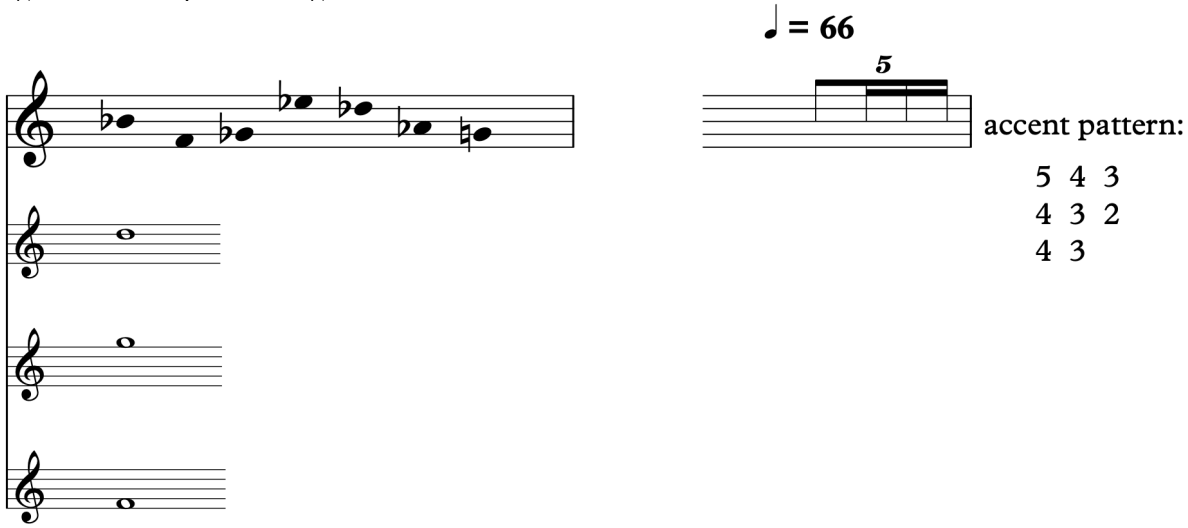
Audio A.184. Resultant phrase from August 28, 2021 MPP session in original key

Audio A.185. Resultant phrase from August 28, 2021 MPP session in first transposition

Audio A.186. Resultant phrase from August 28, 2021 MPP session in second transposition

Audio A.187. Resultant phrase from August 28, 2021 MPP session in third transposition

Figure A.47. Inputs for August 29, 2021 MPP session



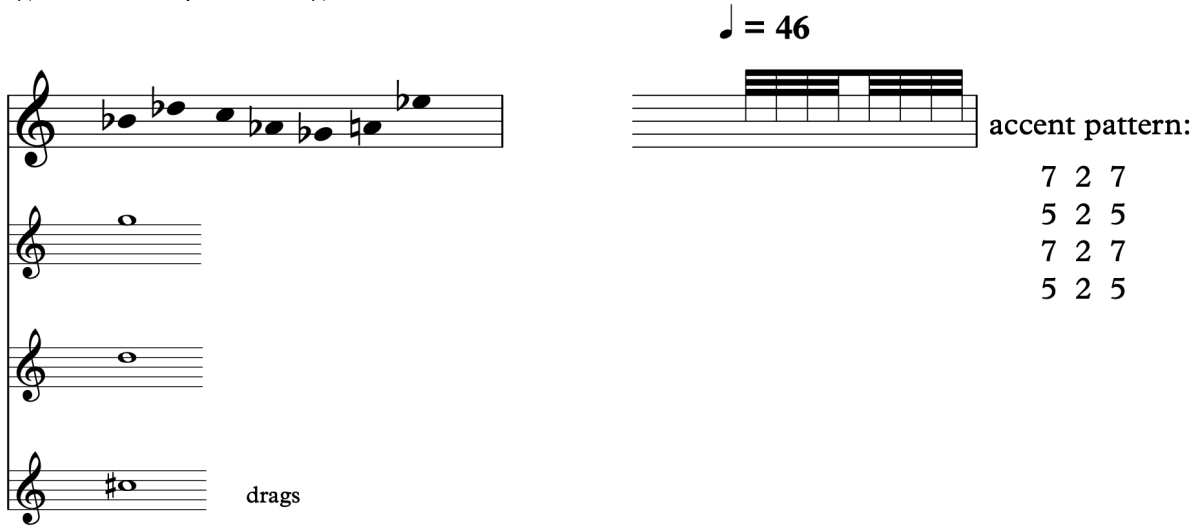
Audio A.188. Resultant phrase from August 29, 2021 MPP session in original key

Audio A.189. Resultant phrase from August 29, 2021 MPP session in first transposition

Audio A.190. Resultant phrase from August 29, 2021 MPP session in second transposition

Audio A.191. Resultant phrase from August 29, 2021 MPP session in third transposition

Figure A.48. Inputs for August 31, 2021 MPP session



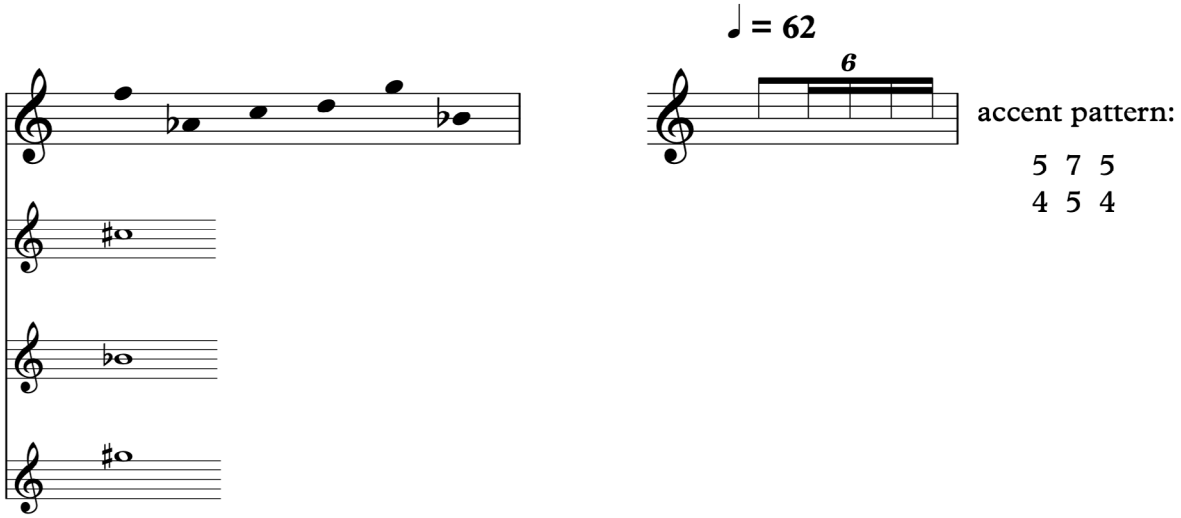
Audio A.192. Resultant phrase from August 31, 2021 MPP session in original key

Audio A.193. Resultant phrase from August 31, 2021 MPP session in first transposition

Audio A.194. Resultant phrase from August 31, 2021 MPP session in second transposition

Audio A.195. Resultant phrase from August 31, 2021 MPP session in third transposition

Figure A.49. Inputs for September 17, 2021 MPP session



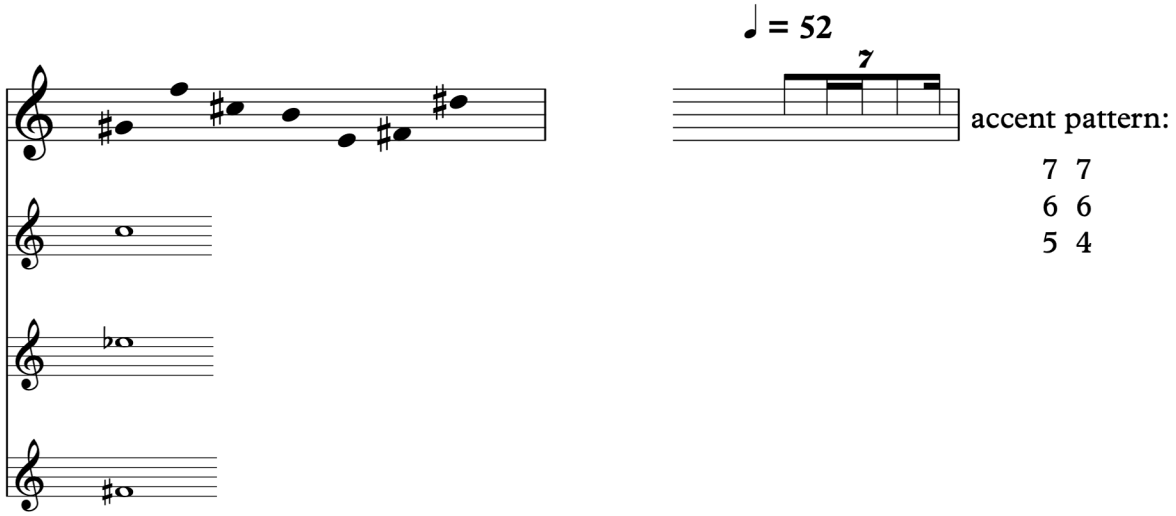
Audio A.196. Resultant phrase from September 17, 2021 MPP session in original key

Audio A.197. Resultant phrase from September 17, 2021 MPP session in first transposition

Audio A.198. Resultant phrase from September 17, 2021 MPP session in second transposition

Audio A.199. Resultant phrase from September 17, 2021 MPP session in third transposition

Figure A.50. Inputs for September 18, 2021 MPP session



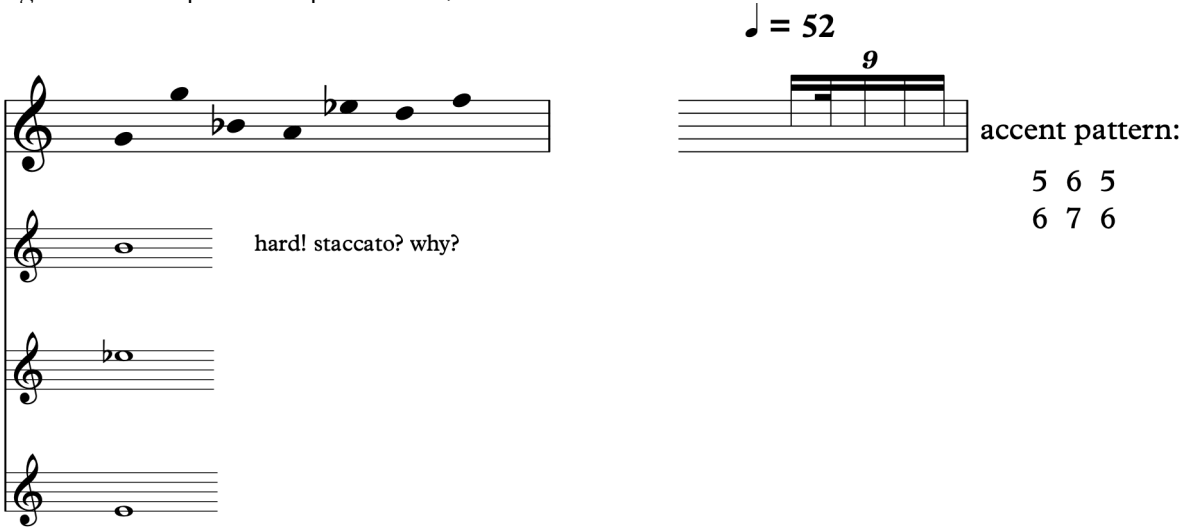
Audio A.200. Resultant phrase from September 18, 2021 MPP session in original key

Audio A.201. Resultant phrase from September 18, 2021 MPP session in first transposition

Audio A.202. Resultant phrase from September 18, 2021 MPP session in second transposition

Audio A.203. Resultant phrase from September 18, 2021 MPP session in third transposition

Figure A.51. Inputs for September 26, 2021 MPP session



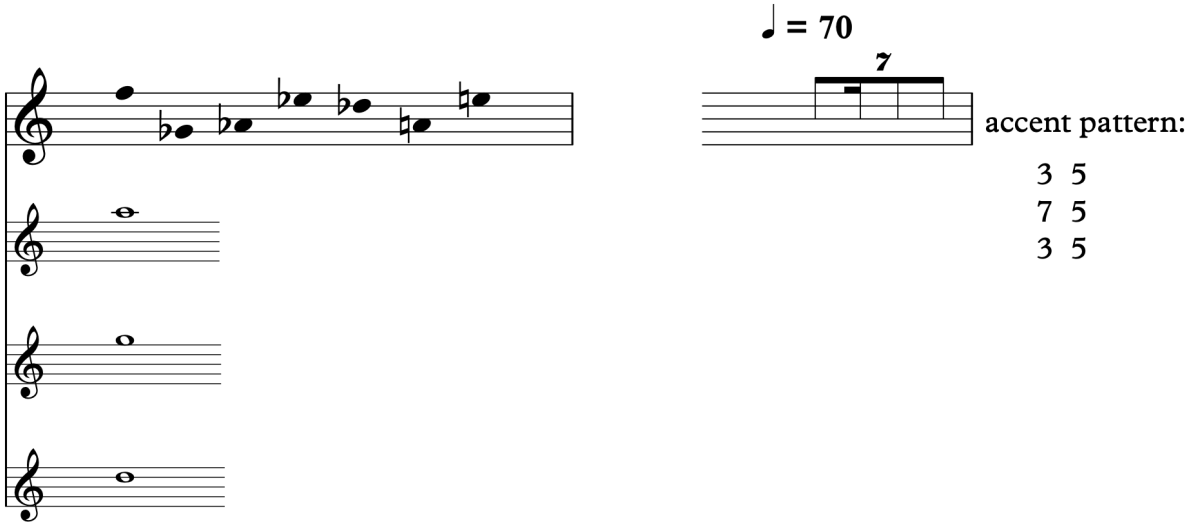
Audio A.204. Resultant phrase from September 26, 2021 MPP session in original key

Audio A.205. Resultant phrase from September 26, 2021 MPP session in first transposition

Audio A.206. Resultant phrase from September 26, 2021 MPP session in second transposition

Audio A.207. Resultant phrase from September 26, 2021 MPP session in third transposition

Figure A.52. Inputs for September 27, 2021 MPP session



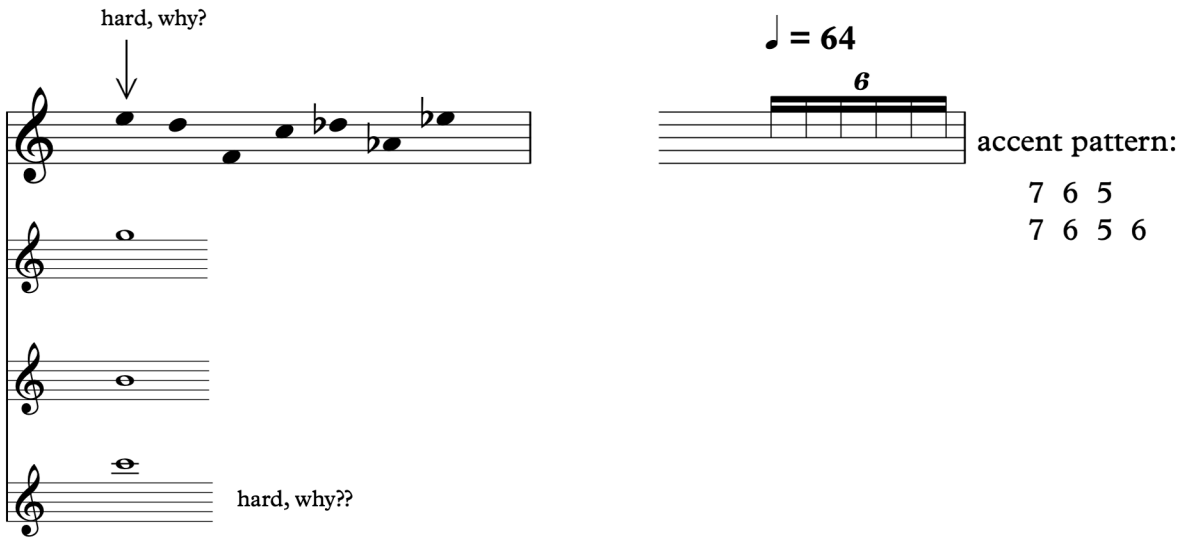
Audio A.208. Resultant phrase from September 27, 2021 MPP session in original key

Audio A.209. Resultant phrase from September 27, 2021 MPP session in first transposition

Audio A.210. Resultant phrase from September 27, 2021 MPP session in second transposition

Audio A.211. Resultant phrase from September 27, 2021 MPP session in third transposition

Figure A.53. Inputs for September 29, 2021 MPP session



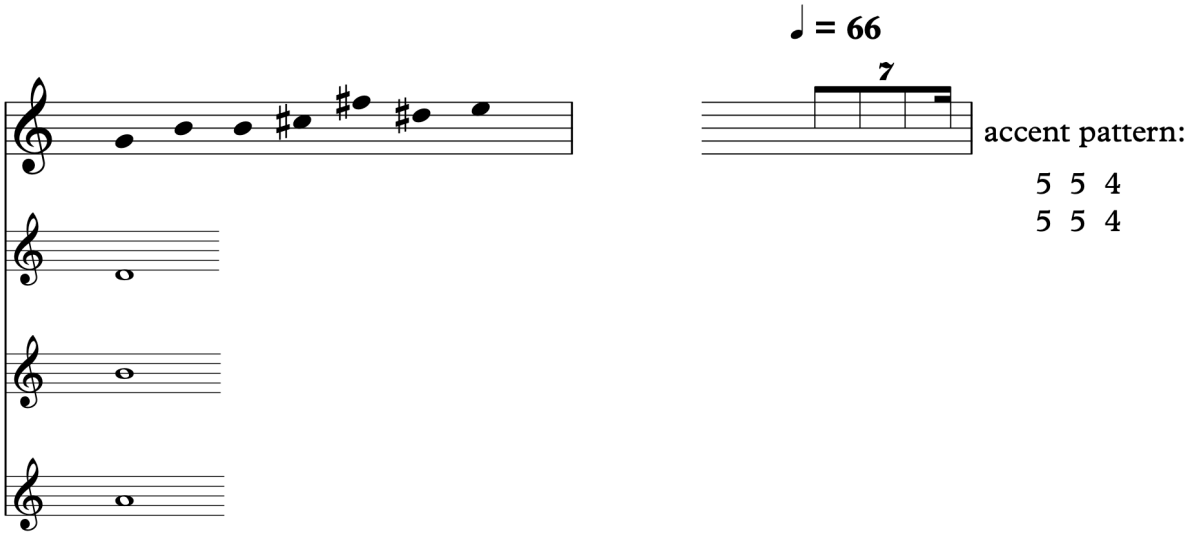
Audio A.212. Resultant phrase from September 29, 2021 MPP session in original key

Audio A.213. Resultant phrase from September 29, 2021 MPP session in first transposition

Audio A.214. Resultant phrase from September 29, 2021 MPP session in second transposition

Audio A.215. Resultant phrase from September 29, 2021 MPP session in third transposition

Figure A.54. Inputs for September 30, 2021 MPP session



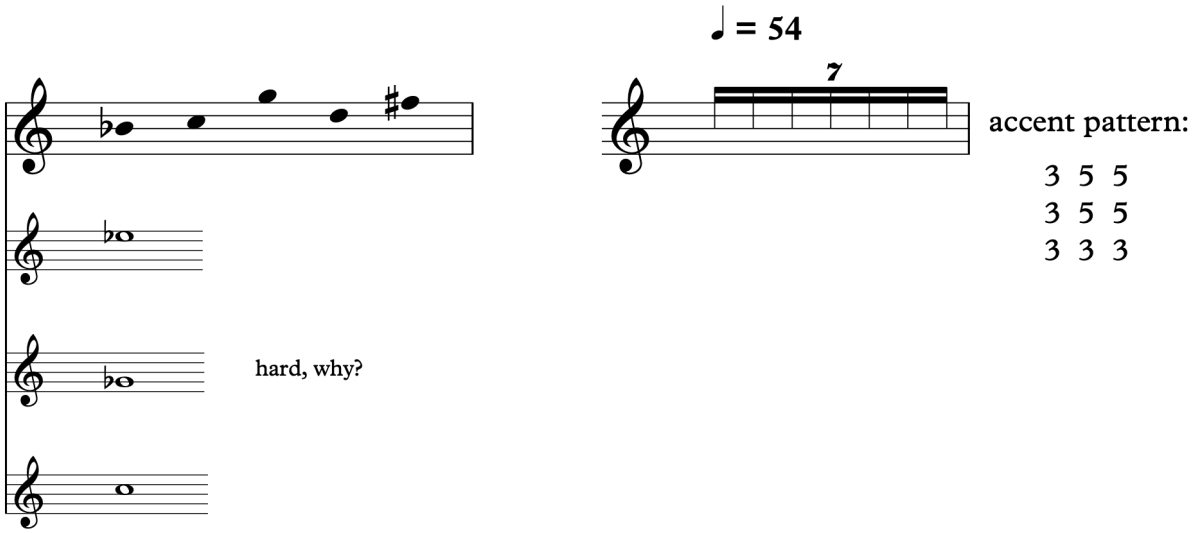
Audio A.216. Resultant phrase from September 30, 2021 MPP session in original key

Audio A.217. Resultant phrase from September 30, 2021 MPP session in first transposition

Audio A.218. Resultant phrase from September 30, 2021 MPP session in second transposition

Audio A.219. Resultant phrase from September 30, 2021 MPP session in third transposition

Figure A.55. Inputs for October 4, 2021 MPP session



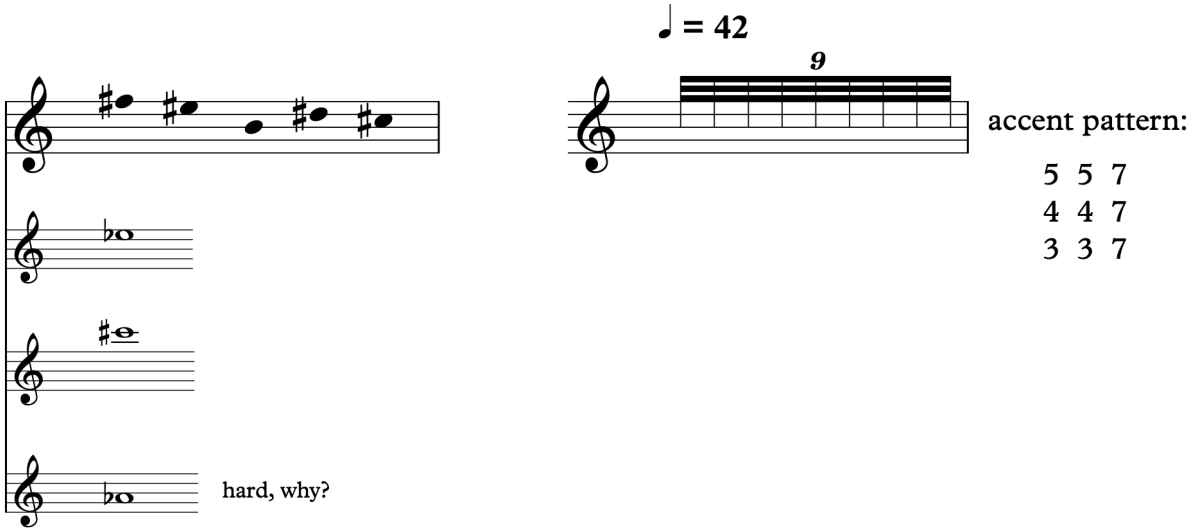
Audio A.220. Resultant phrase from October 4, 2021 MPP session in original key

Audio A.221. Resultant phrase from October 4, 2021 MPP session in first transposition

Audio A.222. Resultant phrase from October 4, 2021 MPP session in second transposition

Audio A.223. Resultant phrase from October 4, 2021 MPP session in third transposition

Figure A.56. Inputs for October 5, 2021 MPP session



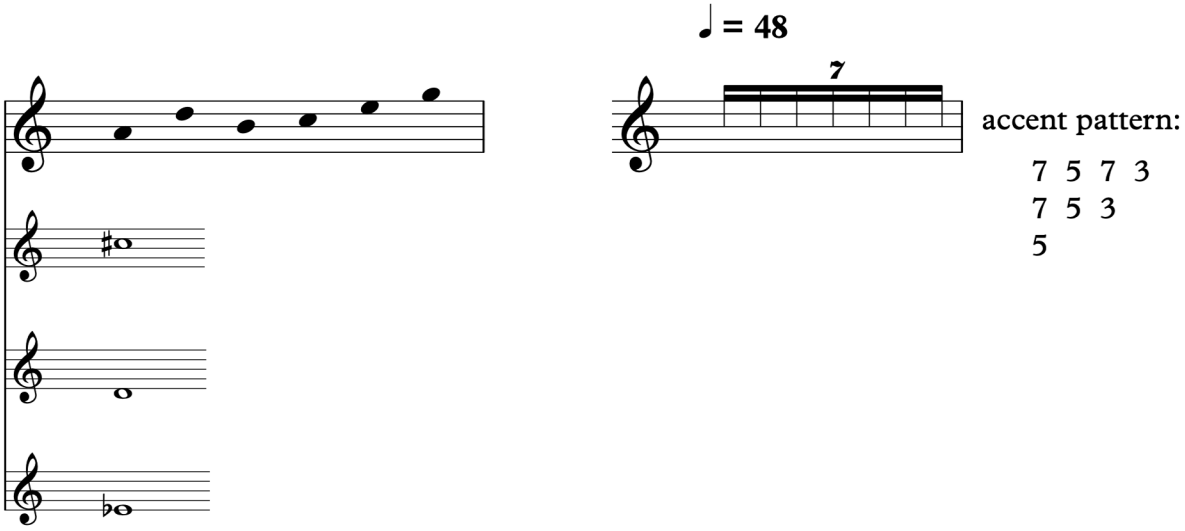
Audio A.224. Resultant phrase from October 5, 2021 MPP session in original key

Audio A.225. Resultant phrase from October 5, 2021 MPP session in first transposition

Audio A.226. Resultant phrase from October 5, 2021 MPP session in second transposition

Audio A.227. Resultant phrase from October 5, 2021 MPP session in third transposition

Figure A.57. Inputs for October 11, 2021 MPP session



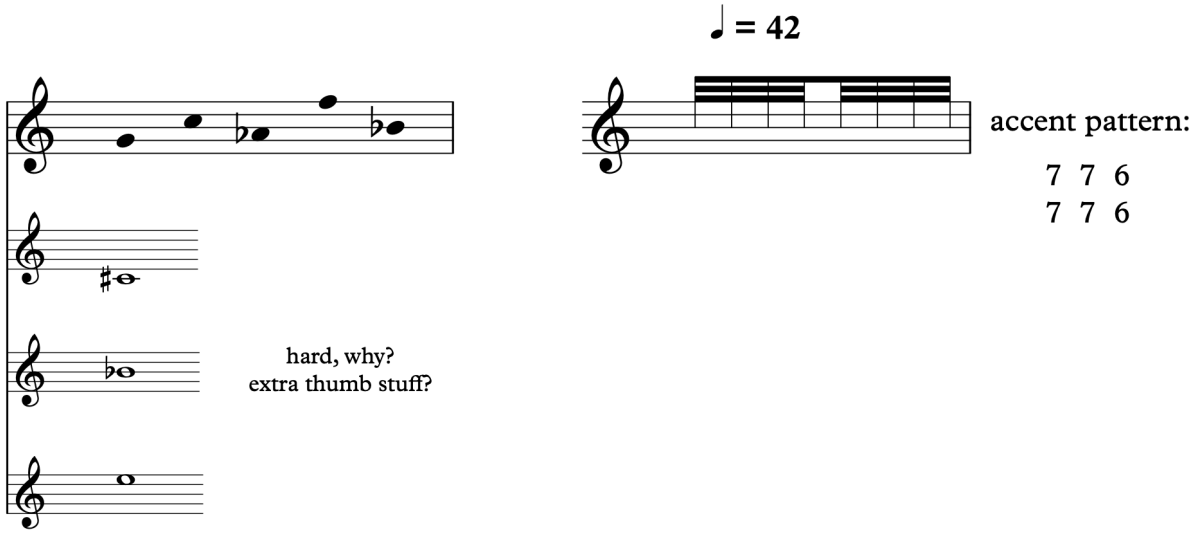
Audio A.228. Resultant phrase from October 11, 2021 MPP session in original key

Audio A.229. Resultant phrase from October 11, 2021 MPP session in first transposition

Audio A.230. Resultant phrase from October 11, 2021 MPP session in second transposition

Audio A.231. Resultant phrase from October 11, 2021 MPP session in third transposition

Figure A.58. Inputs for October 12, 2021 MPP session



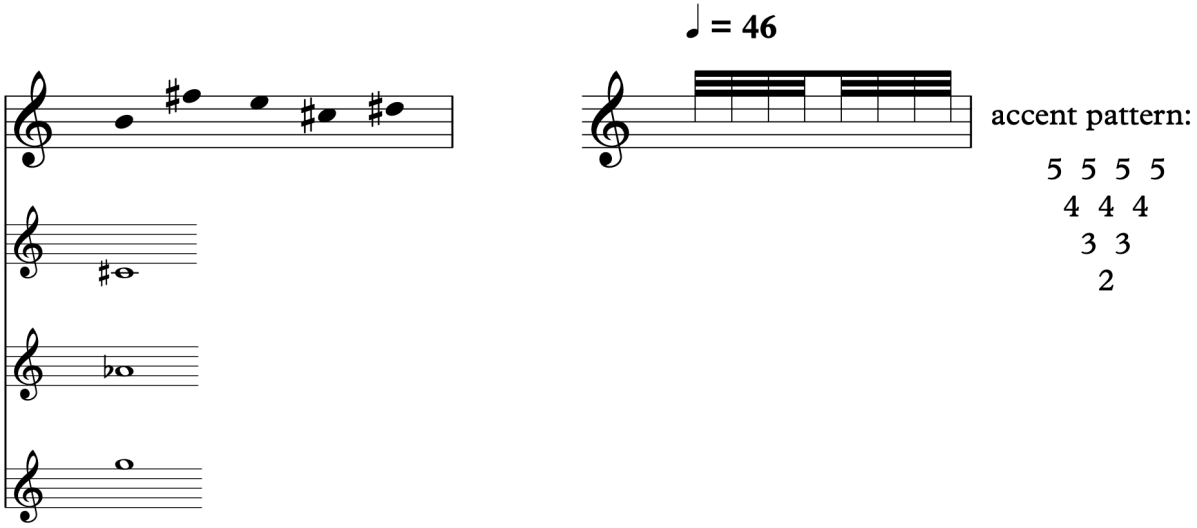
Audio A.232. Resultant phrase from October 12, 2021 MPP session in original key

Audio A.233. Resultant phrase from October 12, 2021 MPP session in first transposition

Audio A.234. Resultant phrase from October 12, 2021 MPP session in second transposition

Audio A.235. Resultant phrase from October 12, 2021 MPP session in third transposition

Figure A.59. Inputs for October 17, 2021 MPP session



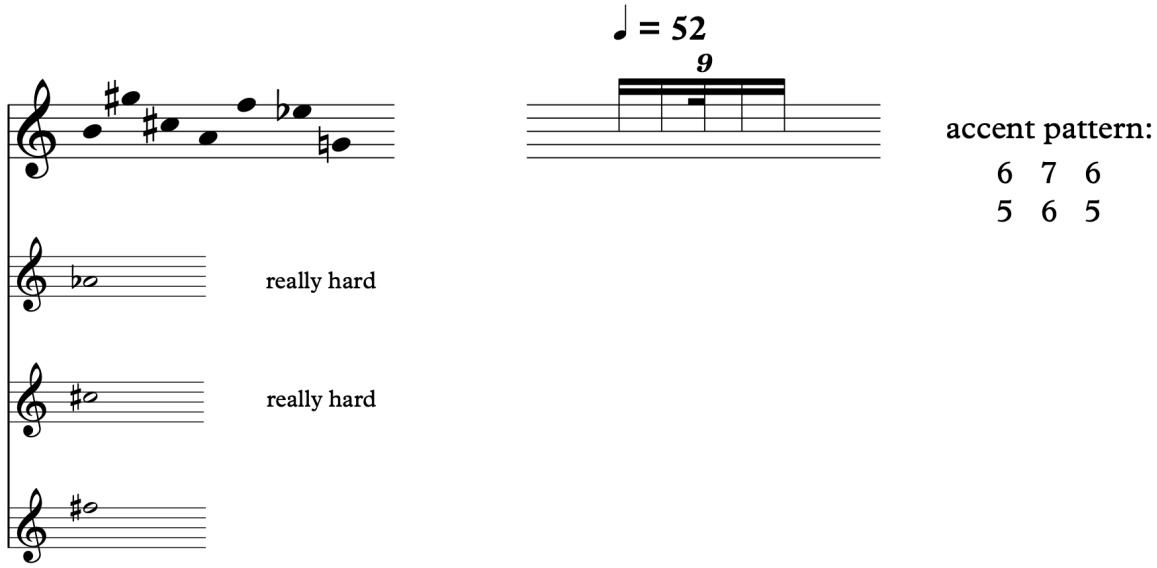
Audio A.236. Resultant phrase from October 17, 2021 MPP session in original key

Audio A.237. Resultant phrase from October 17, 2021 MPP session in first transposition

Audio A.238. Resultant phrase from October 17, 2021 MPP session in second transposition

Audio A.239. Resultant phrase from October 17, 2021 MPP session in third transposition

Figure A.60. Inputs for October 18, 2021 MPP session



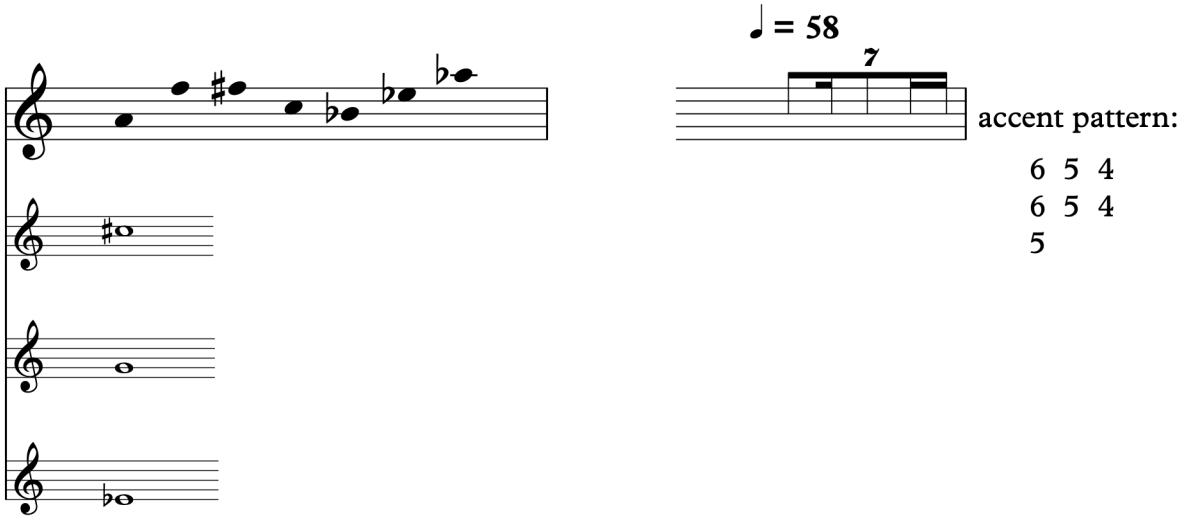
Audio A.240. Resultant phrase from October 18, 2021 MPP session in original key

Audio A.241. Resultant phrase from October 18, 2021 MPP session in first transposition

Audio A.242. Resultant phrase from October 18, 2021 MPP session in second transposition

Audio A.243. Resultant phrase from October 18, 2021 MPP session in third transposition

Figure A.61. Inputs for October 26, 2021 MPP session



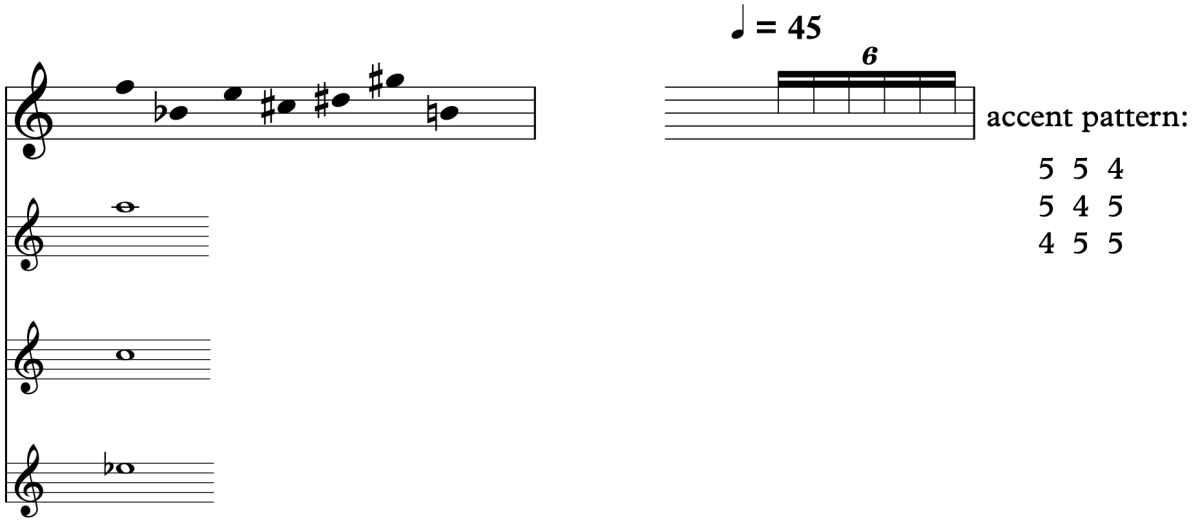
Audio A.244. Resultant phrase from October 26, 2021 MPP session in original key

Audio A.245. Resultant phrase from October 26, 2021 MPP session in first transposition

Audio A.246. Resultant phrase from October 26, 2021 MPP session in second transposition

Audio A.247. Resultant phrase from October 26, 2021 MPP session in third transposition

Figure A.62. Inputs for October 31, 2021 MPP session



Audio A.248. Resultant phrase from October 31, 2021 MPP session in original key

Audio A.249. Resultant phrase from October 31, 2021 MPP session in first transposition

Audio A.250. Resultant phrase from October 31, 2021 MPP session in second transposition

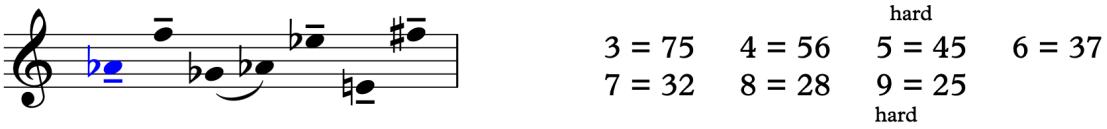
Audio A.251. Resultant phrase from October 31, 2021 MPP session in third transposition

A.2 Phase Two: subdivision recontextualisation sessions

The figures within this section present the inputs for each subdivision recontextualisation session, notated in the format introduced in Section 4.3. The audio examples feature excerpts from the session recordings, presenting one successful rendering of each metrical contextualisation of the phrase being practiced.

Phase Two, Session 1: January 28, 2021

Figure A.63. Inputs for January 28, 2021 Subdivision Recontextualisation session



Audio A.252. Phrase from January 28, 2021 Subdivision Recontextualisation session in triplets

Audio A.253. Phrase from January 28, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.254. Phrase from January 28, 2021 Subdivision Recontextualisation session in quintuplets

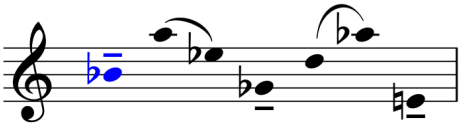
Audio A.255. Phrase from January 28, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.256. Phrase from January 28, 2021 Subdivision Recontextualisation session in septuplets

Audio A.257. Phrase from January 28, 2021 Subdivision Recontextualisation session in octuplets

Audio A.258. Phrase from January 28, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.64. Inputs for February 3, 2021 Subdivision Recontextualisation session



3 = 78 4 = 59 5 = 47 6 = 39
7 = 33 8 = 29 9 = 26

Audio A.259. Phrase from February 3, 2021 Subdivision Recontextualisation session in triplets

Audio A.260. Phrase from February 3, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.261. Phrase from February 3, 2021 Subdivision Recontextualisation session in quintuplets

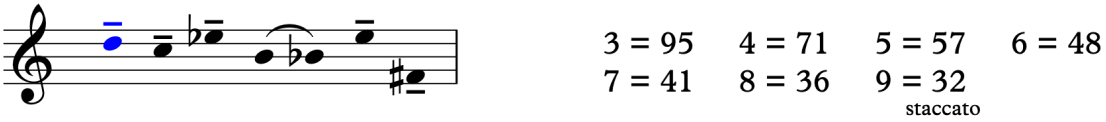
Audio A.262. Phrase from February 3, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.263. Phrase from February 3, 2021 Subdivision Recontextualisation session in septuplets

Audio A.264. Phrase from February 3, 2021 Subdivision Recontextualisation session in octuplets

Audio A.265. Phrase from February 3, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.65. Inputs for February 4, 2021 Subdivision Recontextualisation session



Audio A.266. Phrase from February 4, 2021 Subdivision Recontextualisation session in triplets

Audio A.267. Phrase from February 4, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.268. Phrase from February 4, 2021 Subdivision Recontextualisation session in quintuplets

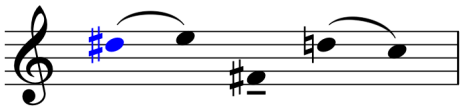
Audio A.269. Phrase from February 4, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.270. Phrase from February 4, 2021 Subdivision Recontextualisation session in septuplets

Audio A.271. Phrase from February 4, 2021 Subdivision Recontextualisation session in octuplets

Audio A.272. Phrase from February 4, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.66. Inputs for April 18, 2021 Subdivision Recontextualisation session, task 1



3 = 103 4 = 81 5 = 62 6 = 52
7 = 44 8 = 39 9 = 34

Audio A.273. Phrase from April 18, 2021 Subdivision Recontextualisation session in triplets

Audio A.274. Phrase from April 18, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.275. Phrase from April 18, 2021 Subdivision Recontextualisation session in quintuplets

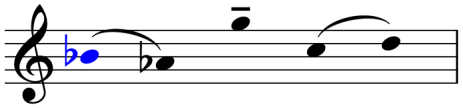
Audio A.276. Phrase from April 18, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.277. Phrase from April 18, 2021 Subdivision Recontextualisation session in septuplets

Audio A.278. Phrase from April 18, 2021 Subdivision Recontextualisation session in octuplets

Audio A.279. Phrase from April 18, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.67. Inputs for April 18, 2021 Subdivision Recontextualisation session, task 2



3 = 103 4 = 81 5 = 62 6 = 52
7 = 44 8 = 39 9 = 34

Audio A.273. Phrase from April 18, 2021 Subdivision Recontextualisation session in triplets

Audio A.274. Phrase from April 18, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.275. Phrase from April 18, 2021 Subdivision Recontextualisation session in quintuplets

Audio A.276. Phrase from April 18, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.277. Phrase from April 18, 2021 Subdivision Recontextualisation session in septuplets

Audio A.278. Phrase from April 18, 2021 Subdivision Recontextualisation session in octuplets

Audio A.279. Phrase from April 18, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.68. Inputs for June 28, 2021 Subdivision Recontextualisation session, task 1

Audio A.280. Phrase from June 28, 2021 Subdivision Recontextualisation session in triplets

Audio A.281. Phrase from June 28, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.282. Phrase from June 28, 2021 Subdivision Recontextualisation session in quintuplets

Audio A.283. Phrase from June 28, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.284. Phrase from June 28, 2021 Subdivision Recontextualisation session in septuplets

Audio A.285. Phrase from June 28, 2021 Subdivision Recontextualisation session in octuplets

Audio A.286. Phrase from June 28, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.69. Inputs for June 28, 2021 Subdivision Recontextualisation session, task 2

Audio A.287. Phrase from June 28, 2021 Subdivision Recontextualisation session in triplets

Audio A.288. Phrase from June 28, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.289. Phrase from June 28, 2021 Subdivision Recontextualisation session in quintuplets

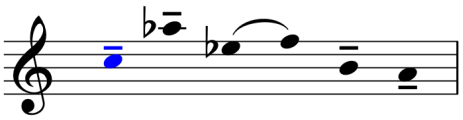
Audio A.290. Phrase from June 28, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.291. Phrase from June 28, 2021 Subdivision Recontextualisation session in septuplets

Audio A.292. Phrase from June 28, 2021 Subdivision Recontextualisation session in octuplets

Audio A.293. Phrase from June 28, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.70. Inputs for July 6, 2021 Subdivision Recontextualisation session



3 = 120 4 = 90 5 = 72 6 = 60
7 = 51 8 = 45 9 = 40

Audio A.294. Phrase from July 6, 2021 Subdivision Recontextualisation session in triplets

Audio A.295. Phrase from July 6, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.296. Phrase from July 6, 2021 Subdivision Recontextualisation session in quintuplets

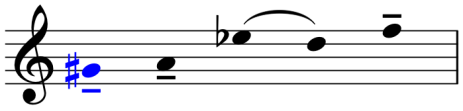
Audio A.297. Phrase from July 6, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.298. Phrase from July 6, 2021 Subdivision Recontextualisation session in septuplets

Audio A.299. Phrase from July 6, 2021 Subdivision Recontextualisation session in octuplets

Audio A.300. Phrase from July 6, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.71. Inputs for July 10, 2021 Subdivision Recontextualisation session



3 = 120 4 = 90 5 = 72 6 = 60
7 = 51 8 = 45 9 = 40

Audio A.301. Phrase from July 10, 2021 Subdivision Recontextualisation session in triplets

Audio A.302. Phrase from July 10, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.303. Phrase from July 10, 2021 Subdivision Recontextualisation session in quintuplets

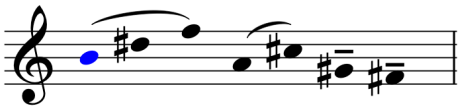
Audio A.304. Phrase from July 10, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.305. Phrase from July 10, 2021 Subdivision Recontextualisation session in septuplets

Audio A.306. Phrase from July 10, 2021 Subdivision Recontextualisation session in octuplets

Audio A.307. Phrase from July 10, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.72. Inputs for July 12, 2021 Subdivision Recontextualisation session, task 1



3 = 105 4 = 79 5 = 63 6 = 53
7 = 45 8 = 39 9 = 35

Audio A.308. Phrase from July 12, 2021 Subdivision Recontextualisation session in triplets

Audio A.309. Phrase from July 12, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.310. Phrase from July 12, 2021 Subdivision Recontextualisation session in quintuplets

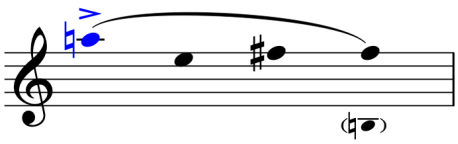
Audio A.311. Phrase from July 12, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.312. Phrase from July 12, 2021 Subdivision Recontextualisation session in septuplets

Audio A.313. Phrase from July 12, 2021 Subdivision Recontextualisation session in octuplets

Audio A.314. Phrase from July 12, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.72. Inputs for July 12, 2021 Subdivision Recontextualisation session, task 2



3 = 128 4 = 96 5 = 77 6 = 64
7 = 55 8 = 48 9 = 43

Audio A.315. Phrase from July 12, 2021 Subdivision Recontextualisation session in triplets

Audio A.316. Phrase from July 12, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.317. Phrase from July 12, 2021 Subdivision Recontextualisation session in quintuplets

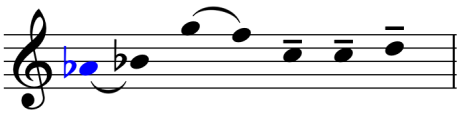
Audio A.318. Phrase from July 12, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.319. Phrase from July 12, 2021 Subdivision Recontextualisation session in septuplets

Audio A.320. Phrase from July 12, 2021 Subdivision Recontextualisation session in octuplets

Audio A.321. Phrase from July 12, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.73. Inputs for July 19, 2021 Subdivision Recontextualisation session



3 = 132 4 = 99 5 = 79 6 = 66
7 = 57 8 = 50 9 = 44

Audio A.322. Phrase from July 19, 2021 Subdivision Recontextualisation session in triplets

Audio A.323. Phrase from July 19, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.324. Phrase from July 19, 2021 Subdivision Recontextualisation session in quintuplets

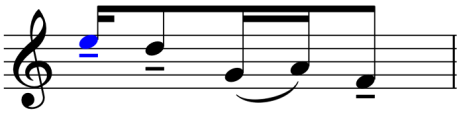
Audio A.325. Phrase from July 19, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.326. Phrase from July 19, 2021 Subdivision Recontextualisation session in septuplets

Audio A.327. Phrase from July 19, 2021 Subdivision Recontextualisation session in octuplets

Audio A.328. Phrase from July 19, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.74. Inputs for July 20, 2021 Subdivision Recontextualisation session



3 = 114 4 = 86 5 = 68 6 = 57
7 = 49 8 = 43 9 = 38

Audio A.329. Phrase from July 20, 2021 Subdivision Recontextualisation session in triplets

Audio A.330. Phrase from July 20, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.331. Phrase from July 20, 2021 Subdivision Recontextualisation session in quintuplets

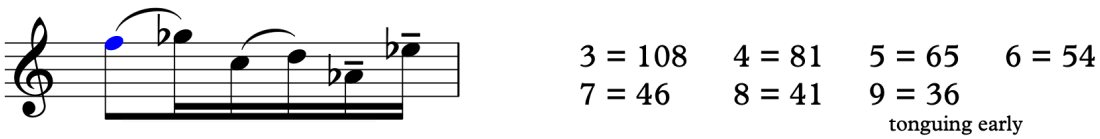
Audio A.332. Phrase from July 20, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.333. Phrase from July 20, 2021 Subdivision Recontextualisation session in septuplets

Audio A.334. Phrase from July 20, 2021 Subdivision Recontextualisation session in octuplets

Audio A.335. Phrase from July 20, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.75. Inputs for July 23, 2021 Subdivision Recontextualisation session



Audio A.336. Phrase from July 23, 2021 Subdivision Recontextualisation session in triplets

Audio A.337. Phrase from July 23, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.338. Phrase from July 23, 2021 Subdivision Recontextualisation session in quintuplets

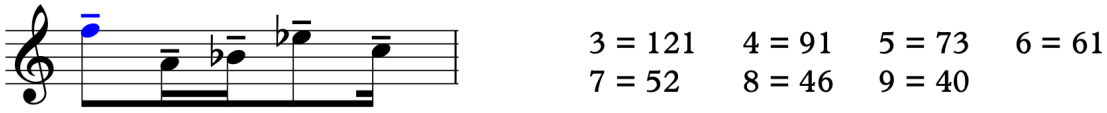
Audio A.339. Phrase from July 23, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.340. Phrase from July 23, 2021 Subdivision Recontextualisation session in septuplets

Audio A.341. Phrase from July 23, 2021 Subdivision Recontextualisation session in octuplets

Audio A.342. Phrase from July 23, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.76. Inputs for August 2, 2021 Subdivision Recontextualisation session



Audio A.343. Phrase from August 2, 2021 Subdivision Recontextualisation session in triplets

Audio A.344. Phrase from August 2, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.345. Phrase from August 2, 2021 Subdivision Recontextualisation session in quintuplets

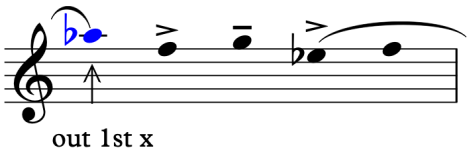
Audio A.346. Phrase from August 2, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.347. Phrase from August 2, 2021 Subdivision Recontextualisation session in septuplets

Audio A.348. Phrase from August 2, 2021 Subdivision Recontextualisation session in octuplets

Audio A.349. Phrase from August 2, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.77. Inputs for August 3, 2021 Subdivision Recontextualisation session



3 = 116 4 = 87 5 = 70 6 = 58
7 = 50 8 = 44 9 = 39

Audio A.350. Phrase from August 3, 2021 Subdivision Recontextualisation session in triplets

Audio A.351. Phrase from August 3, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.352. Phrase from August 3, 2021 Subdivision Recontextualisation session in quintuplets

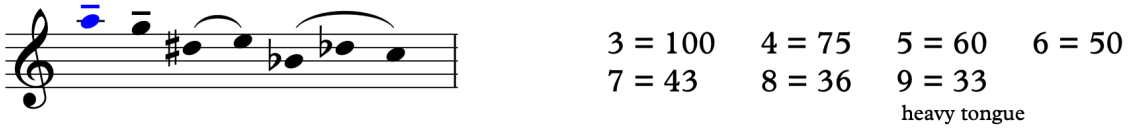
Audio A.353. Phrase from August 3, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.354. Phrase from August 3, 2021 Subdivision Recontextualisation session in septuplets

Audio A.355. Phrase from August 3, 2021 Subdivision Recontextualisation session in octuplets

Audio A.356. Phrase from August 3, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.78. Inputs for August 6, 2021 Subdivision Recontextualisation session



Audio A.357. Phrase from August 6, 2021 Subdivision Recontextualisation session in triplets

Audio A.358. Phrase from August 6, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.359. Phrase from August 6, 2021 Subdivision Recontextualisation session in quintuplets

Audio A.360. Phrase from August 6, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.361. Phrase from August 6, 2021 Subdivision Recontextualisation session in septuplets

Audio A.362. Phrase from August 6, 2021 Subdivision Recontextualisation session in octuplets

Audio A.363. Phrase from August 6, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.79. Inputs for August 16, 2021 Subdivision Recontextualisation session

3 = 120 4 = 90 5 = 72 6 = 60
7 = 51 8 = 45 9 = 40

Audio A.364. Phrase from August 16, 2021 Subdivision Recontextualisation session in triplets

Audio A.365. Phrase from August 16, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.366. Phrase from August 16, 2021 Subdivision Recontextualisation session in quintuplets

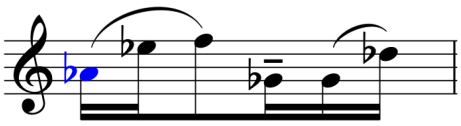
Audio A.367. Phrase from August 16, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.368. Phrase from August 16, 2021 Subdivision Recontextualisation session in septuplets

Audio A.369. Phrase from August 16, 2021 Subdivision Recontextualisation session in octuplets

Audio A.370. Phrase from August 16, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.80. Inputs for August 20, 2021 Subdivision Recontextualisation session



3 = 112 4 = 84 5 = 67 6 = 56
7 = 48 8 = 42 9 = 37

Audio A.371. Phrase from August 20, 2021 Subdivision Recontextualisation session in triplets

Audio A.372. Phrase from August 20, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.373. Phrase from August 20, 2021 Subdivision Recontextualisation session in quintuplets

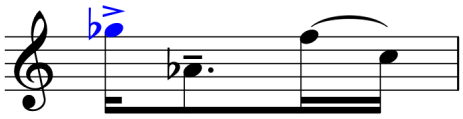
Audio A.374. Phrase from August 20, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.375. Phrase from August 20, 2021 Subdivision Recontextualisation session in septuplets

Audio A.376. Phrase from August 20, 2021 Subdivision Recontextualisation session in octuplets

Audio A.377. Phrase from August 20, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.81. Inputs for August 22, 2021 Subdivision Recontextualisation session



3 = 128 4 = 96 5 = 77 6 = 64
7 = 55 8 = 48 9 = 43

Audio A.378. Phrase from August 22, 2021 Subdivision Recontextualisation session in triplets

Audio A.379. Phrase from August 22, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.380. Phrase from August 22, 2021 Subdivision Recontextualisation session in quintuplets

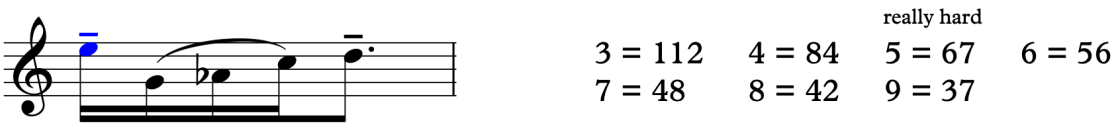
Audio A.381. Phrase from August 22, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.382. Phrase from August 22, 2021 Subdivision Recontextualisation session in septuplets

Audio A.383. Phrase from August 22, 2021 Subdivision Recontextualisation session in octuplets

Audio A.384. Phrase from August 22, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.82. Inputs for August 23, 2021 Subdivision Recontextualisation session



Audio A.385. Phrase from August 23, 2021 Subdivision Recontextualisation session in triplets

Audio A.386. Phrase from August 23, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.387. Phrase from August 23, 2021 Subdivision Recontextualisation session in quintuplets

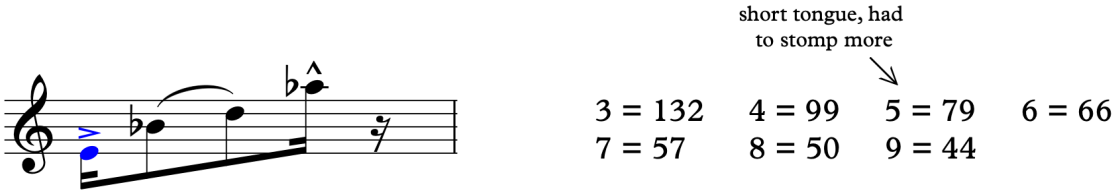
Audio A.388. Phrase from August 23, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.389. Phrase from August 23, 2021 Subdivision Recontextualisation session in septuplets

Audio A.390. Phrase from August 23, 2021 Subdivision Recontextualisation session in octuplets

Audio A.391. Phrase from August 23, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.83. Inputs for August 24, 2021 Subdivision Recontextualisation session



Audio A.392. Phrase from August 24, 2021 Subdivision Recontextualisation session in triplets

Audio A.393. Phrase from August 24, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.394. Phrase from August 24, 2021 Subdivision Recontextualisation session in quintuplets

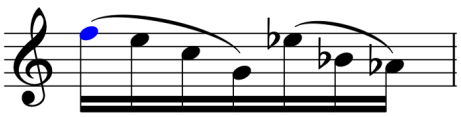
Audio A.395. Phrase from August 24, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.396. Phrase from August 24, 2021 Subdivision Recontextualisation session in septuplets

Audio A.397. Phrase from August 24, 2021 Subdivision Recontextualisation session in octuplets

Audio A.398. Phrase from August 24, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.84. Inputs for August 28, 2021 Subdivision Recontextualisation session



3 = 120 4 = 90 5 = 72 6 = 60
7 = 51 8 = 45 9 = 40

Audio A.399. Phrase from August 28, 2021 Subdivision Recontextualisation session in triplets

Audio A.400. Phrase from August 28, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.401. Phrase from August 28, 2021 Subdivision Recontextualisation session in quintuplets

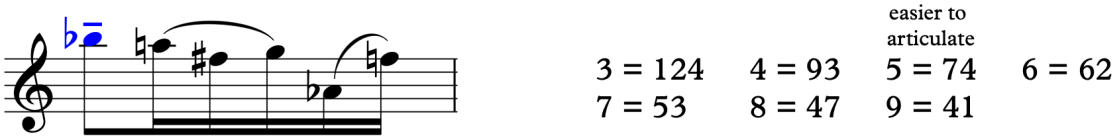
Audio A.402. Phrase from August 28, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.403. Phrase from August 28, 2021 Subdivision Recontextualisation session in septuplets

Audio A.404. Phrase from August 28, 2021 Subdivision Recontextualisation session in octuplets

Audio A.405. Phrase from August 28, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.85. Inputs for August 30, 2021 Subdivision Recontextualisation session



Audio A.406. Phrase from August 30, 2021 Subdivision Recontextualisation session in triplets

Audio A.407. Phrase from August 30, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.408. Phrase from August 30, 2021 Subdivision Recontextualisation session in quintuplets

Audio A.409. Phrase from August 30, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.410. Phrase from August 30, 2021 Subdivision Recontextualisation session in septuplets

Audio A.411. Phrase from August 30, 2021 Subdivision Recontextualisation session in octuplets

Audio A.412. Phrase from August 30, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.86. Inputs for September 2, 2021 Subdivision Recontextualisation session

3 = 126 4 = 95 5 = 76 6 = 63
7 = 54 8 = 47 9 = 42

Audio A.413. Phrase from September 2, 2021 Subdivision Recontextualisation session in triplets

Audio A.414. Phrase from September 2, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.415. Phrase from September 2, 2021 Subdivision Recontextualisation session in quintuplets

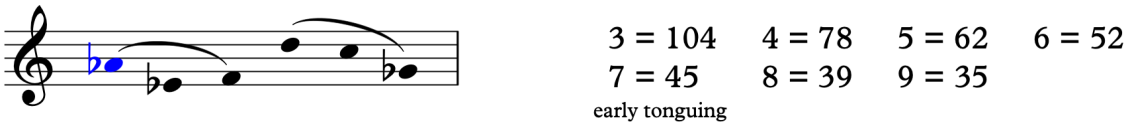
Audio A.416. Phrase from September 2, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.417. Phrase from September 2, 2021 Subdivision Recontextualisation session in septuplets

Audio A.418. Phrase from September 2, 2021 Subdivision Recontextualisation session in octuplets

Audio A.419. Phrase from September 2, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.87. Inputs for September 4, 2021 Subdivision Recontextualisation session



Audio A.420. Phrase from September 4, 2021 Subdivision Recontextualisation session in triplets

Audio A.421. Phrase from September 4, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.422. Phrase from September 4, 2021 Subdivision Recontextualisation session in quintuplets

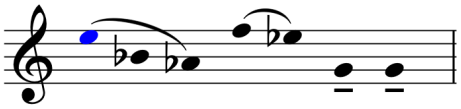
Audio A.423. Phrase from September 4, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.424. Phrase from September 4, 2021 Subdivision Recontextualisation session in septuplets

Audio A.425. Phrase from September 4, 2021 Subdivision Recontextualisation session in octuplets

Audio A.426. Phrase from September 4, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.88. Inputs for September 11, 2021 Subdivision Recontextualisation session



3 = 106 4 = 80 5 = 63 6 = 53
7 = 45 8 = 40 9 = 35

Audio A.427. Phrase from September 11, 2021 Subdivision Recontextualisation session in triplets

Audio A.428. Phrase from September 11, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.429. Phrase from September 11, 2021 Subdivision Recontextualisation session in quintuplets

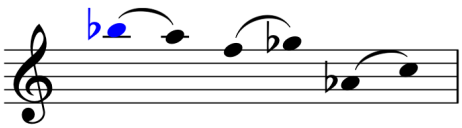
Audio A.430. Phrase from September 11, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.431. Phrase from September 11, 2021 Subdivision Recontextualisation session in septuplets

Audio A.432. Phrase from September 11, 2021 Subdivision Recontextualisation session in octuplets

Audio A.433. Phrase from September 11, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.89. Inputs for September 23, 2021 Subdivision Recontextualisation session



3 = 120 4 = 90 5 = 72 6 = 60
7 = 51 8 = 45 9 = 40

Audio A.434. Phrase from September 23, 2021 Subdivision Recontextualisation session in triplets

Audio A.435. Phrase from September 23, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.436. Phrase from September 23, 2021 Subdivision Recontextualisation session in quintuplets

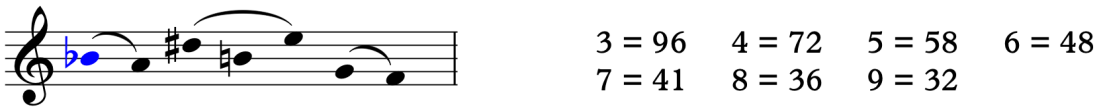
Audio A.437. Phrase from September 23, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.438. Phrase from September 23, 2021 Subdivision Recontextualisation session in septuplets

Audio A.439. Phrase from September 23, 2021 Subdivision Recontextualisation session in octuplets

Audio A.440. Phrase from September 23, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.90. Inputs for September 26, 2021 Subdivision Recontextualisation session



Audio A.441. Phrase from September 26, 2021 Subdivision Recontextualisation session in triplets

Audio A.442. Phrase from September 26, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.443. Phrase from September 26, 2021 Subdivision Recontextualisation session in quintuplets

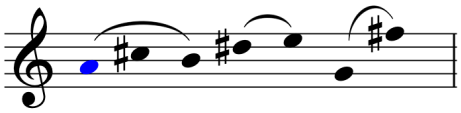
Audio A.444. Phrase from September 26, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.445. Phrase from September 26, 2021 Subdivision Recontextualisation session in septuplets

Audio A.446. Phrase from September 26, 2021 Subdivision Recontextualisation session in octuplets

Audio A.447. Phrase from September 26, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.91. Inputs for September 28, 2021 Subdivision Recontextualisation session



3 = 112 4 = 84 5 = 67 6 = 56
7 = 48 8 = 42 9 = 37

Audio A.448. Phrase from September 28, 2021 Subdivision Recontextualisation session in triplets

Audio A.449. Phrase from September 28, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.450. Phrase from September 28, 2021 Subdivision Recontextualisation session in quintuplets

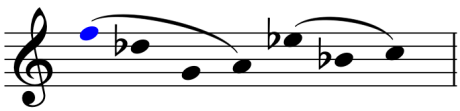
Audio A.451. Phrase from September 28, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.452. Phrase from September 28, 2021 Subdivision Recontextualisation session in septuplets

Audio A.453. Phrase from September 28, 2021 Subdivision Recontextualisation session in octuplets

Audio A.454. Phrase from September 28, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.92. Inputs for September 29, 2021 Subdivision Recontextualisation session



3 = 112 4 = 84 5 = 67 6 = 56
7 = 48 8 = 42 9 = 37

Audio A.455. Phrase from September 29, 2021 Subdivision Recontextualisation session in triplets

Audio A.456. Phrase from September 29, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.457. Phrase from September 29, 2021 Subdivision Recontextualisation session in quintuplets

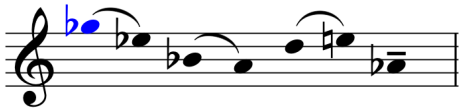
Audio A.458. Phrase from September 29, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.459. Phrase from September 29, 2021 Subdivision Recontextualisation session in septuplets

Audio A.460. Phrase from September 29, 2021 Subdivision Recontextualisation session in octuplets

Audio A.461. Phrase from September 29, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.93. Inputs for October 5, 2021 Subdivision Recontextualisation session



3 = 102 4 = 77 5 = 61 6 = 51
7 = 44 8 = 38 9 = 34

Audio A.462. Phrase from October 5, 2021 Subdivision Recontextualisation session in triplets

Audio A.463. Phrase from October 5, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.464. Phrase from October 5, 2021 Subdivision Recontextualisation session in quintuplets

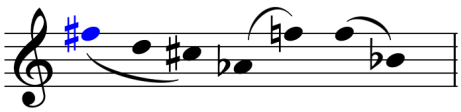
Audio A.465. Phrase from October 5, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.466. Phrase from October 5, 2021 Subdivision Recontextualisation session in septuplets

Audio A.467. Phrase from October 5, 2021 Subdivision Recontextualisation session in octuplets

Audio A.468. Phrase from October 5, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.94. Inputs for October 10, 2021 Subdivision Recontextualisation session



3 = 106 4 = 80 5 = 67 6 = 53
7 = 45 8 = 40 9 = 35

Audio A.469. Phrase from October 10, 2021 Subdivision Recontextualisation session in triplets

Audio A.470. Phrase from October 10, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.471. Phrase from October 10, 2021 Subdivision Recontextualisation session in quintuplets

Audio A.472. Phrase from October 10, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.473. Phrase from October 10, 2021 Subdivision Recontextualisation session in septuplets

Audio A.474. Phrase from October 10, 2021 Subdivision Recontextualisation session in octuplets

Audio A.475. Phrase from October 10, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.95. Inputs for October 12, 2021 Subdivision Recontextualisation session

Audio A.476. Phrase from October 12, 2021 Subdivision Recontextualisation session in triplets

Audio A.477. Phrase from October 12, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.478. Phrase from October 12, 2021 Subdivision Recontextualisation session in quintuplets

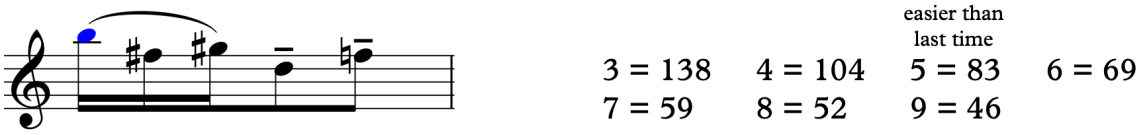
Audio A.479. Phrase from October 12, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.480. Phrase from October 12, 2021 Subdivision Recontextualisation session in septuplets

Audio A.481. Phrase from October 12, 2021 Subdivision Recontextualisation session in octuplets

Audio A.482. Phrase from October 12, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.96. Inputs for October 16, 2021 Subdivision Recontextualisation session



Audio A.483. Phrase from October 16, 2021 Subdivision Recontextualisation session in triplets

Audio A.484. Phrase from October 16, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.485. Phrase from October 16, 2021 Subdivision Recontextualisation session in quintuplets

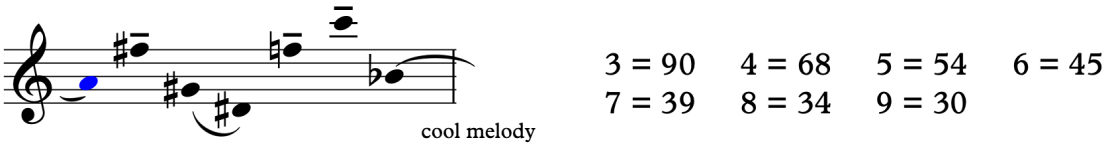
Audio A.486. Phrase from October 16, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.487. Phrase from October 16, 2021 Subdivision Recontextualisation session in septuplets

Audio A.488. Phrase from October 16, 2021 Subdivision Recontextualisation session in octuplets

Audio A.489. Phrase from October 16, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.97. Inputs for October 18, 2021 Subdivision Recontextualisation session



Audio A.490. Phrase from October 18, 2021 Subdivision Recontextualisation session in triplets

Audio A.491. Phrase from October 18, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.492. Phrase from October 18, 2021 Subdivision Recontextualisation session in quintuplets

Audio A.493. Phrase from October 18, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.494. Phrase from October 18, 2021 Subdivision Recontextualisation session in septuplets

Audio A.495. Phrase from October 18, 2021 Subdivision Recontextualisation session in octuplets

Audio A.496. Phrase from October 18, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.98. Inputs for October 22, 2021 Subdivision Recontextualisation session

3 = 112 4 = 84 5 = 67 6 = 56
7 = 48 8 = 42 9 = 37

Audio A.497. Phrase from October 22, 2021 Subdivision Recontextualisation session in triplets

Audio A.498. Phrase from October 22, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.499. Phrase from October 22, 2021 Subdivision Recontextualisation session in quintuplets

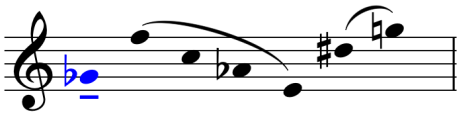
Audio A.500. Phrase from October 22, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.501. Phrase from October 22, 2021 Subdivision Recontextualisation session in septuplets

Audio A.502. Phrase from October 22, 2021 Subdivision Recontextualisation session in octuplets

Audio A.503. Phrase from October 22, 2021 Subdivision Recontextualisation session in nonuplets

Figure A.99. Inputs for October 31, 2021 Subdivision Recontextualisation session



3 = 104 4 = 78 5 = 62 6 = 52
7 = 45 8 = 39 9 = 35

Audio A.504. Phrase from October 31, 2021 Subdivision Recontextualisation session in triplets

Audio A.505. Phrase from October 31, 2021 Subdivision Recontextualisation session in semiquavers

Audio A.506. Phrase from October 31, 2021 Subdivision Recontextualisation session in quintuplets

Audio A.507. Phrase from October 31, 2021 Subdivision Recontextualisation session in sextuplets

Audio A.508. Phrase from October 31, 2021 Subdivision Recontextualisation session in septuplets

Audio A.509. Phrase from October 31, 2021 Subdivision Recontextualisation session in octuplets

Audio A.510. Phrase from October 31, 2021 Subdivision Recontextualisation session in nonuplets

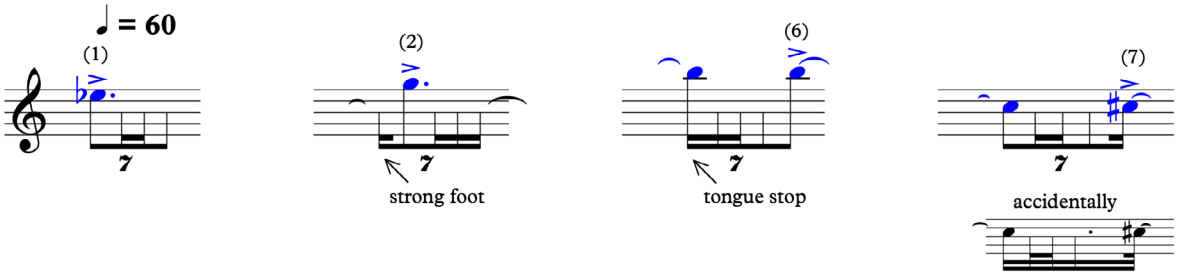
A.3 Phase Three: metrical positioning shifting sessions

The figures within this section present the inputs for each metrical positioning shifting session, notated in the format introduced in Section 4.4. During every Phase Three session, all seven metrical positionings of a phrase were practiced. However, the notational record keeping I utilised within my practice diary only included the prime form of a phrase and metrical positionings that introduced acute instability to my playing. The metrical positionings not included in each of these figures were still practiced, but they did not present notable perturbations during the learning process, and are thus omitted here.

The audio examples feature complete session recordings, with the exception of minor edits that removed lengthy silences (occurring while I wrote practice notes in my diary) and removed moments when I verbalised thoughts unrelated to the practice. All other passages of the practice sessions are included in the recordings.

Phase Three, Session 1: August 3, 2021

Figure A.100. Inputs for August 3, 2021 Metrical Positioning Shifting session

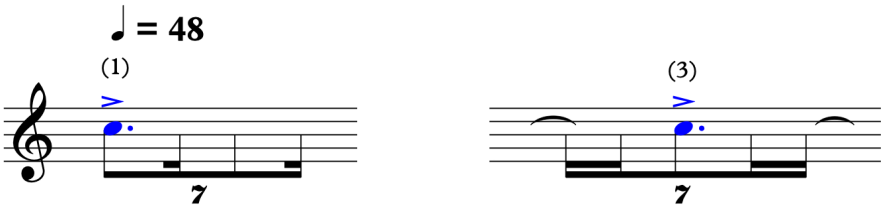


Audio A.511. Learning each positioning from August 3, 2021 Metrical Positioning Shifting session

Audio A.512. Moving between positionings from August 3, 2021 Metrical Positioning Shifting session

Audio A.513. Improvisation from August 3, 2021 Metrical Positioning Shifting session

Figure A.101. Inputs for August 8, 2021 Metrical Positioning Shifting session

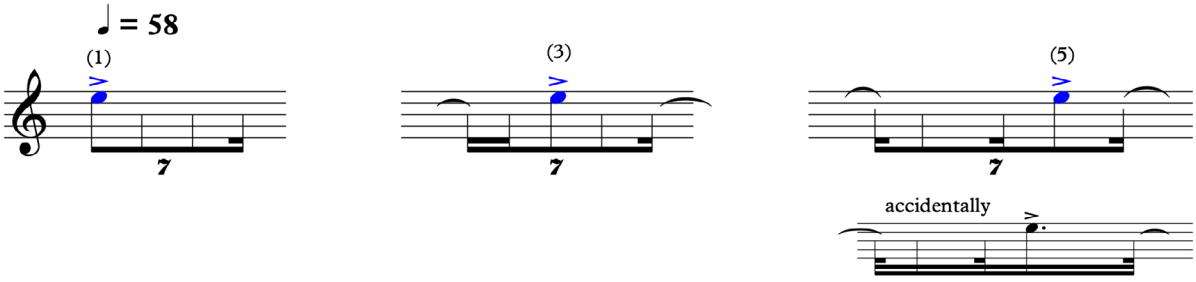


Audio A.514. Learning each positioning from August 8, 2021 Metrical Positioning Shifting session

Audio A.515. Moving between positionings from August 8, 2021 Metrical Positioning Shifting session

Audio A.516. Improvisation from August 8, 2021 Metrical Positioning Shifting session

Figure A.102. Inputs for August 15, 2021 Metrical Positioning Shifting session



Audio A.517. Learning each positioning from August 15, 2021 Metrical Positioning Shifting session

Audio A.518. Moving between positionings from August 15, 2021 Metrical Positioning Shifting session

Audio A.519. Improvisation from August 15, 2021 Metrical Positioning Shifting session

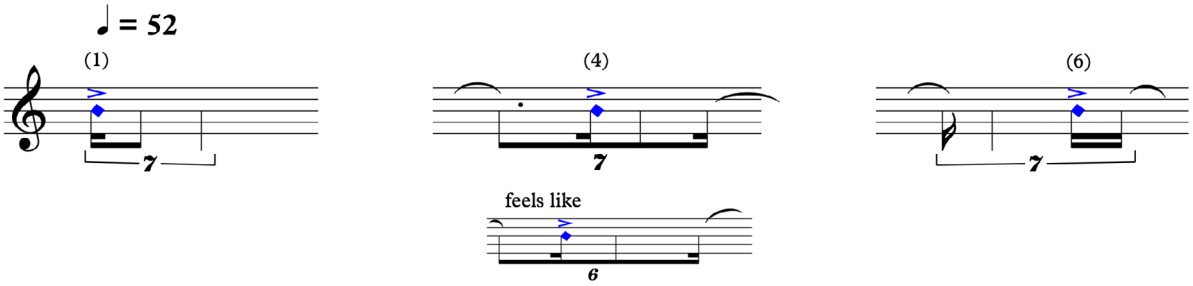
Figure A.103. Inputs for August 16, 2021 Metrical Positioning Shifting session

Audio A.520. Learning each positioning from August 16, 2021 Metrical Positioning Shifting session

Audio A.521. Moving between positionings from August 16, 2021 Metrical Positioning Shifting session

Audio A.522. Improvisation from August 16, 2021 Metrical Positioning Shifting session

Figure A.104. Inputs for August 24, 2021 Metrical Positioning Shifting session

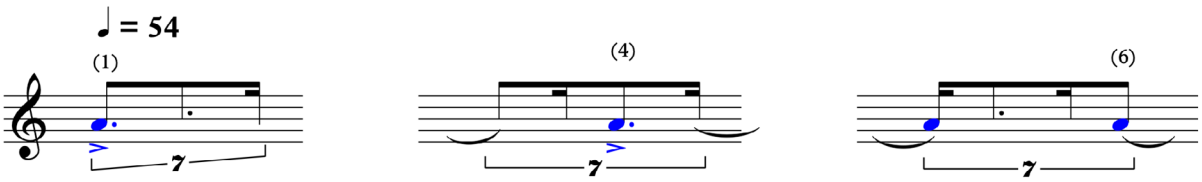


Audio A.523. Learning each positioning from August 24, 2021 Metrical Positioning Shifting session

Audio A.524. Moving between positionings from August 24, 2021 Metrical Positioning Shifting session

Audio A.525. Improvisation from August 24, 2021 Metrical Positioning Shifting session

Figure A.105. Inputs for August 28, 2021 Metrical Positioning Shifting session

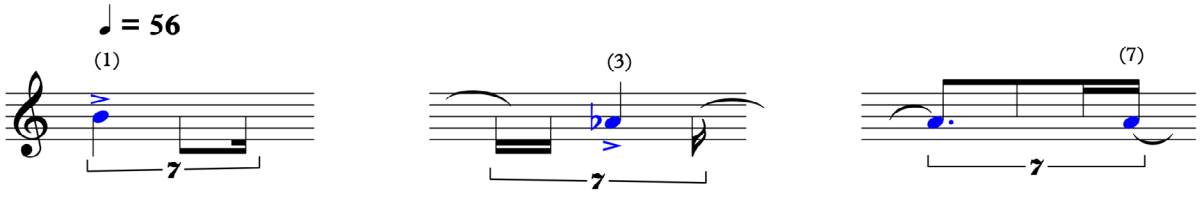


Audio A.526. Learning each positioning from August 28, 2021 Metrical Positioning Shifting session

Audio A.527. Moving between positionings from August 28, 2021 Metrical Positioning Shifting session

Audio A.528. Improvisation from August 28, 2021 Metrical Positioning Shifting session

Figure A.106. Inputs for August 30, 2021 Metrical Positioning Shifting session

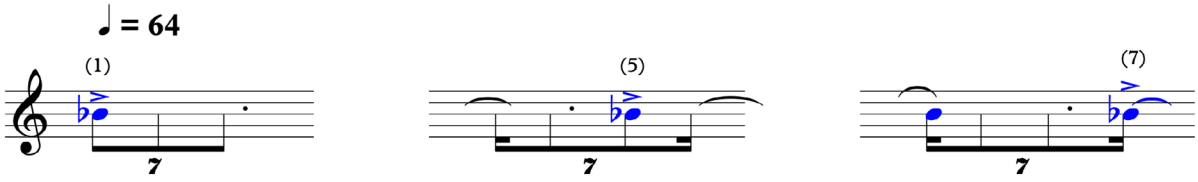


Audio A.529. Learning each positioning from August 30, 2021 Metrical Positioning Shifting session

Audio A.530. Moving between positionings from August 30, 2021 Metrical Positioning Shifting session

Audio A.531. Improvisation from August 30, 2021 Metrical Positioning Shifting session

Figure A.107. Inputs for September 3, 2021 Metrical Positioning Shifting session

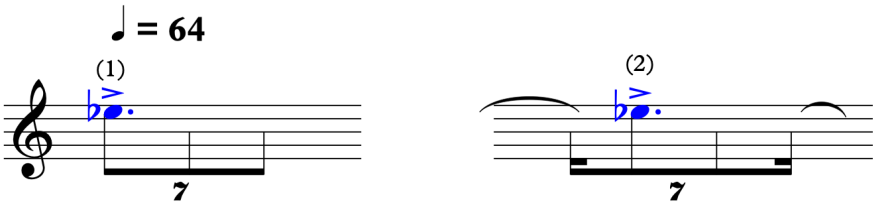


Audio A.532. Learning each positioning from September 3, 2021 Metrical Positioning Shifting session

Audio A.533. Moving between positionings from September 3, 2021 Metrical Positioning Shifting session

Audio A.534. Improvisation from September 3, 2021 Metrical Positioning Shifting session

Figure A.108. Inputs for September 4, 2021 Metrical Positioning Shifting session

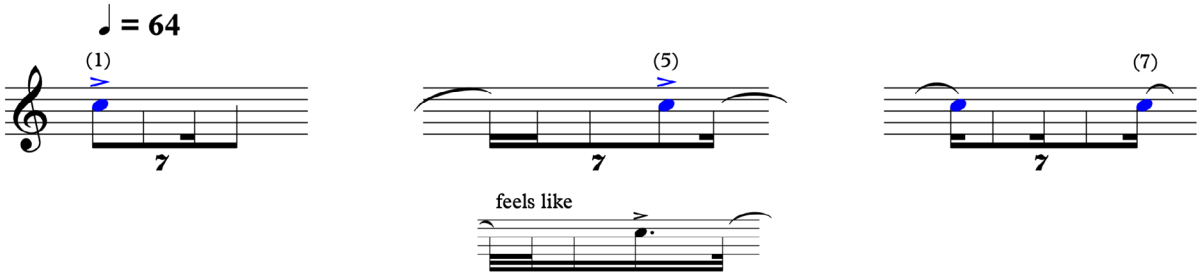


Audio A.535. Learning each positioning from September 4, 2021 Metrical Positioning Shifting session

Audio A.536. Moving between positionings from September 4, 2021 Metrical Positioning Shifting session

Audio A.537. Improvisation from September 4, 2021 Metrical Positioning Shifting session

Figure A.109. Inputs for September 5, 2021 Metrical Positioning Shifting session

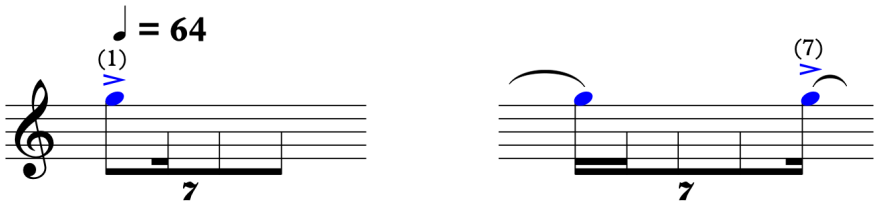


Audio A.538. Learning each positioning from September 5, 2021 Metrical Positioning Shifting session

Audio A.539. Moving between positionings from September 5, 2021 Metrical Positioning Shifting session

Audio A.540. Improvisation from September 5, 2021 Metrical Positioning Shifting session

Figure A.110. Inputs for September 8, 2021 Metrical Positioning Shifting session

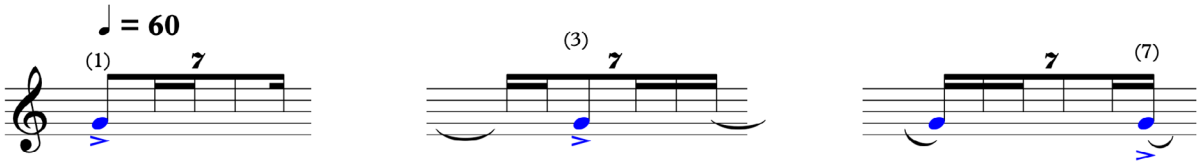


Audio A.541. Learning each positioning from September 8, 2021 Metrical Positioning Shifting session

Audio A.542. Moving between positionings from September 8, 2021 Metrical Positioning Shifting session

Audio A.543. Improvisation from September 8, 2021 Metrical Positioning Shifting session

Figure A.111. Inputs for September 9, 2021 Metrical Positioning Shifting session

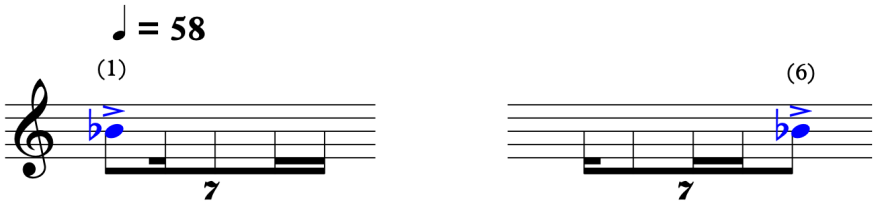


Audio A.544. Learning each positioning from September 9, 2021 Metrical Positioning Shifting session

Audio A.545. Moving between positionings from September 9, 2021 Metrical Positioning Shifting session

Audio A.546. Improvisation from September 9, 2021 Metrical Positioning Shifting session

Figure A.112. Inputs for September 11, 2021 Metrical Positioning Shifting session

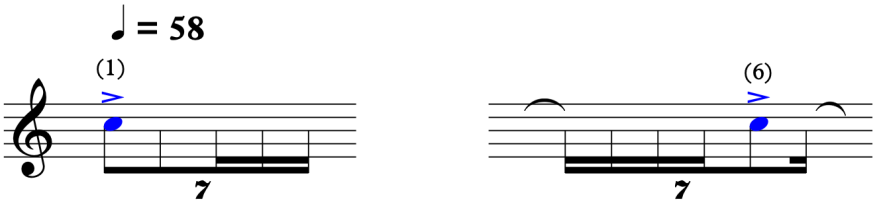


Audio A.547. Learning each positioning from September 11, 2021 Metrical Positioning Shifting session

Audio A.548. Moving between positionings from September 11, 2021 Metrical Positioning Shifting session

Audio A.549. Improvisation from September 11, 2021 Metrical Positioning Shifting session

Figure A.113. Inputs for September 17, 2021 Metrical Positioning Shifting session

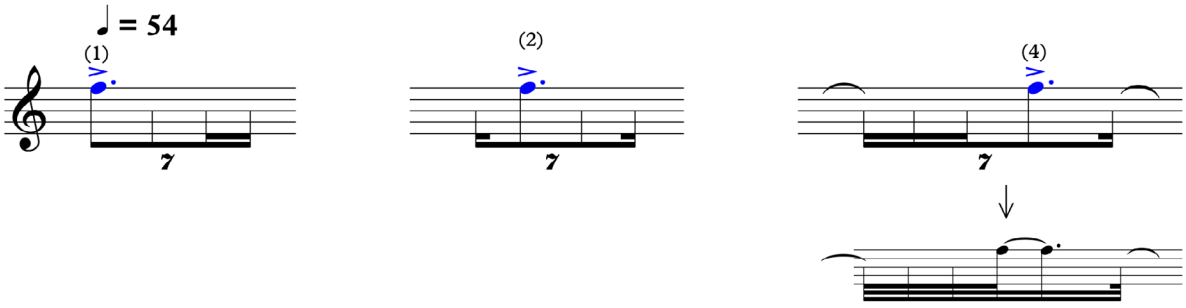


Audio A.550. Learning each positioning from September 17, 2021 Metrical Positioning Shifting session

Audio A.551. Moving between positionings from September 17, 2021 Metrical Positioning Shifting session

Audio A.552. Improvisation from September 17, 2021 Metrical Positioning Shifting session

Figure A.114. Inputs for September 23, 2021 Metrical Positioning Shifting session

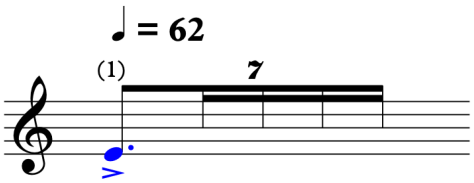


Audio A.553. Learning each positioning from September 23, 2021 Metrical Positioning Shifting session

Audio A.554. Moving between positionings from September 23, 2021 Metrical Positioning Shifting session

Audio A.555. Improvisation from September 23, 2021 Metrical Positioning Shifting session

Figure A.115. Inputs for September 27, 2021 Metrical Positioning Shifting session



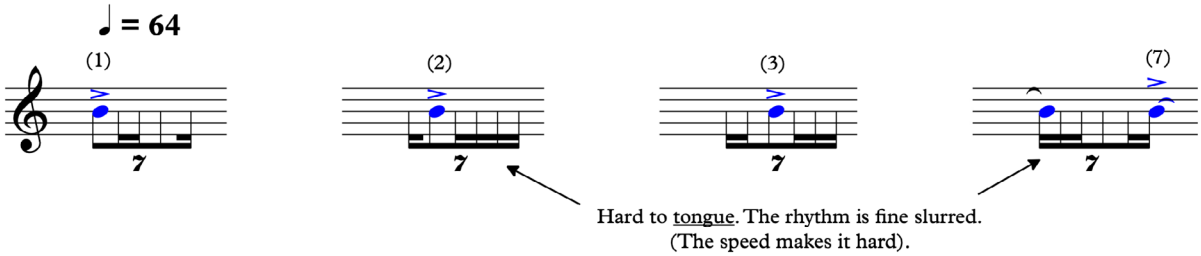
(no tricky ones)

Audio A.556. Learning each positioning from September 27, 2021 Metrical Positioning Shifting session

Audio A.557. Moving between positionings from September 27, 2021 Metrical Positioning Shifting session

Audio A.558. Improvisation from September 27, 2021 Metrical Positioning Shifting session

Figure A.116. Inputs for September 28, 2021 Metrical Positioning Shifting session

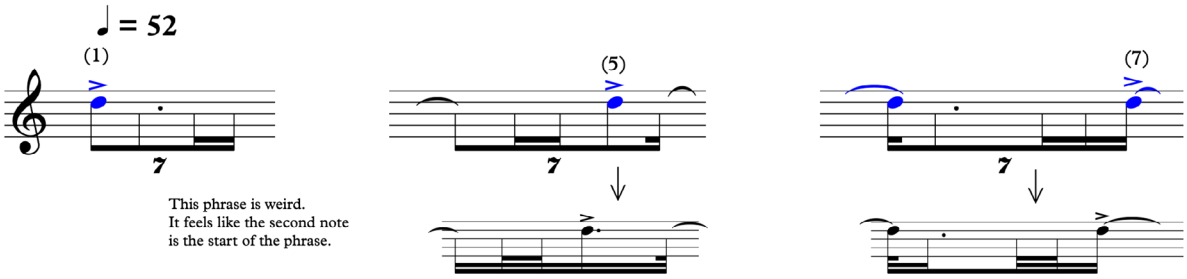


Audio A.559. Learning each positioning from September 28, 2021 Metrical Positioning Shifting session

Audio A.560. Moving between positionings from September 28, 2021 Metrical Positioning Shifting session

Audio A.561. Improvisation from September 28, 2021 Metrical Positioning Shifting session

Figure A.117. Inputs for October 1, 2021 Metrical Positioning Shifting session

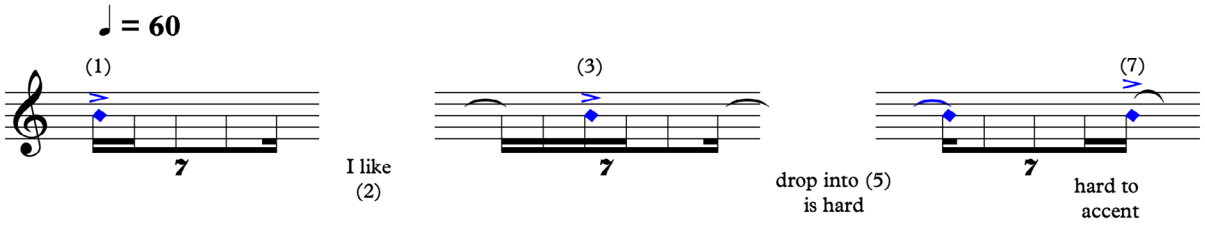


Audio A.562. Learning each positioning from October 1, 2021 Metrical Positioning Shifting session

Audio A.563. Moving between positionings from October 1, 2021 Metrical Positioning Shifting session

Audio A.564. Improvisation from October 1, 2021 Metrical Positioning Shifting session

Figure A.118. Inputs for October 4, 2021 Metrical Positioning Shifting session

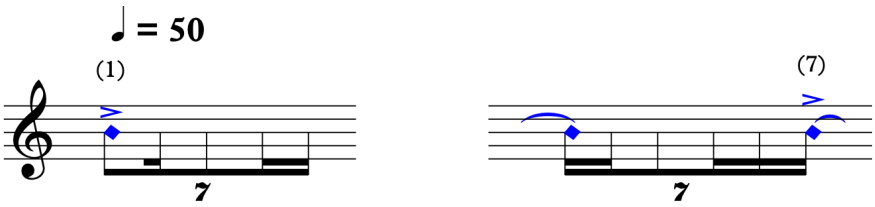


Audio A.565. Learning each positioning from October 4, 2021 Metrical Positioning Shifting session

Audio A.566. Moving between positionings from October 4, 2021 Metrical Positioning Shifting session

Audio A.567. Improvisation from October 4, 2021 Metrical Positioning Shifting session

Figure A.119. Inputs for October 10, 2021 Metrical Positioning Shifting session

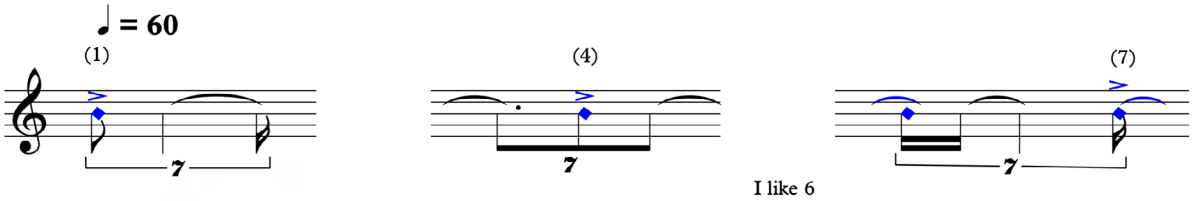


Audio A.568. Learning each positioning from October 10, 2021 Metrical Positioning Shifting session

Audio A.569. Moving between positionings from October 10, 2021 Metrical Positioning Shifting session

Audio A.570. Improvisation from October 10, 2021 Metrical Positioning Shifting session

Figure A.120. Inputs for October 11, 2021 Metrical Positioning Shifting session



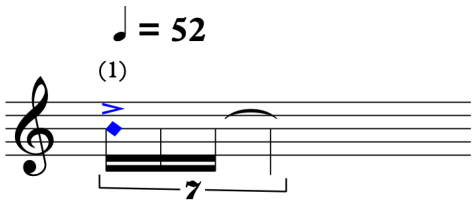
Audio A.571. Learning each positioning from October 11, 2021 Metrical Positioning Shifting session

Audio A.572. Moving between positionings from October 11, 2021 Metrical Positioning Shifting session

Audio A.573. Improvisation from October 11, 2021 Metrical Positioning Shifting session

Phase Three, Session 22: October 16, 2021

Figure A.121. Inputs for October 16, 2021 Metrical Positioning Shifting session



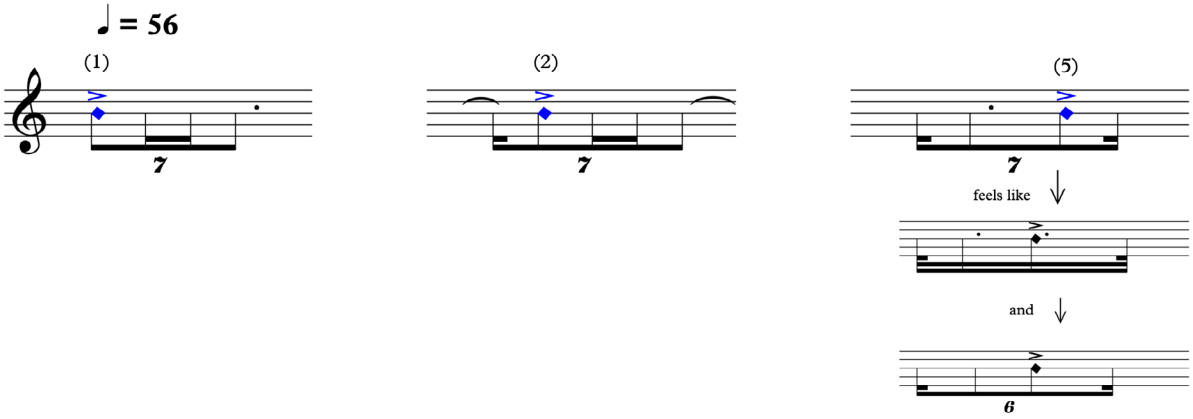
no difficulties, but I like this set!

Audio A.574. Learning each positioning from October 16, 2021 Metrical Positioning Shifting session

Audio A.575. Moving between positionings from October 16, 2021 Metrical Positioning Shifting session

Audio A.576. Improvisation from October 16, 2021 Metrical Positioning Shifting session

Figure A.122. Inputs for October 17, 2021 Metrical Positioning Shifting session



Audio A.577. Learning each positioning from October 17, 2021 Metrical Positioning Shifting session

Audio A.578. Moving between positionings from October 17, 2021 Metrical Positioning Shifting session

Audio A.579. Improvisation from October 17, 2021 Metrical Positioning Shifting session

Figure A.123. Inputs for October 22, 2021 Metrical Positioning Shifting session

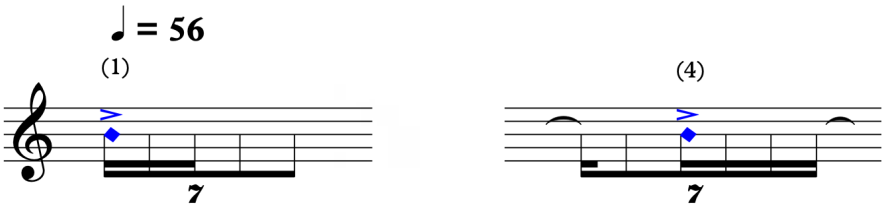
Audio A.580. Learning each positioning from October 22, 2021 Metrical Positioning Shifting session

Audio A.581. Moving between positionings from October 22, 2021 Metrical Positioning Shifting session

Audio A.582. Improvisation from October 22, 2021 Metrical Positioning Shifting session

Phase Three, Session 25: October 26, 2021 (played on soprano saxophone)

Figure A.124. Inputs for October 26, 2021 Metrical Positioning Shifting session



Audio A.583. Learning each positioning from October 26, 2021 Metrical Positioning Shifting session

Audio A.584. Moving between positionings from October 26, 2021 Metrical Positioning Shifting session

Audio A.585. Improvisation from October 26, 2021 Metrical Positioning Shifting session